DII 2019

PROCEEDINGS FOR THE 6TH INTERNATIONAL CONFERENCE ON DEVELOPMENT AND INVESTMENT IN INFRASTRUCTURE - STRATEGIES FOR AFRICA

INNOVATION IN INFRASTRUCTURE DEVELOPMENT AND INVESTMENT - IS AFRICA READY FOR CHANGE?

Editors: Chipozya Tembo-Silungwe, Innocent Musonda, Chioma Okoro
Co-editors: Franco Muleya, Lubinda Habazoka, Erastus Mwanaumo

EAZ

National Economic Summit

Copperbelt University

University of Johannesburg

University of Zambia

NCC

6th International Conference on Development and Investment in Infrastructure - Strategies for Africa

24 – 26 July, 2019
Livingstone, Zambia

Editors
Chipozya Tembo-Silungwe
Innocent Musonda
Chioma Okoro

Co-Editors
Franco Muleya
Lubinda Haabazoka
Erastus Mwanaumo

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Correspondence:

All correspondence pertaining to the International Conference on Development and Investment in Infrastructure (DII-2019) - Strategies for Africa, should be sent to:

Dr Erastus Mwanaumo
DII-2019 Chair: Technical Programme
School of Engineering
University of Zambia
Box 32379
Lusaka
Zambia
Erastus.mwanaumo@unza.zm

Prof Innocent Musonda
DII-2019 Chair: Scientific Programme
Department of Construction Management and Quantity Surveying
University of Johannesburg, Johannesburg
PO Box 17011
Doornfontein
2028, South Africa
Email: imusonda@uj.ac.za

Website: www.diiconference.org
Email: info@diiconference.org

CONFERENCE PARTNERS

University of Zambia

ENDORSEMENTS

FOREWORD

On behalf of the Organising Committee, it is my pleasure to welcome you to Livingstone, Zambia, the host city of the International Conference on Development and Investment in Infrastructure (DII-2019). The DII-2019 conference is part of the DII Conference series on Infrastructure Development and Investment in Africa which aims to provide an international forum for leaders, researchers, practitioners and other stakeholders in infrastructure development to discuss and devise ways of maximizing benefits from infrastructure development in Africa and achieve outputs that will inform policy.

With focus on regulatory, institutional framework, general infrastructure development and investment in Africa, the 2019 conference, themed *"**Innovation in Infrastructure Development and Investment - Is Africa Ready for Change?**"* will address a broad range of topics around infrastructure to evaluate and draw lessons on innovations, empowerment, growth and sustainable development.

The broad topics covered by the conference include:

- Digitalisation in infrastructure development
- Infrastructure project delivery systems
- Future work and transformation in infrastructure development
- Digital empowerment for infrastructure develop
- Sustainability in infrastructure development
- Economics Inclusive growth
- Renewable energy infrastructure development
- Integrative infrastructure planning and management
- ICT and skill transfer in infrastructure development

Warm gratitude is extended to the authors who have successfully gone through a two-tier peer review process in order to have their papers accepted and published in this proceeding. The peer review process would have been impossible without the support of the members of the Scientific and Technical Review Committees (STC). The organising committee is thankful for this voluntary service that is so central to the quality of the accepted papers.

Special thank you also goes to all the conference delegates that have travelled from different continents. Thank you for attending the event and please make the most of your time at the conference while enjoying the hospitality of the Zambian people here in Livingstone.

Erastus Mwanaumo
For/DII-2019

ACKNOWLEDGEMENT

The Organising Committee of the DII-2019 conference is grateful to the University of Zambia, Copperbelt University, Zambia, National Council for Construction (NCC), Zambia, University of Johannesburg, South Africa, the Economics Association of Zambia, Tomorrow Investments Limited, the Universal Mining and Chemical Industries Limited (UMCIL), the Chartered Institute of Building, the South African Council for the Project and Construction Management Professions and other South African, African and International universities and Institutions for supporting the conference through their valued contributions.

The contributions and unique support of the International Advisory and Scientific Committees, who worked tirelessly to prepare refereed and edited papers, which produced this published proceedings of the highest standard including satisfying the criteria for subsidy by the South African Department of Higher Education and Training (DHET), is truly treasured. The contributions of Prof Innocent Musonda, Dr Erastus Mwanaumo, Dr Chipozya Tembo-Silungwe, Dr Franco Muleya, Mrs Chioma Okoro, Ms Chama Mwansa, Ms Cynthia Mailola, and Mr Brian Mutale are recognised. The support of Dr Jeffrey Mahachi and Dr Lubinda Haabazoka is laudable.

DISCLAIMER

While every effort is made to ensure accuracy in this publication, the publishers and editors make no representation, express or implied, with regard to the accuracy of the information contained in these proceedings and cannot accept any legal responsibility of liability in whole or in part for any errors or omissions that may be made.

DECLARATION

All the papers in these conference proceedings were double-blind peer reviewed at abstract and full paper stage by the members of the International Review Committee. The process entailed detailed reading of the abstracts and full papers, reporting of comments to authors, modification of papers by authors whose papers were not rejected by the reviewers, and re-evaluation of revised papers to ensure quality of content.

CONFERENCE COMMITTEES

Organising Committee

Zambia

Dr Erastus Mwanaumo (Chairman: Technical Programme)
Dr Chipozya Tembo-Silungwe
Dr Franco Muleya
Dr Balimu Mwiya
Dr Chabota Kaliba
Ms Chama Mwansa
Mr Brian Mutale

South Africa

Prof Innocent Musonda (Chairman: Scientific Programme)
Mrs Chioma Okoro
Prof Trynos Gumbo

Scientific Committee

This committee ensured that the final papers incorporated the reviewers' comments were correctly allocated to the appropriate theme and met the requirements set by the organisers in line with international standards for inclusion in the proceedings. They also arranged the papers into their final sequence as captured on the USB memory stick and Table of Contents.

Dr EM Mwanaumo, University of Zambia
Dr Chipozya Tembo-Silungwe, Copperbelt University, Zambia
Dr F Muleya, Copperbelt University, Zambia
Dr B Mwiya, University of Zambia
Prof I Musonda, University of Johannesburg, RSA
Prof M Muya, University of Zambia
Prof T Gumbo, University of Johannesburg, RSA

Technical Review Committee

The technical review committee comprised experts from the built environment. The committee ensured that the papers were of the highest standard in terms of originality of material; academic rigor; contribution to knowledge; critical current literature review; research methodology and robustness of analysis of findings; empirical research findings; and overall quality and suitability for inclusion in the conference proceedings.

Dr Alice Lungu - Copperbelt University, Zambia
Dr Anthony Mushinge - Copperbelt University, Zambia
Dr Ayodeji O Aiyetan - Durban University of Technology, South Africa
Dr Bernard M Arthur-Aidoo - Accra Technical University, Ghana
Dr Chrispin Mphuka - University of Zambia
Dr Dingayo Mzyece - Oxford Brookes University, United Kingdom
Mr Danstan Chiponde - Copperbelt University, Zambia
Dr Franco Muleya - Copperbelt University, Zambia
Dr Iruka Anugwo - Durban University of Technology, South Africa
Dr Justus Agumba – Tshwane University of Technology, Pretoria, South Africa
Dr Lovemore Chipungu - University of Kwazulu-Natal, South Africa
Dr Lubinda Haabazoka - University of Zambia
Dr Mbuyu Sumbwanyambe - University of South Africa
Mr Mulenga Mukuka - University of Johannesburg, South Africa
Dr Nalumino Akakandelwa - University of West England, United Kingdom
Dr Nelly Chunda-Mwango - Copperbelt University, Zambia
Dr Nuru Gambo - Abubakar Tafawa Balewa University, Bauchi, Nigeria
Dr Nadine Ibrahim - University of Toronto, Canada
Dr Oluwayomi Babatunde - University of Witwatersrand, South Africa
Dr Ruben Ndihokubwayo - Cape Peninsula University of Technology, South Africa
Dr Sambo Zulu - Leeds Beckett University, United Kingdom
Dr Sitwala Simushi - Copperbelt University, Zambia
Dr Victor Samwinga - Northumbria University, United Kingdom
Dr Walied H Elsaigh - University of South Africa
Prof Albert Malama – Copperbelt University, Zambia
Prof Elena Popkova - Institute of Scientific Communication, Volgograd, Russia
Prof Ephraim Munshifwa - Copperbelt University, Zambia
Prof Felix Masiye - University of Zambia
Prof Jamal Khatib - University of Wolverhampton, United Kingdom
Prof Kahilu Kajimo-Shakantu – University of the Free State, South Africa
Prof Sing Wong - University College of Technology, Sarawak, Malaysia
Prof Sumbye Kapena - Copperbelt University, Zambia

THE PEER REVIEW PROCESS

Overview

The need for high quality conference proceedings, evident in the accepted and published papers, entailed a rigorous two-stage blind peer review process by no less than two acknowledged experts in the subject area. Experts including industry professionals and academics were assigned with the responsibility of ensuring that high standards of scientific papers were produced and included in the proceedings.

First stage of review

Submitted abstracts were twice blind reviewed. Each abstract was reviewed in terms of relevance to conference theme and objectives, academic rigor, contribution to knowledge, originality of material and research methodology. Authors whose abstracts were accepted were provided with anonymous reviewers' comments and requested to develop and submit their full papers taking into consideration the abstract review comments.

Second stage of review

Experts were once again assigned the submitted full papers relative to their areas of expertise. The full papers were reviewed in terms of relevance to conference theme and objectives; originality of material; academic rigour; contribution to knowledge; critical current literature review; research methodology and robustness of analysis of findings; empirical research findings; and overall quality and suitability for inclusion in the conference proceedings.

Third stage review

Authors whose papers were accepted after the second review were provided with additional anonymous reviewers' comments on evaluation forms, and requested to submit their revised full papers. Evidence was required relative to specific actions taken by the authors regarding the referees' suggestions. Final papers were only accepted and included in the proceedings after satisfactory evidence was provided. To be eligible for inclusion, these papers were required to receive a unanimous endorsement by all the reviewers that the paper had met all the conditions for publication. Out of 64 submissions, 42 papers were finally accepted and included in the DII-2019 conference proceedings.

At no stage was any member of the Scientific Review Panel or the Organising Committee or the editors of the proceedings involved in the review process related to their own authored or co-authored papers. The role of the editors and the scientific committee, was to ensure that the final papers incorporated the reviewers' comments and to arrange the papers into the final sequence as captured on the USB memory stick and Table of Contents.

Regards
Innocent Musonda
Chair: Scientific Programme
University of Johannesburg

UNIVERSITY OF JOHANNESBURG

The University of Johannesburg (UJ), is the largest, multi-campus, residential university in South Africa. Born from a merger between the former Rand Afrikaans University (RAU), the Technikon Witwatersrand (TWR) and the East Rand campuses of Vista University in 2005, the University of Johannesburg's unique academic architecture reflects a comprehensive range of learning programmes, leading to a variety of qualifications ranging from vocational and traditional academic to professional and postgraduate programmes, across the four campuses, namely: Auckland Park Kingsway, Auckland Park Bunting Road, Doornfontein and Soweto campuses. The campuses vary in size and each has its own character and culture, contributing to the institution's rich diversity.

The University of Johannesburg has benefited from a large pool of researchers bringing together various fields of expertise and research focus areas. The university provides the ideal ground for interdisciplinary research and the university has more than 87 rated researchers. Five of these researchers are A-rated - all of whom are recognised as world leaders in their field. The university is also home to nine research centres.

The University fosters ideas that are rooted in African epistemology, but also addresses the needs of the South African society and the African continent as it is committed to contributing to sustainable growth and development. We continue to build a culture of inclusion, embracing South Africa's rich history, culture, languages, religions, gender, races, social and economic classes. Additionally, the University encourages a culture of service as part of the university student experience and it proudly pursues a four-language policy of English, isiZulu, Afrikaans and Sesotho sa Leboa.

Our staff and students come from over 50 countries in Africa and the world. The university has also built links, partnerships and exchange agreements with leading African and other international institutions that further enrich the academic, social and cultural diversity of campuses. It is also the recipient of the highest levels of external financial support, from donors and partners all over the world. This demonstrates the high esteem in which we are held internationally.

In its mission, UJ commits itself to the following:

- Quality education;
- Leading, challenging, creating and exploring knowledge;
- Supporting access to a wide spectrum of academic, vocational and technological teaching, learning and research;
- Partnerships with our communities; and
- Contributing to national objectives regarding skills development and economic growth.

The values guiding all University activities include:

- Academic distinction;
- Integrity and respect for diversity and human dignity;
- Academic freedom and accountability;
- Individuality and collective effort; and
- Innovation

In giving expression to its vision of being a pre-eminent South African and African University, UJ has set itself ten strategic goals. Its priorities are to:

- Build a reputable brand;
- Promote excellence in teaching and learning;
- Conduct internationally competitive research;
- Be an engaged university;
- Maximise its intellectual capital;
- Ensure institutional efficiency and effectiveness;
- Cultivate a culture of transformation;
- Offer the preferred student experience;
- Secure and grow competitive resourcing; and
- Focus on the Gauteng city regions.

THE COPPERBELT UNIVERSITY

HISTORY

With its motto "Knowledge and Service", the Copperbelt University (CBU) was established in 1987 as part of the University of Zambia. It was initially intended to be located in Ndola, about 50km South East of Kitwe, as UNZANDO (University of Zambia in Ndola). But since the University of Zambia (UNZA) had no infrastructure in Ndola at the time, UNZANDO was allowed to operate in Kitwe using the Zambia Institute of Technology (ZIT) infrastructure. ZIT was integrated into Copperbelt University in 1989, two years after the university was established. Until recently (when many public and private universities are being established), the Copperbelt University was the only other university in the country after the University of Zambia. Currently, the university has eight academic schools – Schools of the Built Environment, Engineering, Medicine, Graduate Studies, Business, Mines and Mineral Sciences, and the School of Natural Resources. In addition, the University offers distance education through its Directorate of Distance Education and Open Learning. The Dag Hammarskjold Institute for Peace Studies is accommodated at Copperbelt University.

THE SCHOOL OF BUILT ENVIRONMENT

The School of the Built Environment (SBE) (formerly School of Environmental Studies) was established in 1981 under ZIT when the School admitted its first students. The School remained temporarily situated at ZIT until 1989. The School of the Built Environment (SBE), therefore, increased its scope by taking on the ZIT Diploma courses in Architecture, Quantity Surveying, Land Surveying and Town & Country Planning, and Advanced Technician course in Construction. The University began to offer these programmes at degree level. Currently, the School consists of four departments, namely: Architecture, Construction Economics and Management (CEM), Real Estate Studies (RES, formerly Land Economy), and Urban & Regional Planning (URP). In addition, the school also offers a Master of Science programme in Project Management. The School also runs a Project and Consultancy Section called the Practice Office, which is responsible for undertaking consultancy services in various fields of the built environment. Currently, there are 5 undergraduate and 1 masters' degree programmes offered in the school. These are BSc. in Quantity Surveying, and BSc. in Construction Management (both offered by the CEM Department); BSc. in Real Estate Studies (offered by the RES Department); BSc. in Urban & Regional Planning (offered by the URP Department); Bachelor of Architecture (BArch, offered by the Architecture Department); and the MSc. in Project Management (offered by the School of Graduate Studies).

After successful completion of their degree programmes, our students join both public and private sector reputable organisations within and outside the country where they work as Architects, Design Consultants, Construction Managers, Valuers, Planners, Project Managers, Quantity Surveyors, Investment Bankers and many more. Other than the masters programme, which takes up to two years to complete, all our undergraduate programmes should take five years to complete. Our students come from within and outside

Zambia. In terms of staffing, it is the policy of the University that it recruits highly qualified personnel. For this reason, the university has put in place a policy where the minimum qualification of a lecturer is not only a masters' degree but also that the masters' degree must be in the same discipline as the lecturer's first degree. In addition to this profile, the SBE has a very ambitious programme where it intends to expand the school by introducing more programmes like the MSc. Degree in Land Management. This will help in meeting the ever increasing demand for qualified professionals within and outside the SADC region. More information on CBU in general and SBE in particular, can be found on our website at www.cbu.edu.zm.

University of Zambia

THE SCHOOL OF ENGINEERING, UNIVERSITY OF ZAMBIA

INTRODUCTION

University of Zambia opened its doors in 1966, two years after Zambia attained its independence. The main purpose was to produce human resources (graduates) for the government and industry in Zambia. From the first intake of students of 300, the population has grown to the current population of over 32,000. The School of Engineering located at the main campus of the University of Zambia in Lusaka is one of the twelve (12) schools in the university. Over the years, the school has responded to various national challenges through teaching, research, training, consultancy and public service. The School of Engineering, now comprising the Departments of Agricultural Engineering, Civil & Environmental Engineering, Electrical and Electronic Engineering, Geomatics Engineering and Mechanical Engineering was established on 1st May 1969.

The school has a student population that is in excess of 490 undergraduate students, 400 Master of Engineering students and 15 Doctoral Candidates across all the departments. The postgraduate programmes aim at training engineers with advanced and in-depth knowledge in specialised fields. The number of postgraduate programs remained small for a long period of time until the year 2010 when it became clear that there was a serious gap in trained manpower in the energy sector.

To address this gap, the University of Zambia, School of Engineering with the financial support from NUFFIC, developed a master's degree program in Renewable Energy. From this experience, the School identified many gaps in engineering management fields, the ICT sector, environment, structural and project management, and developed a number of other programs in electronics, construction and engineering management. The aim was to elevate the caliber of engineers in the country to improve the management of engineering firms in line with the new technologies.

POSTGRADUATE PROGRAMMES OFFERED IN THE SCHOOL

PhD research programmes

PhD research programmes offer a vast range of opportunities to students who relish the chance to undertake a research project with clear intellectual, scientific, industrial or commercial relevance and challenge. Currently the school has PhD Candidates in the Departments of Civil & Environmental Engineering and Mechanical Engineering. The School also undertakes interdisciplinary research in conjunction with other institutions.

Taught MEng programmes

Part I – Taught Component (First Year)

1) Master of Engineering in Agricultural Management (Taught or by Research)
2) Master of Engineering in Engineering Management (Taught or by Research)
3) Master of Engineering in Structural Engineering (Taught or by Research)
4) Master of Engineering in Environmental Engineering (Taught or by Research)
5) Master of Engineering in Construction Management (Taught or by Research)
6) Master of Engineering in Project Management (Taught or by Research)
7) Master of Engineering in Water Resources Engineering (Taught or by Research)
8) Master of Engineering in ICT (Taught)
9) Master of Engineering in ICT Security (Taught)
10) Master of Engineering in ICT Regulation, Policy and Management (Taught)
11) Master of Engineering in Computer Communications (Taught)
12) Master of Engineering in Telecommunications Systems (Taught)
13) Master of Engineering in Wireless Communications (Taught)
14) Master of Engineering in Electrical Power Engineering (Taught or by Research)
15) Master of Engineering in Geo-Information & Geodesy (Taught)
16) Master of Engineering in Production Engineering & Management (Taught or by Research)
17) Master of Engineering in Thermo-Fluids Engineering (Taught or by Research)
18) Master of Engineering in Renewable Energy Engineering (Taught or by Research)
19) Master of Engineering in High Voltage Engineering and Power Management (Taught or by Research)
20) Master of Engineering in Electromagnetic Compatibility and Electrical Safety (Taught or by Research)

Part II – Research Component (Second Year)

Part II comprises research work and a dissertation. A candidate is, at the end of his/her research work, and prior to the submission of his or her dissertation, expected to present the results of his/her research work at an open Seminar organised by the Directorate of Research and Graduate Studies for the purposes of discussion and comments. The Examination includes a viva-voce.

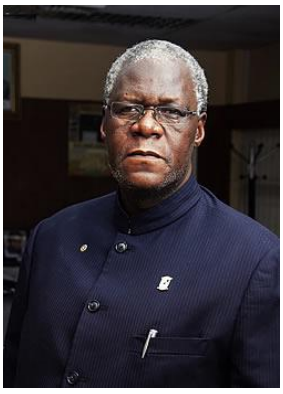
All Master Programmes are also offered by Research (Two-year programmes)

With these new strides, the university answers the call from society, which requires a pool of well-trained engineers meeting the challenges of operating in the developing world while meeting the challenges of both the developing and developed economies.

KEYNOTE SPEAKERS' PROFILES

The Development and Investment in Infrastructure (DII) conference is an international conference which provides a forum for discourse on the status quo regarding Africa's massive shortfall in infrastructure development and investment that limits its productive capacity and global competitive advantage. Inaugurated in 2014 in Livingstone, Zambia, the conference has been jointly hosted by the University of Johannesburg, the University of Zambia, Copperbelt University, and the National Council for Construction - Zambia. The DII-2019 conference will see collaboration between the DII and the Economics Association of Zambia on their National Economic Summit. Previous meetings have been supported by the Network of Energy Excellence for Development (NEED), a project funded by the European Union (EU) and the African, Caribbean and Pacific Group of States (ACP) and the University of Toronto, Canada on their Engineering Education for Sustainable Cities in Africa (EESC-A) project. The conference is a great platform for development and Built Environment professionals, researchers, academics and post-graduate students who are passionate about eliciting solutions to the infrastructure challenges and sustainability in Africa.

Themed, *"**Innovation in Infrastructure Development and Investment - Is Africa Ready for Change?**"* the 2019 conference will focus on the role of empowered and capable stakeholders in ensuring sustainable infrastructure development in Africa. The conference will address a broad range of topics around infrastructure to evaluate and draw lessons on innovations, empowerment, growth and sustainable development. The confirmed DII-2019 keynote speakers include:



Lt. Col (Rtd) Prof. Naison NGOMA

Professor Naison Ngoma has over forty years of experience in Government (Zambia Air Force and the Ministry of Defence), Universities and international organisations that include United Nations (UN) Agencies, the African Union Commission and COMESA. Prof. Ngoma who is currently the Vice Chancellor of the Copperbelt University as well as Vice Chancellor of Mukuba University and Kapasa Makasa University. Prof. Ngoma served in various portfolios as Director at Dag Hammarskjöld Institute of Peace and Conflict Studies (DHIPS), Consultant in Governance and the Security Sector, Facilitator and Head of different research and project undertakings in education and specialised institutions. He has published books and papers both locally and internationally.

Prof. Luke MUMBA

LUKE MUMBA has a wealth of knowledge and experience gained over his illustrious academic and professional career that spans over 25 years. Born and raised in Zambia, Prof Mumba holds a doctorate degree in genetics from University of Cambridge (1994); a Master's Degree in Molecular Genetics from the University of Wales, UK, (1987); and a Bachelor's Degree in Biology & Chemistry from UNZA (1985). He received recognition as an Extraordinary Associate Professor in the Department of Botany & Zoology of the University of Stellenbosch, South Africa between 2012 and 2014. He is a recipient of four international research fellowships and awards (British ODA Fellowship; Beit Trust Fellowship; UNESCO Fellowship; and the Rodger Gilbert Memorial Prize Award). Luke is the Founding Director of the Biotechnology Outreach Society of Zambia, a professional association spearheading biotech outreach in Zambia. He is also one of the founding trustees of the Zambian Academy of Sciences. He has received many awards, fellowships and visiting scholarships including from the Hawaii State Foundation (Honolulu), Austrian (Innsbruck) and the British ODA Fellowships. He has served in many national boards including as Chairman of the National Aids Council Biosafety Committee, member of the Board Directors of the Zambia Wildlife Authority (ZAWA), Member of the National Plant Genetic Resources Committee, member of the University of Zambia Council and Senate, and as member of the National Biosafety Committee. Luke has also presented, researched and written widely on genetics, biotechnology and on science, technology and innovation (STI) in general. Prof Mumba has contributed to the development of STI strategies and policies at national, regional and continental levels in Africa. He is currently a member of the African Union Commission (AUC) Monitoring and Evaluation (M&E) Committee on the "Science, Technology and Innovation Strategy for Africa" (STISA-2024).

Mr. Matthew NGULUBE

MATTHEW NGULUBE is the Executive Director at National Council for Construction, Zambia. He has been an owner and Principal Consultant of a consulting quantity surveyors firm for over 18 years. He has consulted as Project Manager and Quantity Surveyor for several multi-million dollar projects, in both the private and public sectors, which have left a landmark in Zambia's infrastructure development. Key among them include: Upgrade of the Kenneth Kaunda International Airport; Kasumbalesa border post One-Stop-Shop; Radisson Blu 4-Star Hotel in Lusaka; Levy Business Park Shopping Mall; and the Engineering Institution of Zambia Office Complex. He is the incumbent Chairman of the Quantity Surveyors Registration Board of Zambia and the Vice President of the Association of Quantity Surveyors for Southern Africa Region (AAQS) as well as the Commonwealth Association of Surveyors and Land Economists (CASLE) Southern Africa Region. He is also a member of the International Federation of Surveyors (FIG) and serves as Board Member of the Road Development Agency in Zambia.

DII – 2019
24 – 26 July 2019, Livingstone, Zambia

International Conference on Infrastructure Development and Investment Strategies for Africa

24 July 2019

To whom it may concern

PEER REVIEW PROCESS (PRP) CONFIRMATION

On behalf of the DII-2019 International Conference on Infrastructure Development and Investment Strategies for Africa, we confirm that the manuscripts accepted for oral presentation and publication in the Conference proceedings were blind peer-reviewed by two (2) or more technical specialists.

The reviewers were selected from the experts in the Scientific and Technical Review Committee. To be eligible for inclusion, the papers, reviewed through a three-stage review process (abstract, full paper and final paper) received a unanimous endorsement by all the reviewers that they had met all the conditions for publication. All accepted manuscripts will be published via the conference proceedings.

The conference proceedings with **ISBN 978-0-620-81856-8** will be provided at the conference to be held in Livingstone, Zambia, from 24 – 26 July, 2019.

Regards,

Dr Justus Agumba

DII-2019 PRP Manager

agumbajn@tut.ac.za

Conference website: www.diiconference.org

Email: info@diiconference.org

Development and Investment in Infrastructure (DII)

University of Zambia

CONFERENCE PROGRAMME

TUESDAY, JULY 23, 2019 (CHRISMA HOTEL)		
14:00-18:00	**Workshop:** Postgraduate Research	
17:00-19:00	Conference Registration	
WEDNESDAY, JULY 24, 2019 (AVANI HOTEL)		
07:30-08:30	**Registration**	
	Welcome ceremony **Chair: Prof Innocent Musonda –** DII-2019 Scientific Chairperson – University of Johannesburg, South Africa	
08:40-09:00	Welcome addresses - Prof Luke Mumba – Vice Chancellor – University of Zambia	
09:00-09:20	Official Opening of the Conference: Prof Nkandu Luo – Minister of Higher Education, Republic of Zambia	
09:20 -09:40	Opening address - QS Matthew Ngulube – Executive Director – National Council for Construction	
09:50 -11:10	**Tea break/Networking**	
	Technical Sessions	
	Breakaway Session 1:	**Breakaway Session 2:**
	Theme: Financing for Development **Session chair: Dr Austin Mwange**	**Theme: Sustainability in Infrastructure** **Session chair: Prof Ephraim Munshifwa**
09:50 -10:10	The Eurobond Debt Trap and the Possible Escape Options - **Mbewe Kalikeka, Shebo Nalishebo Nathan**	Impact of Household Energy Efficiency and Behavioural Scenarios on CO2 Emissions of Zambian Energy System - **Ismo Heimonen, Albert Malama, Nusrat Jung, et al.**
10:10 -10:30	Zambia's Debt and The Sustainability of Fiscal Policy - **Zondwayo Duma**	Mechanically Stabilised Earth Wall with Geosynthetic Reinforcement and Gabion Facing: an Effective Solution to Mitigating the Effects of Flash floods on Bridge Crossings in Zambia - **Trinity Dhanda, Augustine Katotobwe**
10:30 -10:50	Effects of Public Expenditure on Gross Domestic Product in Zambia from 1980 - 2017: An ARDL Methodology Approach - **Mubanga Mpundu, Janie Mwafulirwa, Mutinta Chaampita, Notulu Salwindi**	"Design of a Resilient Off-grid Solar PV Supply for Rural Communities in Zambia." - **Sebastian Namukolo, Ackim Zulu**
10:50 -11:10	In Further Pursuit of an IMF-Programme: Possible Pathways for Zambia and Lessons for Africa - **Caesar Cheelo**	Factors Influencing the Adoption of ICT in Zambian Real Estate Agency Practice – **Ephraim Munshifwa**
11:10-11:30	**Tea break/Networking**	
	Technical Sessions	
	Breakaway Session 3:	**Breakaway Session 4**
	Theme: Inclusive Economic Growth **Session chair: Dr Chabota Kaliba**	**Theme: Infrastructure project delivery systems** **Session chair: Dr Alice Lungu**
11:10-11:30	Smart Tourism for Enhancing Tourism Experience: Prospects and Challenges for Africa - **Randhir Roopchund**	Root Causes of Delays in Ghanaian Public Sector Competitive Tendering Process - **Jemima Antwiwaa Ottou, Bernard Kofi Baiden, Gabriel Nani**
11:30-11:50	Empirical Analysis of Investment Strategies on the African Content: International and Domestic Market - **Agape Kapasa**	Issues of Corruption in Construction Projects and Infrastructure Development in Nigeria: An Empirical Approach – **Chinedu C. Adindu, S. O. Yusuf, A. M. Musa**

	Technical Sessions cont'd.	
11:50-12:10	Unveiling the 2019 Employment Code: Severance Pay and Job Creation **Miselo Bwalya, Felix Mwenge, Tamara Billima Mulenga (ZIPAR)**	Effectiveness of Waste Management Control Systems in Bloemfontein - **Fidelis Emuze, Michael Oladokun**
12:10-12:30	Women's Entrepreneurship and Sustainable Livelihoods in Lusaka Urban - **Atangambuyu S. Silungwe , Wilson Silungwe**	Indicators of Management Capability in Small and Medium-Sized Construction Organisations: A Literature Review - **Marcia Mampholo Raphiri, Innocent Musonda, Chioma Sylvia Okoro**
12:30-12:50	Towards Improved Public Private Partnerships in the Delivery of Sustainable Infrastructural Projects - **Kajimo-Shakantu and Xhala**	Replacing the Construction Contract with the Total Cost of Ownership Contract - **Sitwala Simushi**
12:50-13:10	Factors Affecting Public Participation in EIA and Social Impact Assessments: Case Study of Five Projects in the Copperbelt Province of Zambia - **Alice Lungu, Xoliswa K. Kauert and Vincent Chiona**	Assessing the utility of the retention bond as an alternative to cash retention for small-scale contractors in Zambia - **Chipozya Tembo-Silungwe, Danstan Bwalya Chiponde, Nomsa Shankaya**
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Sustainability in Infrastructure Development

DII-2019-016

Factors Influencing the Adoption of ICT in Zambian Real Estate Agency Practice

Ephraim Kabunda Munshifwa[1] and Kopano Chilembo[2]

Abstract

Real estate agency business brings together buyers and sellers making the real estate markets to emerge and function. Thus readily available information on who is selling and buying becomes essential to this practice. A system for collecting, analysing and storing of this information is cardinal to improving efficiency in this business. Advancements in information and communication technology (ICT) since the early 1970s have provided solutions to data storage and manipulation in many industries. However, despite its obvious benefits in other industries, particularly with the use of the internet, its adoption in real estate agency practice in Zambia has been sluggish - despite the traditional systems being slow, inefficient and costly. Thus, this study investigated factors influencing adoption of ICT in Zambian real estate agency practice. Data for the study was collected through a questionnaire administered to 20 registered estate agency firms. The study found that pressure to increase clientele, reduction of advertising costs, improving sales and minimising transaction costs are key consideration in the adoption of ICTs in firms. Thus, firms, before adopting ICT solutions, weigh the cost of equipment and monthly charges on internet access against benefits in sales and reduced marketing or advertising costs.

Keywords: ICT, real estate agency, internet, Zambia.

1. Introduction

Real estate agency has, since the early 1990s, grown as a business that facilitates exchange of contracts between buyers and sellers. At the core of this business is the management of information on recently sold and let real estate. Thus readily available information on who is selling and buying becomes essential to the practice. A system for collecting, analysing and storing of this information is cardinal to improving efficiency in this business. Advancements in information and communication technology (ICT) since the early 1970s have provided solutions to data storage and manipulation in many industries. However despite its obvious benefits in other industries, particularly with the use on the internet, why has its adoption in real estate agency practice been sluggish in Zambia? Thus this study investigated factors influencing adoption of ICT in Zambian real estate agency practice.

Zambian real estate agency business has gone through a number of phases. After the passing of the Land (Conversion of Titles) Act in 1975 and abolition of estate agency business, the country experienced a period which had an opaque or no market. During this socialist environment, estate agents were cited as being responsible for inflating land values and exploiting a resource which was a "gift from God" (Kaunda, 1975). Property transactions were thus restricted to "un-exhausted improvements" on land only. Information on past transactions was almost none existent. After 1991, with a reversal to a capitalist re-orientation, estate agency business was once again formally recognised with the passing of the Estate

[1]Associate Professor & Dean, School of the Built Environment, P.O Box 21692, Kitwe
[2] Graduate of the 2016 Real Estate Studies class

Agency Act of 2000 and establishment of the Zambia Institute of Estate Agents (ZIEA) to regulate the profession. In a market environment, like Zambia, real estate agents perform a number of crucial functions such as negotiating on behalf of the client, advertising the property, advising clients and aiding in the conveyance of titles. However, despite these developments, the adoption of ICT in the business has been sluggish, hence the justification for this study.

This paper is structured as follows: after this introductory section, Section 2 reviews literature on ICT and real estate agency while Section 3 presents the research design. Section 4 discusses findings with Section 5 concluding the paper.

2. ICT and Real Estate Agency: A Literature Review

Estate agency practice exists within the realm of the real estate market system. Broadly, a market system is defined as "a system of society-wide coordination of human activities not by central command but by mutual interaction in the form of transactions" (Lindblom, 2001, p. 4). From a "new institutional economics" perspective, markets exist to minimise transaction costs (Williamson, 1979). Thus it can be argued that estate agency business exists to reduce transaction costs for market participants through the provision of an exchange structure of agents, offices, business networks and infrastructure such as ICT. This interaction is facilitated by the estate agency practice.

Advancements in information and communications technology (ICT) from the 1970s has found application in industry, including in estate agency practice. Particularly, after the merging of networks and creation of the internet in the early 1980s, the growth in the use of computers in business has grown exponentially. This shift from mechanical/analogue technology to the digital age opened up new avenues for the practice.

The use of ICT in the real estate industry is however not without debate. While some see it as an important tool in the business, others view it as a threat to the traditional way of doing things (see. Baen and Guttery, 1997; Deo, 2000; Guttery et al., 2000; Benjamin et al., 2005). For instance, Baen and Guttery (1997) predicted that increased use of the Internet and information technology would have a dramatic and negative impact on the real estate industry in terms of both income and employment levels. This study further argued that buyers and sellers with ready access to information through the internet will have no need for traditional ''intermediaries''. Thus Baen and Guttery (1997) predicted that improvements in computer technology would substantially reduce the number of active real estate agents because of improved efficiency as a result of user friendly market information and services.

Another study undertaken by the National Association of Realtors (NAR) in 1999 in the USA confirmed Baen and Guttery's (1997) predictions then. The NAR study found that 37% of all potential home-buyers searched for a home online in 1999, up from just 2% in 1995 (NAR, 1999). A similar point was emphasized in Guttery et al (2000), asserting that if buyers and sellers can sit at their computers and gather enough information to enable them transact, why would they need an estate agent? These studies though agree that the use of the internet in business improves efficiency in communication, contribute to lowering transaction costs and improves storage of information, thus threatening the traditional way of practice which is slow, inefficient and costly.

Other studies, such as Benjamin and Chinloy (1995), Bond et al (2000), Muhanna (2000), Stanfill (2000), Gwin (2004), Saber and Messinger (2010), Sun and Ifeanyi (2013), have argued for the use of the internet. For example, Saber and Messinger (2010) argued that due to heterogeneity of real estate, services of real estate agents will still be invaluable for inexperienced buyers or sellers. Muhanna (2000) also gathered data about Internet use from 197 agents and found that 79% of these firms viewed the Internet as an

opportunity and less as a threat. Muhanna (2000) further contended that internet use has given rise to new strategies that many believe will positively transform the very nature of work and structure of organizations. This study further observed that in a short period, the internet has emerged as a viable commercial medium, forcing significant changes on the real estate industry. Similar findings were reported by Tse and Webb (2002) suggesting that business survival was becoming more closely tied to the real estate firms' abilities to adapt to technological changes. Tse and Webb (2002) studied the impact of information technology on real estate brokerage in Hong Kong, using regression models to investigate how page "views" on the Internet affect real estate transactions and commissions. Tse and Webb (2002) and Guttery et al (2000) identified the following as some of the advantages of using Internet in real estate business: reducing the cost of property transfer, saving time, gives client a wider option, cheaper mode of advertising firm's products and services, allows firms to offer additional products and services and improves sale volume.

Bond et al (2000) also examined the extent to which real estate agents use the Internet for marketing real estate products and services - findings indicated that most real estate agency firms are aware of the opportunities and threats of the Internet. Thus Bond et al (2000) concluded that internet is undeniably a significant current and future avenue for doing business for real estate firms, asserting that the Internet delivers the least cost method for providing real estate information. The study further argued that all agents can remain competitive only if they offer their properties on the Internet. Bond et al. (2000) surveyed the Ohio real estate agency market for web usage.

Other studies such as Cassam et al (2000) and Ford and Rutherford (2001) linked internet use to income/revenue, reduced property transfer costs and increased sales. For instance, Cassam et al (2000) observed that if both buyers and sellers are in territories where they can easily access real estate information using the Internet, this would quicken the entire transaction, availing consumers with more market knowledge and in the process saving time, money and reducing risks associated such transactions.

Ford and Rutherford (2001) used 50,078 residential sales in the Dallas-Fort Worth area and found evidence of a positive link between the firm's income and Internet use. After controlling for physical characteristics and market conditions, the study concluded that houses listed on the Internet took about 6.1% longer to sell, but sellers received about a 1.4% higher price. These findings are similar with those from Benjamin & Chinloy (2005) which used a database of over 1,700 observations from the NAR 2001 survey of real estate firms to examine the impact of Internet usage on revenue and net income of residential real estate agency firms. Specifically, findings revealed that when residential real estate agency firms increased their use of the Internet by one standard deviation unit, their revenue rose by 0.33 standard deviation units and their earnings by 0.26 standard deviations units.

Recent literature thus suggests that the use of internet by real estate firms has contributed to increased efficiency in the delivery of services, thus increasing sales volume and reducing transaction costs related to advertising and marketing. Studies thus agree that real estate agents can use the internet to send up-to-date information to potential clients at a very low cost, accurately and quickly. However, these studies also acknowledge that, like any new innovation, the use of the internet also presents threats to traditional "business as usual" ways of transacting. In view of the two realities, it was therefore important to understand the major factors influencing the adoption of ICT, particularly the use of the internet, in Zambian practice.

3. Study Area Profile and Research Methodology

3.1 Real estate agency business in Zambia

Estate agency practice in Zambia can be traced from as early as the 1940s, before Zambia gained its independence from British rule. Practitioners as the time were British white settlers and practiced by a few privileged lawyers and architects (Stephens, 1981; Chunda, 2000). This system continued even after independence in 1964, until July 1975 when estate agency practice was abolished through a Presidential decree. This was triggered by the sale of Stand No. 29, Lusaka from Solar Investments to Development Bank of Zambia at K150,000, which was viewed as an exploitative transaction and facilitated by estate agents. The feeling at the time was that Zambians were poor people who had no need for the services of estate agents (Kaunda, 1975). The then President attributed the inflated prices of land and housing to the operation of estate agents. Thus from July 1975, all real estate agents were banned. All land administration functions of real estate agencies or organisations, including banks and law firms were taken over by local authorities.

With change of government in 1991 came a philosophical re-orientation to capitalism where markets were seen as important governance structures - this provided ground for the re-introduction of estate agency practice. In order to regulate the practice, the Estate Agents Act No. 21 of 2000 was passed which provided for the established of the Zambia Institute of Estate Agents. Thus the re-establishment of estate agency practice in Zambia falls squarely within the information age when use of computers and other cyber systems was also intensifying. As earlier noted, the merging of networks in the early 1980s provided a platform for the emergence of the internet as known today. Thus the early 1990s also saw the establishment of Zamnet Communications in 1994, the first internet service provider in Zambia. This was later followed by the licencing of Coppernet and Zambia Telecommunications (ZAMTEL). It can thus be argued that the adoption of internet use in real estate business in Zambia coincides with its re-introduction in the country, that is, in the early 1990s.

3.2 Research design and data collection

Data for the study was collected through the administration of questionnaires to 20 real estate firms registered with Zambia Institute of Estate Agents (ZIEA); regulators of estate agency practice in Zambia. As shown in Table 1 below, a total of 1853 companies are registered by Patents and Companies Registration Agency (PACRA). The selection criterion for this study was to select companies which are both situated in Lusaka and registered with ZIEA. Out of the 1853 firms only 25 satisfied this criterion. Thus questionnaires were administered to these 25 firms, with the target respondents being Principals/ Directors/Owners of companies (7), estate agents/valuers/property managers (12) and ICT experts (1). A statistical package was used for the presentation and analysis of data.

It should also be noted that although ZIEA has approximately 300 members, the number of paid up members fluctuates year to year. The 2019 published list shows 93 individual members distributed in 48 firms across the country. Indications are that, although 1853 are registered at PACRA as real estate firms, there is a high likelihood that either they are operating informally, hence not registered with ZIEA, or have ended in different lines of business which do not require ZIEA registration.

Table 1: Sampling data

Data source	Sampling Criteria	Number of firms
PACRA	All registered real estate firms	1853
ZIEA	Firms with at least one registered estate Agent	48
Estate Agency firms in Lusaka	All Lusaka firms registered with ZIEA and PACRA	25
Administration of Questionnaires	All Lusaka firms registered with ZIEA and PACRA	25
Questionnaires completed		20 (80%)

4. Findings and Discussion

The majority (90%) of respondents for this study were between 26 to 50 years. This meant that the majority fell within the information (digital) age, a period of time from the 1970s and characterised by a shift from mechanical/analogue technology to digital electronics and cyber systems. With growing competition in the estate agency business, some scholars have suggested that the only way to survive the competition is to use the internet (Gwin, 2004). Thus the questionnaire was slanted at investigating the impact of Internet use on real estate firms' operations.

It was evident that the majority (at least 95%) of real estate firms in Lusaka were using Internet and that firms realized its importance in marketing and advertising. However, the data also indicated that not all are using Internet in their operations. For instance, the 5% who were not using the internet argued that they were too small and lacked the financial capacity to pay for internet charges. Thus for them, costs outweighed the benefits. Others feared that the use of the internet would make clients (buyers and sellers) bypass their firms, similar to Baen and Guttery's (1997) observations. The study established that the use of internet commenced mostly after 1994, with seven firms adopting its use in the 1994/95 period, eight between 2006 and 2010 and four between 2011 and 2015. Thus the majority could be said to have adopted internet use from 2006.

The study found four factors as key influencers in the adoption of ICT, particularly internet use, in estate agency practice in Zambia. These included: (a) increase in clientele, (b) reduction in advertising costs, (c) increase in sales, and (d) reduction in transaction costs.

4.1 Increase in number of clients

Besides the use of ICT equipment for business, 14 out of 20 firms also indicated that they had their own internet websites. These firms argued that the internet was a useful tool for advertising their services, hence increasing the number of clients. For instance, 95% reported increased flow of clients after the installation of internet facilities; this ranged between 41% and 90%. A number of reasons were however given by the 5% who had no websites of their own. These reasons included firms being too small, lack of financial capacity to run a professional website and fears that clients (buyers and sellers) would bypass them by using internet. Despite these mixed results, 19 out of 20 agreed that internet use had widened the market for their real estate business, which was attributed to the fact that the Internet covers a wider range compared to other form of advertising. This was further attributed to the fact that once you advertise using the internet, the postings will remain online longer than using a radio station which may be a one-off advertisement.

4.2 Reduction in adverting costs

Advertising is one of the major activities of estate agents. The study found that 75% of respondents found the use of the internet beneficial in reducing advertising costs; this ranged between 11% and 90%. Traditionally, Zambian estate agents have relied on daily newspapers, radio and bill boards for listing property available for sale and letting. However, with the onset of the internet, most firms have found that its use lowered advertising costs, despite the initial high cost of setting up. The internet has also enabled the sharing of advertising costs in that even when a firm does not have its own Web page, it is able to use other companies' websites to advertise their products and service. For example, firms are able to advertise their products on football clubs' websites. Respondents, thus, felt this was far cheaper compared to having their own website and that it further widened their market. However, respondentS were wary of the limits this posed in comparison to running their own websites. These findings are in conformity with literature such as Crowston and Wigand (1998) reviewed earlier.

4.3 Increase in sales volume

Sales targets are key performance indicators for any real estate firm. Thus the study examined the contribution of internet use to sales volumes for firms. The majority (90%) agreed that the use of the internet contributed positively to company sales and lettings, which most firms put at between 70% and 80%. However, firms did not provide actual sales figures for further interrogation; the general consensus was that internet use is an important tool in increasing sales in a firm. A further scrutiny of this data using a One-way ANOVA analysis (see Table 2 below) showed that these results were statistically significant. These findings are in harmony with earlier studies such as Tse and Webb (2002) and Muhanna (2000). Nonetheless, most respondents were quick to point out that increased sales did not automatically translate into profits for them because of the high cost related to maintaining webpages, connection charges, internet service fees and wages for IT specialists.

4.4 Reduction in transaction costs

The study found that 15 out of 20 agreed that the use of the internet had resulted generally in reducing transaction costs. This reduction ranged between 61% and 70%. Although transaction costs include advertising costs discussed earlier, respondents were quick to point out that communication costs were an integral part of transaction costs. For instance, the study found online communication by use of Facebook (55%) and Emails (90%) were more prominent than traditional systems of land phones, letters and postal services. Thus most firms regard Internet as the best tool for both external and internal communication.

4.5 ANOVA analysis

A One-way ANOVA analysis was then used to further interrogate the purported link between internet use and the four dependent variables. The analysis was based on the hypotheses that internet use had strong relationships with increase in clientele, reduction in advertising costs, increase in sales and reduction in transaction costs (see Table 2).

Results revealed that despite respondents indicating that internet use had resulted in increased number of clients and reduced advertising costs, the quantitative analysis showed a mismatch between perception and figures. As pointed out earlier, the absences of actual sale figures and advertising costs limited the

scrutiny of these relationships; however, these findings were supported by literature reviewed. The case was similar for internet use and reduction in transaction costs. Although showing a slightly stronger relationship than the other two (i.e. $F = 3.331$, $p = 0.085$), it fails just outside the $p \leq 0.05$ at 95% confidence level; again showing a mismatch between the perception of respondents on the relationship and actual percentage figures. It was however clear that respondents' perceptions and actual percentages were consistent with regards to the relationship between internet use and increased sales. For instance, the ANOVA results showed F value of 5.545 and p value of 0.030 at 95% confidence level; indicating a strong relationship between these two variables.

Table 2: ANOVA Analysis

Dependent variables		Sum of Squares	df	Mean Square	F	Sig.
% Increase in no. of clients	Between Groups	.674	1	.674	.154	.699
	Within Groups	78.526	18	4.363		
	Total	79.200	19			
% Reduction in advertising costs	Between Groups	.129	1	.129	.018	.894
	Within Groups	126.421	18	7.023		
	Total	126.550	19			
% Increase in sales	Between Groups	27.918	1	27.918	5.545	.030
	Within Groups	90.632	18	5.035		
	Total	118.550	19			
% Reduction in transaction costs	Between Groups	24.761	1	24.761	3.331	.085
	Within Groups	133.789	18	7.433		
	Total	158.550	19			

ANOVA analyses highlighted a gap in the use of ICT in real estate business in Zambia. Despite a number of firms using computers and the internet, storage of historical financial data is still weak. This was revealed in the mismatch between the perception on benefits between internet use and the four dependent variables. Computers should enable firms to keep accurate records on costs related to advertising, marketing and communication while at the same time tracking sales, market growth and clientele. Only with such accurate figures can firms be able to carry out a cost-benefit analysis with regards to the use of ICT and the Internet in real estate practice.

Overall, this study concluded that internet use is a growing trend in Zambian real estate practice. In fact most practitioners agreed that its use resulted in more positives than negatives. Thus this study complements studies such as Bond et al (2000), Muhanna (2000), Stanfill (2000), Gwin (2004), Saber and Messinger (2010) and Sun and Ifeanyi (2013) which also concluded that the use of ICT has a positive effect of real estate business.

5. Conclusion

It was clear from this study that internet use had a number of benefits for real estate firms in Zambia. The adoption of its use is largely dependent on its ability to increase clientele, reduce advertising costs, increase sales and reduce general transaction costs. However, firms weigh the costs associated to purchase of computers, equipment and monthly maintenance charges on internet access against benefits in sales, market growth, reduction running costs before adoption ICT and internet use in an organisation. The study also noted that Zambian firms may not effectively be using ICT in storage of historical financial information as was highlighted by the ANOVA analyses of perceptions of benefits from internet use and actual figures given as percentages. There is thus need for real estate professionals to take advantage of available training in various forms of ICT, such as data mining, to assist in the analysis and reporting of market trends.

This research though was limited in quantitative data, particularly that relating to sales and costs over time; it thus relied more on practitioners' perspectives. There is need for a more detailed quantitative study to further test of the relationships examined in this study, vis-a-viz, the use of ICT.

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DII-2019-022

Will Rural Areas Disappear? Participatory Governance and Infrastructure Provision in Oyo State, Nigeria

Ayobami Abayomi Popoola[1] and Hangwelani Hope Magidimisha[2]

Abstract

Participatory governance, which entails planning with the people, has been identified as the route to efficient service delivery. Participation amongst various political tiers of government and representation between the people remains factors that influence the location of infrastructure. Over the years, rural service delivery is often subjected to political activity and less of the rural public interest. The study examined people experiences in governance (history of community representation, public participation in governance, and politics) and its effect on service delivery in rural local government areas (LGAs) of Oyo state, Nigeria. The concept of governance provides the conceptual balance for this study. The study made use of a mixed approach for data collection, qualitative and quantitative tools of a questionnaire and in-depth interview respectively. The study revealed that most service delivery such as water infrastructure, school buildings and drainage construction were provided based on political affiliation. Over 50% of the respondents view local governance as the state governor designated entity, as 54.4% of the respondents perceive that the local government does not practice participatory governance. Rural dwellers perceive bias in service delivery as infrastructure politicking exists. The study recommended that democratic local government autonomy remains a feasible and responsive solution to efficient service delivery in the local space.

Keywords: government, infrastructure-provision, local government area, rural areas, rural-participation

1. Introduction

The act of rural neglect remains a salient underlining challenge to the sustainability of human settlement as a whole. This is so because, planners and environmentalist have failed to realise that urban decay, poverty and collapse are a reflection of abject rural poverty and infrastructural neglect. Despite the human resource endowment of rural areas, these areas and their dwellers remain deprived of a good quality of life and their livelihood is being threatened by internal and external shocks inform of infrastructure dearth. Rural exclusion (planning inclusive) remains a common characteristic of rural areas.

Rural development driven by the provision of social and physical infrastructure (Asian Development Bank (ADB), 2007) is a key element that will facilitate the relationship between the rural areas and urban centres (Paul et al., 2014). Nonetheless, service delivery remains unequally distributed across space and the service provider remains less responsive. Rural areas are characterised by poor service delivery (Fisher and Knuston, 1989) owed to lack of voice, representation in the decision-making process (Amdam, 2000; Rakodi, 2010). The studies advocate for planning within the rural sphere to promoting rural governance, private-public partnership, public interest and inclusive planning.

[1] Department of Town and Regional Planning, University of KwaZulu-Natal, Durban, South Africa; bcoolay2@yahoo.com

Over the years, planning for infrastructural provision has been done without rural preference. Rural areas remain less relevant in the infrastructural provision map of politician and decision makers. Sometimes rural planning and local politics, often times, do work together towards the need for development and sustainability across all settlements, based on suggestions by the political office holders (Maos and Charney, 2012; Leone, 2013). Although there exists a poor definition of public interest and distrust among public stakeholders, private stakeholders and citizens as rural planning are being used as an instrument of manipulation, selfishness and selective development in places of choice by political office holders and their "instructive planners" (Johnson, 1997).

Discussions about the rural space have often been focused on food production and poverty with few (Maos and Charney, 2012; Leone, 2013) addressing the politics of rural service delivery. Provisions of services are often defined by the political affiliation and the responsiveness of governance. Within the rural space of Nigeria, the local government is responsible for the provision of infrastructures. Nonetheless, the rural people been planned for in facility location are not included in the decision making process.

It is against this backdrop that the study aims to examine local experiences of people in governance (history of community representation, public participation in governance, and politics) and its effect on service delivery in rural LGAs of Oyo state, Nigeria

1.1 The Context: Oyo State

Oyo as a state in Nigeria is made up of thirty-three (33) local government, three (3) senatorial districts (see Figure 1) out of which twenty-eight (28) are considered to be rural local government areas (National population commission (NPC), 2006; Oluseyi, 2006; Bankole and Bakare, 2011; Adelekan, 2016). The local government areas are in-charge of local grass-roots politics and governance of the people and can be classified into urban and rural local government areas.

Characterising the rural grassroots governance in Oyo state is the local government chairmen who are democratically elected through local government election conducted by the state governor or a caretaker chairman as designated by the governor in power. The last democratically elected chairmen of any local government area in Oyo state was elected twelve years ago. For the past eight (8) years, the grassroots has been governed by caretaker chairmen (handpicked political loyalist of the governor and his party) who are politically chosen by the governor and his party. Across the rural Oyo state, political parties have their own strongholds which define rural service delivery. For example, in the year 2015 (the last democratic election), the political stronghold and landscape of the state was highly distorted owing to the politics of deflection among strong political figure (Iginla, 2014).

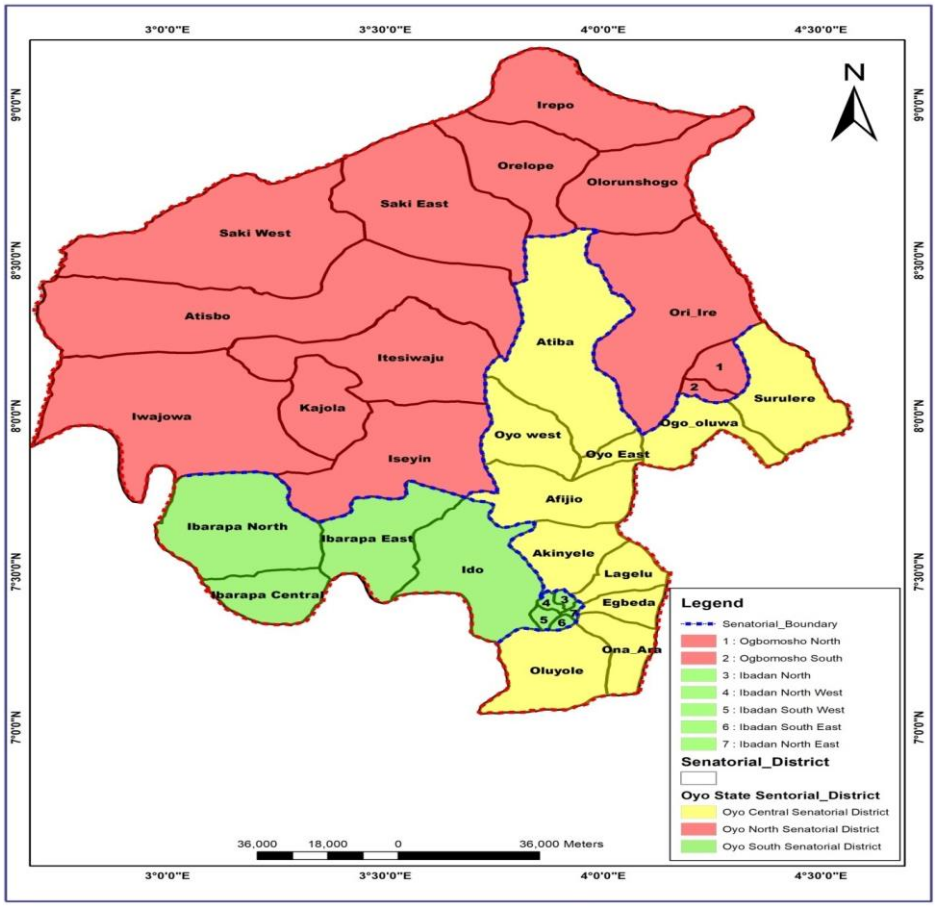

Figure 1: Oyo state LGAs within the Senatorial district context (**Source:** Authors' Mapping, 2019)

2. The Good Governance of Rural Service Delivery: The Conceptual Discourse

This study is based on the concept of good governance. The study attempts to situate rural service delivery within good governance discussions. The history of governance which can be traced to the 20th century perceive governance to be a measure of administration exerted by various administrative institutions across a well-defined administrative boundary Frederickson and Smith, 2003; United Nations Economic and Social Council, 2006). It refers to the process whereby policies on public life and allocation of resources are enacted and decisions concerning development are influenced by various stakeholders (United Nations Development Programme (UNDP), 2009). Thus reinstating the role of the state in developmental processes on one side (Batley 2002) and the other flip of the coin been the actions, series of process and activities of how private stakeholders plan and manage the public interest such that all views and needs are integrated together in a collective manner (UN-Habitat, 2002). UNDP (1997) in trying to explain the good governance ideology identified 5 main principles for defining good governance, these are legitimacy and voice; direction; performance; accountability and fairness. These principle highlights that governance is beyond the government, but rather recognizing the different stakeholders/actors (private actors/institutions, non-profit/governmental bodies, private individuals and citizens) playing diverse roles towards development.

The early 1990s marked the understanding of good governance as relating to public sector improvement (Grindle, 2004) and efficient management national endowment through a responsive exercise of power

within the legal framework of such country (World Bank, 1992; Asian Development Bank, 1995), such that all stakeholders are decision makers, well represented and heard (UNDP, 1997). This ideology remains vague as rural areas remain left out and behind in infrastructure access and provision. Studies (Chinsman, 1998; Oyeranti and Olayiwola, 2005; Ogeidefa, 2010; Adebayo, 2014) reported that rural areas in Nigeria are grossly neglected and marginalized as far as service delivery is concerned.

The prospect of a country (rural areas inclusive) depends on the quality of its governance. It is generally believed that good governance of rural participation and inclusiveness will help translate to equity in service delivery (infrastructure provision), and the promotion of the rule of law. It ensures that relevance is based on generally agreed views in the society with the rural poor and the vulnerable well represented in the development decision-making process (rural servicing) and resource (infrastructure) allocation (Centre of Governance and Democracy, 2000; Lange, 2010).

Within the rural area dichotomy, terms such as inequality, lack of participation and lack of representation have been the limitation towards rural infrastructure development. Rural-urban migration continues to be on the increase as household poverty, weak governance, and inefficient infrastructure persists. Sound governance is perceived as being crucial to solving these problems. How settlements are governed with respect to facility location and allocation, equal representation and sustainability of livelihood is of utmost importance. It is imperative that the public governance help limits the rural-urban drift through efficient service delivery in infrastructure provision for the rural poor (World Bank 1992; 1994; Lange 2010).

Dealing with rural infrastructure deficiency requires good and inclusive governance. The local government who are perceived to be the main actor in rural service delivery has remained irresponsive over the decades owing to political manipulation by the higher tiers of governance (Odoh, 2004). Agagu (2004) hinges the inability of local government to facilitate rural infrastructure on the incessant changes in politics, policies and structures of local government in Nigeria. Such incessant changes no doubt constitute problems to the operations and performance of this local government. The local government as an institution is subjected to perpetual learning of new rules with little or no opportunity to fully exploit, let alone improve upon existing rules.

Observed from the colonial period of local government administration is the much noise of development from below, "bottom-up" approach to development which remains a mirage in Nigeria (Lawal, 2004). There have been more noise than action. Likewise, rural peoples are not well represented (Sikiru, 2000). The political need for local government as a complimentary authority elected democratically or non-democratically to the federal or state government (Awa, 1981; Majekodunmi, 2013), aimed at controlling a small spatial entity of common interest (Wraith, 1984; Agbakoba and Ogbonna, 2004) through community participation in management of social amenities, local politics and decision making in their immediate areas (Emezi, 1984; Alobo, 2014). Nevertheless, this assumption of local government been responsive is a false one. The issue now arises as to what the relevance of local government is to the people and how it is perceived.

3. Study Materials and Methodology

The rural terrain and the dispersed nature of the rural people and space were some factors accountable for sample size selection across the study area. A combination of qualitative and quantitative data was collected for the study. Questionnaire served as the quantitative data capturing tool while in-depth interview and field observation were the data capturing tools for the qualitative data. Questionnaires were administered across the purposive sampled rural LGAs and administered using a non-probabilistic (accidental) sampling technique to select the households administered questionnaires.

Owing to the nature of the research which depends on the experience of the responder about governance and service delivery, non-probability sampling technique remains best to be used. Non-probabilistic sampling techniques have been identified to provide a range of alternative techniques based on researchers' subjective judgement, time and financial limitation (Yusuf, 2013). Purposive sampling as a type of non-probabilistic sampling is considered better when communal studies are carried out.

The sample frame for the selected LGAs for the study is the 185,683 rural dwellers in Oyo state based on the household survey conducted by NPC (2006). Taking into consideration the rural terrain, time schedule, a 90% confidence level, 5% margin for error, Odewumi et al. (2013), Australia Bureau of Statistics (2019) and Yusuf (2003). A 0.1346% sample size representing 250 rural residents was adopted for the administration of the structured questionnaire in the six (6) rural LGAs as shown in table 1. The study employed a cross-sectional survey approach to facilitate the collection of both qualitative and quantitative data from primary and secondary sources. This study adopted the cross-sectional survey research design for questionnaire-based data obtained from rural residents. The study area Oyo state, at present, has 3 senatorial districts (Oyo South, Oyo Central and Oyo North), 33 LGAs and 337 political wards. Oyo state has a total of 1,279,681 households across 33 LGAs (NPC, 2006). However, for the purpose of this research, the state was delineated using the 3 Senatorial Districts (North, South and Central) in the state as contained in Table 1.

Table 1: Sampled Size according to LGAs

S/N	LGA	Senatorial District	Sample size per LGA (0.1346%)	Per cent (%)
1.	IDO	Oyo South District	37	14.8
2.	Ibarapa Central	Oyo South District	51	20.4
3.	Irepo	Oyo North District	43	17.2
4.	Olorunsogo	Oyo North District	38	15.2
5.	Oyo-East	Oyo Central District	40	16.0
6.	Egbeda	Oyo Central District	41	16.4
	TOTAL		250	100

Source: Authors' compilation (2019).

The option of the senatorial district was adopted as against the federal constituency owing to the fact that some federal constituencies fall within the urban area with no rural local government area. A total of six (6) rural LGAs (two (2) LGAs each from the three senatorial districts) were chosen purposively. It is from the purposively selected LGAs that communities were selected randomly based on outlook and rural characteristics. Preliminary field survey with officials of the Department of Agriculture who are the main contact with the rural areas were considered in arriving at the settlements chosen across the LGAs. The settlement selected for sampling study within the local government areas were selected using accidental, convenience and cluster sampling technique. A total of two hundred and fifty (250) rural households were administered the questionnaire. To enhance data capture for this study, 35 rural stakeholders which include built-environment professionals and government officials were administered the questionnaire and some interviewed based on availability, as instructed by Departmental unit head to represent the unit, or been a field support staff.

In the sampled rural LGAs, questionnaires were administered purposively and interview conducted using non-probabilistic sampling techniques such as purposive, snow-ball and accidental sampling. Community leaders served as the key informant and were interviewed. Also, people along the circulation routes were interview using accidental sampling and based on the person's willingness to respond. For this study, the responders are household head, wife or the eldest person in the house. Instances where the responder is

not educated or request for discussion to be in the native language for ease of communication, the questions are asked in the native language. Owing consideration was given to ethical issues such as the respondents' privacy to responses given and the right to withdraw from the interview when the need arises.

4. Research Analysis and Findings

4.1 Hope for rural Space: Will rural areas disappear?

This study session comes from the angle of the argument made by Gasperini (2003) that rural areas will not disappear even in the face of urbanization. Querying this assertion in the face of urban literature (Grgić, et al., 2010; McGranahan and Satterthwaite, 2014), this study attempts to examine the perception of stakeholders to if rural areas will disappear. Responding an official of the Department of Works was of the view that "*...all rural can never become urban because rural is universal, it is only infrastructure facility that is making rural setting to disappear and the rural area is getting close to government..*" (Officer of Department of Works, May 2018, Iseyin LGA). The existence of the space character called rural is argued to continually exist, although the infrastructure if provided can shape her connection to and perception of the world.

Corroborating this view, a rural stakeholder reported that *"…what the government is planning for as they are ensuring that the people in the rural area get a better life. More so, there is no country that doesn't have rural area, most food that feeds the urban settings comes from rural area so if rural should disappear, then farming activities will be cancelled and food production goes into extinct..."* (Officer of Rural Access and Mobility Project, May 2018, Oyo State). Two rural teachers reported that *"…rural areas will continually exist as, one said using her locality as a case study stated that looking at our area such (disappearance of rurality) cannot occur, because of the development here. Those that are leaving will still come back here. All the mobile network available in Nigeria are here. Regarding food we eat fresh foods here so there is no point moving to town…"* (Teachers, May 2018, Ijawaya and Akufo village at Ido and Atiba LGA).

4.2 Perception of Participatory Governance in LGAs

As presented in Figure 2, 89.6% of the total respondent perceived that rural LGAs are not well catered for when infrastructure is taken into consideration. Local government provides the community with a formal organizational framework which enables them to conduct their affairs effectively for the general good. This general good is subjective as in most cases the local community is not carried along in the decision-making process for the "public good" by the governing body.

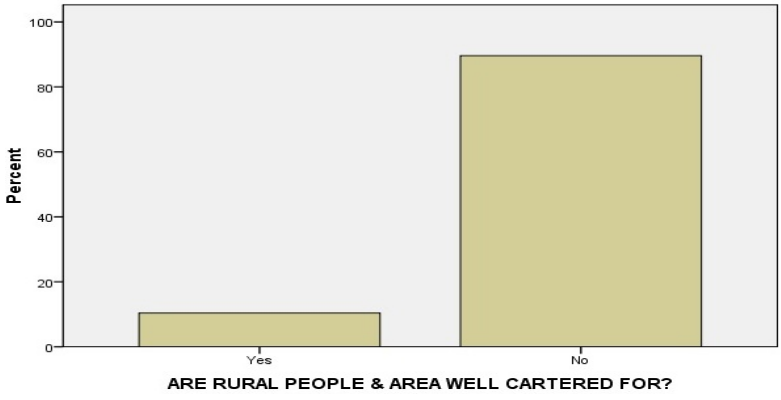

Figure 2: Perception of Rural Livelihood and Infrastructure

Public opinion and community consultations remain an avenue through which the voice of the rural people is heard and registered. Finding revealed that 88% of the sampled respondents have never attended or been invited for a rural public opinion meeting. This finding reveals that 2 out of every 3 respondents do not have their views represented at the local governing level. This perception is not far from the basis on which the people perceived the LGA and the leadership. The study revealed that 203 respondents perceive their LGA not to be participatory and inclusive (a subset of good) in decision making, out of which 136 respondents state that their local government chairman/caretaker does not engage the populace in governance (in the context of their view not well represented or considered sustainable) (see Table 2). Furthermore, the finding showed that 79 of the sample respondents are not sure if the chairman practices good and inclusive governance.

Table 2: Cross-tabulation Analysis of Participatory governance in the LGA

Is LGA governance participatory/inclusive?	Do you perceive LGA chairman as participatory?			
	Yes	No	Not Sure	**Total**
Yes	22	8	17	47
No	13	128	62	203
Total	35	136	79	250

The key informant interview with a local community leader in Irepo on the level of communal participation in the decision-making process portrays governance at the local level with no rural communal representation. The leader stated that: "*...how do you expect them to be participatory when they weren't democratically elected by the people of the community... we do not support them and they do not welcome our views....they were sent here by the governor (state government) as caretaker committee... so their participation is with the state government, not the rural community...*" (Community Leader, May 2018, Iya-Yooyi Irepo LGA). Asked if represented during stakeholders meeting, a rural stakeholder at Ido responded that: "*....the meeting has always been a waste of time... as most times our views and suggestions are not welcomed or considered to be useful to them... they (local governing body) are subjected to the dictates of the state instructions*" (Traditional leader, May 2018, Akufo Ido LGA).

Further inquiry into the rural peoples' experiences as to "what is and how is" good and inclusive governance in their LGAs. A plethora of responses were received. A responder in Egbeda LGA stated this: "*...inclusive governance in my LGA calls for self-independence (state-LGA democratic independence)*…" (Rural dweller, May 2018, Owo-Baale Egbeda LGA), supporting the perception, a leader in Oyo-East LGA stated that "…*the government of the day has failed the electorates because they do not keep to manifestoes*…" (Community leader, May 2018, Ajagba Oyo-East LGA) as the local governance has "…*not been very open but partial and non-participatory*…" (Community leader, May 2018, Gaa-Sidi Olorunsogo LGA). As narrated by a leader this type of governance has failed and there exists a dichotomy between the masses and the leader.

Although the people quite understood good governance as "…*the participatory governance to me is okay because people are allowed to participate in the government* …" (Ibarapa central LGA leader, May 2018); "…*it is a process where every class of the society is involved in decision making and policy formulation towards development*…" (Olorunsogo LGA leader, May 2018); "…*involvement of the locals in government*…"; "…*a kind of government that involves the LGA occupants in decisions*…" (Irepo LGA leader, May 2018).

Summarising this description reveals that the local respondents saw good governance as a type of government that incorporates the peoples' views into the decision making processes "*...thereby incorporating the young, old, adult without social marginalization into governance such that they all*

contribute their own quota to their societal development giving room for smooth running of governance, transparency and also accountability…"(Olorunsogo LGA leader**,** May 2018). It is still perceived that such governance is a mirage in the LGAs and as put by a community leader "*... participatory governance is at zero level in the rural LGAs of Oyo state... although it is needed as it will help the government to understand the plight of the masses*… (Community leader, May 2018, Egbeda LGA) and put by another leader "…*it will be a welcomed development if our views were welcomed, respected and considered in decision making*…" (Community leader, May 2018, Oyo-East LGA).

The limited participation in governance has been attributed to the lack of local government autonomy and democracy (see Figure 3). About 42% of the sampled respondents are not willing to participate in governance if the LGA is not autonomous, 38% stated that their participation in governance has nothing to do with the internal democracy in the LGAs while the remaining 20.4% are indifferent to the role LGA autonomy plays in participation in governance.

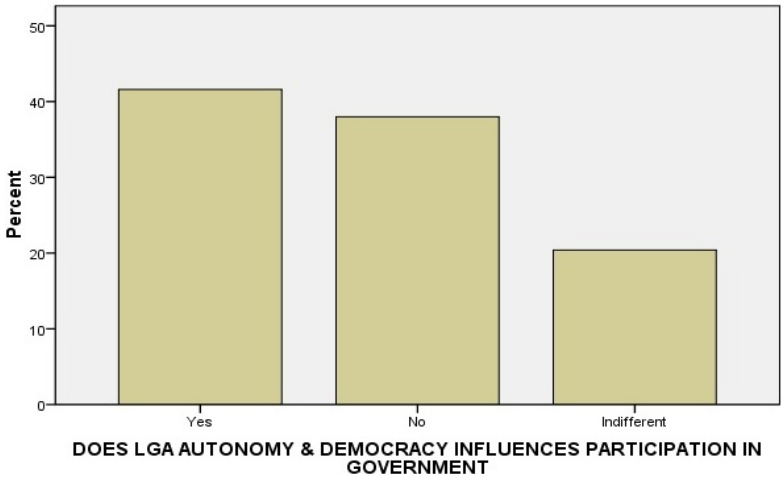

Figure 3: Response to LGAs autonomy and participation in governance

4.3 Is there infrastructure politicking or bias in rural service delivery?

Local government represent an ancient political entity in space recognised by the law of a country, governed by a democratic or non-democratically elected (Majekodunmi, 2013) with a common interest (Agbakoba and Ogbonna, 2004). Nonetheless, the politics of local government composition and representation at the local level has shaped the place of service delivery in the rural space.

From the sample rural dwellers, 101 reported that they were never aware of ever been represented at any governance (executive and legislative) level (local, state and federal) in their community, ninety-two had an mental history of representation while the remaining 57 also had the history of representation but over 20 years ago (see Table 2). Out of 250 respondents, 101 respondents had no history of representation. From the 92 respondents that reflected a history of representation, 60 respondent perceived the service delivery was not noticeable during the period of representation while 12 respondent observed a noticeable difference in service delivery during the period of representation Followup from the ninety-two respondents with a history of representation shows that majority (60 respondents) of them perceive that the representation didn't trickle-down into effective service delivery for the community.

Table 2: Cross-tabulation of History of Community Representation and Service Delivery

History of Representation.	Perceived Level of Service Delivery.			
	Noticeable	Non-noticeable	Indifferent	**Total**
Yes	12	60	20	92
No	23	53	25	101
Maybe Over 20years	12	25	20	57
Total	47	138	65	250

Statements from the key informants present a mixed reaction as relating to inclusiveness, service delivery and responsive representation. When asked if the community has benefitted from the perceived history of good governance and inclusive representation. A person responded that "…*we have arrived at this type of governance (participatory/inclusive) before and our advocacy (through responsive representation) led to the establishment of a primary health centre*…" (Rural dweller, May 2018, Atiba LGA). This portrays the notion of effective communal representation by the political class. Nonetheless, a dweller differs in her perception and history of governance as relating to service delivery. She said, "…*fair political government I will say and this is because infrastructure facilities are not readily accessible in area*…" (Rural dweller, May 2018, Oyo-East LGA); further stated by a civil servant in Egbeda LGA was that "…*the government is irresponsible and our political representatives are weak; they are not forthcoming in the rural areas in terms of social facilities* …" (Civil servant /rural dweller, May 2018, Egbeda LGA)

Although in Nigeria, LGAs are seen as a means of enhancing development and service delivery, improving living standards, human capacity building, improve governance and deepen democracy (Mabogunje, 1980; Buccus et al., 2007) living up to the expectation remains oblique. In Nigeria, nepotism in facility allocation and location has shaped service delivery. The level of political affiliation among the tiers of government and the level of LGA or community representation across the levels of governance is also a factor. Findings revealed that 58% of respondents perceived and have experiences that show that political affiliation among the tiers of government influences service delivery.

A leader stated that "… *during an election that we vote, you have to pray the party you voted for in a community wins… if not, do not expect them to carter (in service delivery)… even if they do, it will be minimal as compared to communities that voted for the candidate or party*…" (Community leader, May 2018, Oyo-East LGA). Although subjective, yet the statement cannot be totally ignored as informant portrays a share of priority among the governing body when it has to do with service delivery. As the democratically elected continue to have a spatial arrangement for service delivery based on the number of votes they receive from each community.

The place of interaction among the tiers of government was investigated. Finding show that 81.6% of respondents perceive that there is no relationship between the three tiers of government in relation to the provision of services in their respective communities. Reacting to this, a community leader said "… *in those days (the 1980s) we used to see and enjoy the projects such as schools and community health care clinics and programmes from and by the state and federal government in our local community…., but nowadays (post-millennium) you can rarely see such*…" (Community leader, May 2018, Ibarapa central LGA). This assertion points to the perceived level of interaction between the tiers of government as relates to social infrastructure and service delivery prior to the millennium era which is marked by partisan politics and political ideology as against country-wide rural social welfare which was the focus of the pre-millennial democratic regime.

4.3 How involved are the rural dwellers in development?

Making use of data gathered from the questionnaires administered to the rural stakeholders this study investigated the involvements and level of participation of local people in rural development with a focus on infrastructure. Interview response from both local dwellers and stakeholders which has been analysed using thematic content analysis was also used to buttress the quantitative responses. Table 3 presents the stakeholder's response on how much the interviewed department or agencies involve the rural people in developmental projects. From the sample of 35 stakeholders, only 30 responded to the question as questions asked might be outside the stakeholder's job and duty description and limited clarity or information about the question asked. From the 30 question responder, 29 affirmed that their agency or department involve rural people in projects and planning while 1 said the agency or department does not involve rural people. When queried further people involvement ranges from a decade to a month ago and involvement was in capacity building, physical project construction and assistance in accessing credit facilities.

Table 3: Perceptions of stakeholders' in people participation in development

Stakeholders (Department/Unit) responses on the involvement of rural people in projects and planning		
Responses	Frequency	Percentage
YES	29	82.9
NO	1	2.9
No response	5	14.3
Total	35	100.0
Stakeholders (Department/Unit) responses on Last time rural community engagement was carried out and nature of involvement		
Responses Coalition		
2017 Agricultural funding and practice seminar 2017 Youth empowerment program through agriculture 2017, reconstructing a damaged classroom 5 years ago, focusing on improving rural dwellers A decade ago January 2018, enlightenment jungle on planning relevance Last month, project financing at Tede LGA March 2018, Commercial project RAMP- Recently, rural/urban road easy accessibility		

Governance belongs to the people and as such the role of the public service official is to satisfy and meet the needs of the public. This study has extensively identified that citizen participation in the making of development is integral to its sustenance. The public within the purview of this study is rural dwellers while the public service officials are the thirty-five built-environment and other professionals that were interviewed. The study attempted to investigate the local people's involvement in rural infrastructure development. The theoretical and practical involvement of the people in the processes of development is targeted making the processes, programmes and projects a community driven one.

Despite the reported involvement of the rural people by 29 out of 30 responding stakeholders, field observation and informal discussions reveal that the level of people participation was programmes or project defined or as stipulated by the donor agency or the government. For example, the Federal Government of Nigeria (FGN) and International Fund for Agricultural Development supported empowerment scheme tagged Rural Finance Institution Building Programme (RUFIN) in Oyo state

targeted at financing rural small and medium farmers and dwellers within a community demands for a continuous interaction the local people and cooperative societies and likewise the provisional cash transfer handled by the Department of Agriculture across the LGAs in collaboration with the FGN demands a continuous interaction; thus the said involvement.

As reported, the nature of interaction can be classified into socio-economic and physical infrastructure investment. From the nature of the responses (see Table 3) socio-economic capacity rural people involvement includes agricultural funding and practice seminar (2017); income-expenses livelihood meeting (year 2013); youth empowerment program through agriculture (2017); rural project financing in Tede LGA (Last Month February, 2018) and commercial farming project (March 2018) while infrastructure related includes the reconstruction of a damaged classroom (2017); public enlightenment jungle on radio on the relevance of planning (January 2018) and RAMP- Recently, rural/urban road easy accessibility (2018). The study wasn't focused on distilling the reason for the focus on socio-economic interaction but revealed is that agricultural related agencies and departments often engage in rural interaction when compared with other built-environment related institutions.

The relevance of community involvement and representation in the decision table is imperative for infrastructure development projects. Output example of the failure of integrating the community in the decision-making process can be seen to play out in the under-utilized healthcare facility at Alabi village (see Plate 1).

Figure 1: Abandoned and unutilized healthcare facility at Alabi village LGA (Source: Authors' Fieldwork)

Iterating the relevance of community engagement in Alabi village where Plate 1 was provided, one the villagers was of the view that the provision of an additional quality water source to ease the pressure on the only functioning hand-pump borehole if the community was consulted and questions asked before the new health care facility was proposed and constructed. In his words she said *"... it is not that the hospital is not good but we already have one working, electricity or water would have been better for us in this community, if not borehole, well is even good..."* (Rural dweller, May 2018, Alabi village). This represents an infrastructure of waste and of no effect as the case may be.

This section is summed that why various departments and agencies identify that it involves rural dwellers in decision making, evidence as in the case the abandoned health facility shows that the level of rural people involvement in infrastructure provision is still minimal and this often results into waste or misplacement of rural community infrastructure needs.

5. Conclusion and Policy Recommendations

In the quest for space equality, advocacy planning and inclusive governance, bringing the rural areas into the fold of governance remains the way towards bringing about equality, equity and social inclusion and representation. The effect of the effective and responsive representation will help bring about improved service delivery in the rural LGAs and also generate an improved livelihood and settlement liveability for dwellers in the rural LGAs. Based on the study findings, it is proffered that improved sensitization of the rural public on the need to participate in rural governance and the benefits of participating be done. The reported neglect by the residents and the perceived non-accordance not given to their views and suggestions cannot warrant to total neglect in governance by the people. People must endeavour to be resilient towards engaging in the governance of their communities.

Government policies must consider adopting strict policies that enforce community representation which is not politically driven or motivated by any political parties but a communally people-based-representation in the roundtable of local governing stakeholders. Also, improved and responsive representation among the democratically elected people and the appointed local managers cannot be under-emphasized in the quest for efficient service delivery. This study further recommends that political tussle should be advocated to stop at the place of the election and thus not excluding communities that did not vote for a candidate or party in the delivery of service. Likewise, means to promote better representation (LGAs like Olorunsogo and Egbeda) in the candidacy election process and also effectiveness and responsiveness of the representative among the people need to be devised by the government.

The government must consider introducing a tool and agency that will assist in monitoring the activities of the rural representatives, so as to ensure that representation translates into improved rural service delivery. The relevance of local government autonomy towards sustainable rural politics and infrastructure development is imperative. LGAs must be made sustainable and independent on the other tiers of government before meeting their own peoples' needs. Thus, LGAs must be made independent.

A positive, collaborative and constructive relationship between the tiers of government remains important. As no LGA can survive on its own without external help same way the federal and state government cannot fully comprehend the infrastructure needs of a society without the assistance of the grassroots managers. Therefore, there is a need for a blend between the bottom-up approach as advocated by the local government and the top-down as designated by the federal and state government. The federal government must understand that the infrastructure location characteristics of these rural areas must be considered. In areas where respondents complain of dearth and lack of federal and state coordinated infrastructure projects, government at federal and state level must endeavour to encourage the allocation of need infrastructures in such LGAs and communities through purposive allocation of facilities. As much as people understand what participatory governance entails, there is a need for politicians to make their governing process participatory and inclusive to all.

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DII-2019-023

Resilient Off-grid Solar PV Power Supply for Rural Communities

Sebastian Namukolo[1] and Ackim Zulu[2]

Abstract

Off-grid solar-photovoltaic (PV) supply could be the path for achieving energy access in rural areas of Sub Saharan Africa, significantly moving the rural population toward the target of the 7th Sustainable Development Goal. Energy from the PV plants has the desirable attributes of being clean and affordable. Despite these desirable attributes, off-grid PV plants are also prone and susceptible to lightning effects in operation, this situation particularly accentuated in Sub Saharan Africa where there is high lightning activity. To redress this, the general principles of lightning protection are invoked in the design of the PV power supply to stave off the negative effects resulting from the plant being struck by lightning. This paper discusses the matters of energy access using off-grid PV systems and proposes a design approach, which makes the PV plant to be more resilient in lightning-prone regions. The proposed design approach has been derived by synthesizing the design procedures of off-grid PV systems and those of lightning protection of electrical installation. Five subsystems of lightning protection in PV-powered plants, which may be selectively applied depending on the results of the risk assessment, are adopted. This proposed approach is expected to reduce outages and downtime of the PV power plant.

Keywords: Energy access, lightning protection, off-grid energy, photovoltaic energy, resilient system, rural development, solar energy.

1. Introduction

It is well-recognised that energy is a basic requirement to human life and activities. This requirement is so fundamental that there have been strong movements for access to energy to be declared a human right (Bradbrook and Gardam, 2006; Pandey, 2018). While the general use of energy is in the economic sectors of residential, commercial, transportation, and industrial endeavours, the specific use of energy at the basic level is in preparing food, keeping warm and lighting. There is now a more precise and universally accepted definition and specification of energy access at the household level which includes attributes of capacity, reliability, affordability and cleanliness (IEA, 2017). It is at this level that access to energy is being touted to the legal position of a human right. The United Nations has adopted the core attributes of the modern definition of energy access in formulating the 7th Sustainable Development Goal (SDG7) which has the objective to "ensure access to affordable, reliable, sustainable and modern energy" (UN, 2018). The renewable forms of energy, such as that of solar, wind and biomass, carry the characteristics spelt by the objective of the SDG7. As a general position, there is a clear relationship between the level of consumption of energy and national development, with the developed countries tending to have higher energy consumption per capita than the developing countries. However, the disparities of energy access

[1]Lecturer; School of Engineering; University of Zambia; Box 32379, Lusaka, Zambia; sebastian.namukolo@unza.zm.
[2]Senior Lecturer; School of Engineering; University of Zambia; Box 32379, Lusaka, Zambia; ackim.zulu@unza.zm.

distribution within communities of developing countries come to the fore when comparing the rural areas to the urban areas. According to authoritative sources (IEA, 2017), the rural population constitutes about 84% of the population of the developing regions identified as lacking energy.

Conversion to modern energy which is clean and affordable energy is big challenge for the rural populations of the developing countries, who currently rely on the traditional biomass for energy. Although this position typifies the outlook of much of sub-Sahara Africa, there is a steady electrification of rural communities using renewable energy sources, where decentralised and distributed systems have proved to be cost-effective compared to grid-extension projects. Among the renewable technologies applied in decentralised and distributed energy system, photovoltaic (PV) systems on the solar resource is becoming dominant, spurred on by the favourable conditions of improving technologies and falling costs of components of off-grid solar systems in the form of PV panels, batteries and end-user's energy-efficient appliances.

While the technology for off-grid PV systems for rural applications can be said to be robust on the score of performance to produce the required energy, one overlooked aspect in the design of the system is on the aspect of reliability of the system when installed in situations of exposure to the elements of lightning. Lightning effects can have a disruptive effect on the operation of the PV system, exposing the system to undesirable downtimes, if not permanent breakdown. It is argued in the work of this paper that a reliable PV system for off-grid PV system could include a component of protection against the damaging effects lightning, despite the addition protection increasing the initial capital cost of what this far has been heralded as an affordable cost.

Off-grid PV energy supply has the potential to posses all attributes of Modern Energy Technology (MET) (Da Silva et al, 2014), substantially satisfying all the levels in the multitier definition of energy access (Bhatia and Angelou, 2015). It is postulated that the diffusing and assimilation of MET such as off-grid PV solar plants in rural area could follow the same pattern of development in Sub Saharan Africa as that for the Mobile Telecommunication of Communication (MTT). In areas of Sub-Saharan Africa, MTT installations are susceptible to the effects of lighting and therefore deliberate measures are applied in the design and installation to protect the telecommunication infrastructure. In the same vein, and as a corollary to the trajectory of the development MTT, the proposal in this work is that, since off-grid PV plants in Sub Saharan Africa are in similar environments and operating conditions as MTTs, they are subjected to the same vulnerability caused by lightning and would use similar principles for protection. This paper proposes an arrangement of lightning protection for the off-grid PV plants which adds a level of resilience to the operation of the energy plant. The methodology followed to derive the combined arrangement is to synthesis the design considerations for off-grid PV power plant with those for igniting protection of general electrical installations. The process to synthesise elements of PV design and lightning protection design is grounded in the concepts of cross-functional design as opposed to isolated-functional approach (Grady, 2010). The presentation of the paper is arranged as follows: the configuration of an off-grid PV system is presented in Section 2, while a discussion of lighting and its effect on electrical installation is in Section 3. The proposed architecture for the lighting protection system in an off-grid PV plant is given in section 4, which is followed by the conclusion in section 5.

2. Off-grid PV System

PV systems are deployed in on-grid or off-grid systems but are generally and usefully deployed as off-grid systems in rural areas due to absence of or difficulties to connecting to the grid. The off-grid form normally subsists as a stand-alone PV system. A solar PV stand-alone power system has the most benefits in remote or rural areas where it exerts its advantages in economy, space utilisation and environmental considerations (Chilumbu and Zulu, 2017).

As shown in Figure 1, a solar PV stand-alone system typically has three main components and auxiliaries. There three main components are the PV array, the battery bank, and the inverter-charger. The PV array converts light energy to electrical energy in the DC form under conditions of sunlight. The storage batteries are charged by the DC power and the inverter is used to convert the DC voltage of the battery to the more-widely used AC form which can be fed to AC loads. There is a limited amount of loads which can be power directly by DC power. The charge controller, maximum power point tracker (MPPT) and other controls constitute the auxiliaries. More details of these components are described in the following subsections.

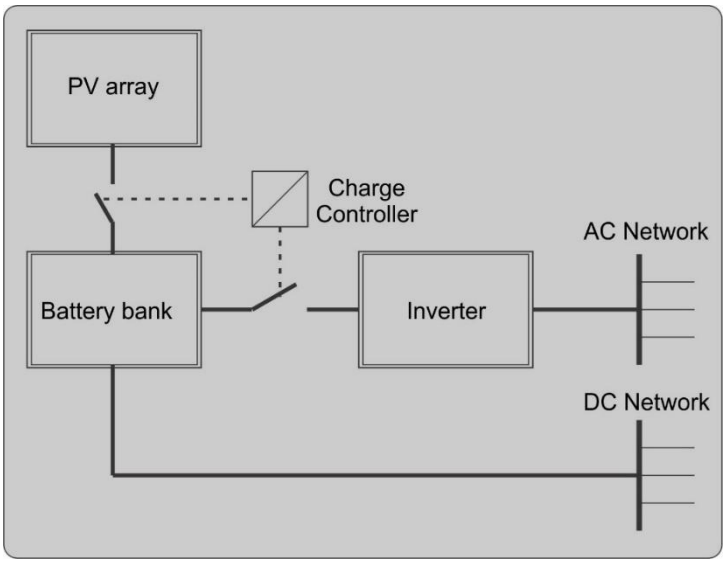

Figure 1: Off-grid PV plant with components

2.1 PV modules

A PV module is built up of individual PV cells which, by sunlight action, generate DC electrical voltage. The process of electricity generation by the solar cell is that, when the surface of the thin wafer of the cell is struck by photons, the electrons get knocked loose from the atoms in the semiconductor material, creating electron-hole pairs. If the circuit is completed by connecting the terminals of the positive and negative sides of the material in an electrical circuit, an electric current (photocurrent) flows in the arrangement of generating power. The technology of PV cells is continually evolving but at present three types are common for commercial solar cells, namely: monocrystalline silicon, polycrystalline silicon and amorphous silicon (Ali and Salih, 2013).

2.2 Energy storage

As a PV system would be non-functional when there is no sunlight, practical application of stand-alone systems require some method to store energy collected during times of sunshine. The most widely-used and most economical energy-storage technology for PV application is the battery.

The battery will store electrical energy for use during non-sunshine periods or will serve loads during the day when the PV modules are not generating sufficient power to meet usage requirements. PV systems use deep-cycle batteries, which are different from the common shallow-cycle batteries used in

automobiles. Deep-cycle batteries, usually of lead-acid type, are designed to controllably discharge and recharge up to 80% of their capacity several hundreds of times (Masters, 2012).

2.3 Inverter

An inverter is a device that converts DC power to AC power. This device in needed to perform this conversion PV plant as the AC form of power is required in most user applications. The change in voltage can typically be from 12, 24, 48, 72 V DC to 240 V AC single-phase or 400 V AC three-phase. Three main categories of inverters are available, namely, sine-wave, modified sine-wave and square-wave, and follow this categorisation according to the type of waveform constructed by the switching devices (Mohan et al, 2003). The sine-wave class is capable of producing a high quality sine wave comparable to the waveform of utility power

2.4 Auxiliaries

In the optimal operation of the PV power plant, other components may be added to the system, such as the charge controller and the MPPT system. The charge controller helps control the state-of-charge of the batteries, preventing the over-charging or under-charging batteries, while the MPPT device is employed for the PV panel to get the optimal power from the sunlight.

The Solar PV stand-alone system may also include other parts, such as safety and protection equipment, metal structures for supporting the modules, power factor correction system, blocking-diodes which prevent back flow of current, bypass diodes which are connected across several cells to limit the power dissipated in shaded cells, and additional devices that are used to ensure optimal or proper operation, including those for monitoring and metering (Masters, 2012).

3. Lightning and Electrical Installations

The various types of electrical discharges, typically manifested in lightning storms, can have an extensive geographical reach and attain magnitudes of electric current in hundreds of kilo Amperes. These magnitudes of electric current as arising from lightning activity, whether by direct or indirect action, can present a definite threat to electrical installations, of which off-grid PV installations are included. As electrical installations are installed within the habitat of humans and animals, such inhabitants are equally exposed to the threats of lightning. In addition to the concern for life, the secondary and also important consideration of the impact of lightning on electrical installation is economic and this impact can be appreciable. Any economic consideration of the operation of the electrical installation will include the impact of lightning, and where this is deemed to be signification, mitigation measures must be arranged.

From a technical point of view, lightning is characterised as wave of electric current, with the wave being defined as a double exponential by the parameter T_1/T_2, with a rise time of T_1 [in μs] , followed by a falling tail of time T_2 [in μs] after having reached a peak value of I_p [in kA]. Thus, two overvoltage models arise classified as (1) direct strike model and, (2) indirect strike model. The direct and indirect strike models for lightning induced overvoltage are characterised as 10/350 and 8/20, respectively, as illustrated in Figure 2. The direct strike is the more severe of the two, but is rarer in occurrence than the indirect strike (Gomes and Diego, 2011).

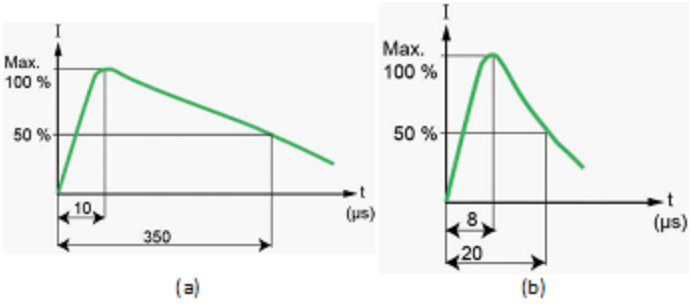

Figure 2: Lightning overvoltage models (a) direct strike (b) indirect strike (Vallvé et al, 2016)

The international and common approach to protection of installations against lightning is covered in the international standard IEC 62305:2013 (IEC, 2013) providing guidance on principles, risk assessment, effect and protection firstly to structures and life and finally to electrical components within the structures. The guidance of the standard is applicable to a wide-range of electrical installations including telecommunication systems, power systems and, as the authors postulate, off-grid PV installations.

A well-designed protection system for telecommunication system or off-grid installations will follow the guidance of standard IEC 62305 and will build and cover three system components of 1) the air-termination, 2) the current path to earth, and 3) the earthing system (Dehn & Söhne, 2015). These system components are described in the following subsections.

3.1 Air termination system

The air-termination system is an arrangement of protruding or prominent metal parts such as metal rods, swathed wires and cables or conductors in a mesh installed at relevant projecting high points of a structure and intended to intercept or control lightning strikes to the structure requiring protection. If correctly designed and installed, the air-termination system reduces the effects of lightning strikes to a structure in a controlled fashion. There are well-tested methods to apply in the design of the air termination systems but the rolling-sphere, mesh and protective-angle methods are common.

3.2 Earthing system

The earthing system is the ground-termination part of the lightning protection system. The purpose of the earthing system is to absorb or dissipate the intercepted lightning current to the earth, and acts as an enormous sink. A properly functioning earth-termination system performs several functions, of which the following are notably important:

- protecting the high-voltage parts;
- guaranteeing that protection measures work and limiting voltages to permissible values including during faults;
- creating the reference for all equipotential bonding and lightning protection measures, and
- ensuring protection of persons and equipment.

A typical plan of the earthing can be an arrangement of driven metal rods in the ground or a mesh of conductors in the ground.

3.3 Current path to earth

The system of current-path-to-earth consists of down conductors. The systems of air-termination and the earth-termination are brought electrically together by the system of down conductors, whose function is to conduct the intercepted lightning current to the earth-termination system in a safe manner. To perform this onerous role, a well-designed system will follow the shortest path possible for length of the path of the current, and that several paths will be available for conducting current from the air-termination system to the earth-termination system.

Down conductors are usually mounted directly on the protected structure. In some cases, parts of the structure case serve as natural down conductors such as metal installations, metal frame work and precast parts.

4. Lightning Protection Scheme for Off-Grid PV Plant

The general approach and guidelines introduced in section 3 for general electrical installations, would typically be applied to design of off-grid PV installation to protect the installation from effects of lightning strikes. It is the position of the authors that lighting activity as it applies to the regions of Sub Saharan Africa, and as reported by Cecil et al (2012) is in range of 10-50 thunderstorm/km^2/year for much of the Sub Saharan Africa, and poses a serious risk to the performance of PV installations. Thus, there appears to be added-value and economic benefit to include a lightning protection system to the PV installation for increased performance in the measure of availability of the energy plant. It is proposed that a level of assurance of resilience can be achieved in designs of PV installation for rural application in Sub Saharan Africa if lightning protection is routinely applied.

A refined process for decision-making on whether a PV plant installation requires a lightning protection system and the degree and extent of protection required, can follow from the full assessment guided by IEC 62305. Figure 3 shows the flow process adapted for such decisions for off-grid power plants.

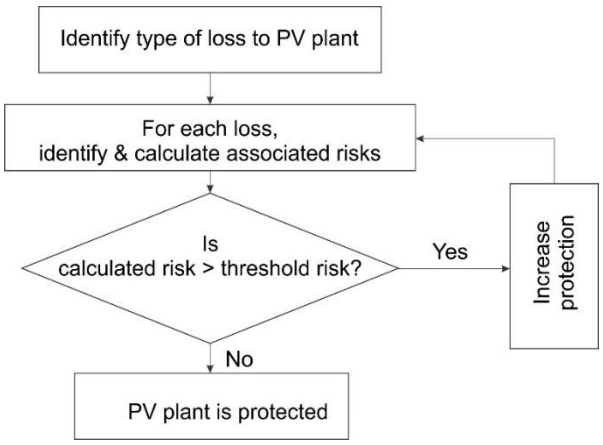

Figure 3: Flow process for lightning protection risk assessment

The options and level of lightning protection may be identified by the components or subsystems considered. In using the generic guide for general installation, an approach that may be applied for off-grid PV installation is illustrated in Figure 4, where five subsystems are identifiable (Surgetek, 2013). The following subsections describe the approach for each subsystem.

4.1 Air-termination and down conductor system

The air-termination system is designed in such way that all the PV modules are in the protection zone defined by the air-termination system. The design approach using the rolling sphere method can typically achieve this criterion. It is important to observe that the height of air-terminal and the quality of the air-termination rods to be selected will be influenced by the class of lightning protection system. It is a good practice to ensure that an adequate separation distance as specified by the standard is maintained between the PV supporting frames and the air-termination elements.

4.2 Earth-termination system

The earth-termination system of the building is to be designed as a foundation earth-electrode while that for the PV installation is recommended to be designed as a ring-earth electrode with a mesh size of specified size guided by the spatial size occupied by the plant. It is expected that the metal supporting frames onto which the PV modules are fixed will be connected to the earth termination system at every 10 m position.

The earth-termination system of the PV system and the building would be connected with each other by one conductor of specified size according to the standard. It is expected that the interconnections within the individual earth termination system will appreciably reduce the resultant earthing resistance, while the intermeshing of the earth-termination system will reduce the voltage level of lightning effects on the electric connecting cables creating an equipotential region between PV array and the building. Other specific requirements, drawn from the standards are:

- surface earth electrodes being installed least 0.5 m deep into the soil;
- four-wire connectors being used to interconnect the meshes; and
- joints in the soil and stainless steel strips being protected with an anticorrosive agent

4.3 Surge protection measures in the PV array

The requirements for the bonding of all conductive systems entering the operation building from outside have to be included in the lightning equipotential bonding. This requirement is fulfilled by the direct connection of all metal systems and by the indirect connection of all live systems by means of lightning arresters.

Anticipated partial lightning currents can be prevented from entering the building by applying the bonding near the entrance of the structure. By this practice, the low voltage power supply in the operation building can be protected by a multi-pole combined lightning current and surge arrester. The DC lines entering the PV inverter will normally be protected in the building by a spark-gap-based lightning current arrester.

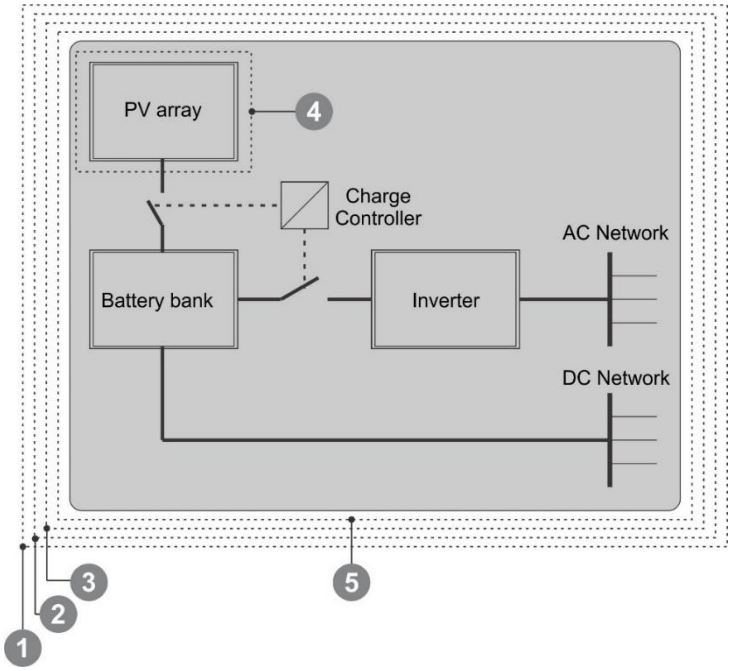

Figure 4: Subsystems of lightning protection for PV plant

4.4 Surge protection measures for ICT systems

It is desired and designed that transient surges due to induction effects of lightning strikes are conducted into the isolated air termination system so that a reliable and continuous transmission of the measured data to the measuring unit is assured. This calls for having the sensor cables entering the building connected through surge protective devices. The components covered under this consideration include the following:

- remoter diagnostic, supervisory and control systems;
- measurement instruments for wind and temperature; and
- communication system linking to the processing unit.

5. Conclusion

It has been argued in this work that, while off-grid PV plants can help to achieve the objective of the United Nations' 7th goal of affordable and clean energy goal on energy access in rural areas of Sub Saharan Africa, the resilience of such PV plants can be enhanced by including in the design of the system aspects of protection against effects of lightning. While there is an additional cost for inclusion of the lightning protection system in the design, this has to be justified through a risk assessment which determines the penalty of loss of PV plant against the extra investment in the lightning protection.

Protection of electrical plants is not a new consideration and this work has shown how general principles of lightning protection can be adapted and adopted for particular protection off-grid PV power plants in lightning-prone areas of Sub Saharan regions, such as Zambia. The adaptation of the general principles of lightning protection for off-grid PV plant usage identifies five systems which are cooperatively

intertwined for full functioning of the protection system but the implementation of the subsystems can be guided by the level of risk calculated.

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Mechanically Stabilised Earth Wall with Geosynthetic Reinforcement and Gabion Facing: An Effective Solution to Mitigating the Effects of Flash Floods on Bridge Crossings in Zambia

Trinity Dhanda[1] and Chanda Katotobwe[2]

Abstract

A study to establish the causes of failures of bridge crossings during the rainy seasons in Zambia was conducted. Document review and observation techniques were used to establish the probable causes of bridge failure and to develop a long-term solution. Bridge failure reports from the Road Development Agency were analyzed and experts were sent to carry out investigative observations on failed bridge locations. Results from this research showed that, in most cases, bridge failures are mainly occurring in the rainy season due to complex interactions between the resistance and the load, and the collapse starts from the approach embankments, then the abutment, and finally the deck. It was observed that the approaches to all the bridges that were washed away after the flash floods were designed of compacted earth and were identified as the weaker zones for attack by the flash floods. It was further observed that conventional solutions such as increasing the bridge spans and reinforced concrete abutments have longer construction times and are less tolerant to severe hydrostatic pressures as well as seismic vibrations and vehicular loads. In this paper, a long-term solution to the problem of bridge damage during the rainy seasons by reviewing the Mechanically Stabilised Earth Wall (MSEW) with geosynthetic reinforcement and gabion facing structures as a potentially more resilient structure for bridge approaches is proposed. Various components of the proposed MSEW structure have many advantages over the conventional methods. These include the high tensile capacity geosynthetic reinforcement, which reduces the need for high-engineered fills, and the provision of seismic resistance and flexibility to the structure.

Keywords: bridges, geosynthetic, reinforcement, resilience

1. Introduction

Catastrophic damage and complete loss of bridges during the rainy season is now a commonplace occurrence in the country. Figures 1a and 1b show pictures of the damage to the Lunzua Bridge during the 2018-2019 rainy season. Figures 2a and 2b show pictures of the loss of the crossings on the Lifune and Msuzi River crossings after the flash floods of the 2018-2019 rainy season. The damage and loss of bridges disrupt communication, flow of goods and are a serious economic burden to the national treasury. There is urgent need therefore, to devise a long term solution to address, both, the issues of existing bridges that need attention and that of bridges to be constructed in the near future. It is for this reason that

[1] Tomorrow Investments Ltd., 3 Lukusuzi Rd., Kalundu, Lusaka, Zambia; info@tomorrow1989.net

Tomorrow Investments Ltd (TIL), following the principle of corporate citizenship, are proposing an innovative long-term mitigation plan.

Damage to abutment wing wall

Bridge bump

Figures 1a and 1b: **The damage to the Lunzua Bridge of the 2018-2019 rainy season**

Figures 2a and 2b: **Bridge crossings for the Lifune (left) and Msuzi (right) rivers washed away during the 2018-2019 rainy season.**

1.1 Problem statement

Over the past few years, a dangerous but repetitive trend where almost every year the country loses bridges to flash floods during the rainy season has been observed. In this paper we review this unfortunate trend, establish the cause and present a potentially innovative and cost-effective solution. The solution seeks to mitigate the disruptive and destructive effects of flash floods on bridges. Several bridges have been washed away in the country recently. These include the Nalubumba Bridge on the Kalomo-Mapatizya Road (2017), the Ng'ona River Bridge in Kawambwa district (2018), the Msuzi Bridge on the Chipata-Lundazi Road (2018), and the Lunzua Bridge, on the Kasama-Mpulungu road (2019). This is in addition to several small bridge crossings on small roads that were also washed away.

The country needs a solution that provides the following attributes to these highly disruptive events:

- ***Flexibility***: by providing superior tolerance to differential settlement on poor foundations.
- ***Resilience***: designed to cope with peak river flows (floods) with capacity to dissipate energy from flowing water, and drain freely with no hydrostatic pressure issues.
- ***Cost effective***: in both construction time and materials.
- ***Predictable longevity***: through the use of reliable and durable materials.
- ***Versatility***: ease of adaptation to different environments.

2. Literature Review

The best way to avoid bridge failures is to anticipate failures and plan for them. Civil Engineering problems have been well-managed through innovation. Traditionally, pertinent developments in civil and structural engineering were a result of parallel developments in the technology of construction materials. Larger and more elaborate structures became possible as technology migrated from using wood to building stone to concrete, to reinforced concrete, and most recently to pre-stressed reinforced concrete and reinforced fiberglass (Holtz, 2001). The development of steel enabled the construction of longer span bridges and taller buildings than were possible using wrought iron or other traditional construction materials.

Compaction and other soil improvement techniques occurred largely because of developments in construction equipment by manufacturers and contractors (Bathurst, Jones 2001). Probably the best example of a parallel development between materials and the construction application is soil reinforcement. In a direct analogy with reinforced concrete, steel and polymeric materials provide tensile resistance and stability to soils that have low to no tensile strength. With innovation in civil engineering technology, there are now more solutions to problems.

2.1 Possible causes of bridge failures

There are many factors that lead to bridge failures. These can include fires, accidents, overloading, earthquakes, and flooding. In the case for this paper, and because the observed bridge failures occur during the rainy season, the focus is on bridge failures due to flash floods. Choudhury and Hasnat (2015) have summarized the many factors that contribute to catastrophic structural failures in bridges:

- ***Floods*** - can cause a bridge to collapse in far more insidious ways by gradually wearing away the earth around and underneath the bridge piers, abutments, and its approach embankments (scouring). With the changing climate and the extreme weather conditions, it may be conceivable that bridges are being subjected to more flood-related damage. Most of this damage is not from water alone. During a flood, rivers pick up debris, such as trees and buildings, and push it forcefully against bridges, causing their foundations to wash away and structural elements to break apart.

- ***Manufacturing defects*** - sometimes, the simple failure of a small piece of the bridge can induce the collapse of the entire bridge. Also, when low-grade or faulty materials are used, the entire bridge is rendered too weak to withstand the rigors of time and harsh conditions.
- ***Design flaws*** - the collapse of some bridges was inevitable even before the bridge was built. In this case usually the faults were not in the construction of the bridge, but the design itself. The bridge is doomed to fail from the moment it is designed. This is usually the case on many bridges where hydrological and geotechnical studies are not properly executed and guess-work precedes science.
- ***Construction Flaws*** - negligence or malpractices by contractors have a great impact on the overall integrity of the structure. Like for design flows, these problems can arise from incompetence, cost-cutting, or corruption, among others.
- ***Poor maintenance*** - though a difficult problem to diagnose subsequent to a collapse, many bridge collapses could have been prevented with more stringent inspection and maintenance routines, and lots of collapses that occur for other reasons are exacerbated by poor maintenance. Unfortunately, this is a problem that is endemic even in developed countries. When a bridge is designed, the engineers assume a certain level of maintenance that is necessary for the bridge to live out its intended lifespan. Rusted parts must be replaced, drainage areas cleared, new coats of paint applied and reinforcements added if traffic levels or rainfall levels are expected to increase.

In most cases, the causes of bridge failures are difficult to diagnose because they occur due to complex interactions between the resistance and the load (Choudhury and Hasnat, 2015). For any particular case of failure, a forensic study would be needed to establish whether a failed bridge did or did not fulfill required codes, design specifications, and expectations of the profession and whether, by accepted standards, problems should have been recognized and the bridge closed or retrofitted. Without a consistent forensic study, statements about the cause of failure are suspect, and eventually equally faulty solutions can be effected.

2.2 Possible solutions to bridge failures due to flash floods

Since many bridges are collapsing during the rainy season, the hydraulic impact of the flowing water could be the major cause of failure. It is worth noticing that a great number of bridges have concrete abutments, piers and piles as part of the integral structure with variety being much noticed on the bridge deck, which may comprise prefabricated steel panels, composite, or reinforced concrete. The alternative solution within this approach would require the following measures:

- Proper geotechnical and hydrological investigations before carrying out the design works.
- If the peak flood levels and scouring depth cannot be properly envisaged, it is better to increase the safety factor on the bridge span design. This entails pushing the abutments way off the river course.
- Stabilize all the layers within the embankment of the bridge-span to improve its resilience.
- Avoid the need for intermediate piers by introducing long span bridge decks.
- Improve diligence in design, construction, and maintenance phases. Furthermore, routine inspections are a prerequisite before and after the rainy season.

- Slope stabilization and scour protections of existing bridge approaches.

3. Study Methodology

A systematic evaluation of the causes of the bridge failures during the flash floods of the 2018-2019 rainy season was performed. Due to limitations of logistics and resources a detailed countrywide study for all the bridge failures was not conducted and the current results and conclusions were based on the few randomly selected bridge failure points across the country. A team of civil/structural engineers went to bridge failure sites to perform root cause investigations (RCI) of the bridge failures after the flash floods. Three sites that experienced bridge failures during the 2018-2019 rainy season were investigated: Msuzi Bridge, Ng'ona Bridge, and Lunzua Bridge. The points of reference for the RCIs were:

- Structural integrity of the bridge compression and tensile members.
- Check for excessive differential settlements on both the abutment and the approach embankment.
- The slope of the failure surface material.
- Point of attack of the flash flood.
- The bridge span against the river regime width and depth.

4. Results of the Study

Results of the study showed that:

- The bridges had "bridge bumps" on the approaches close to the bridge abutment. The bridge bumps result from post construction consolidation mainly caused by vehicular loads on the area very close to the abutment due to poor compaction caused by restricted access of standard compaction equipment during the construction phase (Wahls, H.E., 1990). In this zone, contractors use smaller compaction machines in order not to damage the abutment and this results into poor compaction and thus into a vulnerable zone to vehicular loads and seismic loads. This weak region becomes the initial failure zone during flash floods and can lead to the collapse of the approach, abutment, and the whole bridge (excessive differential settlement in the proximity of the abutment ~ 0.5-1 meters from the edge of the abutment).
- The failure surfaces of the bridges inspected were almost vertical.
- The points of attack of the flash floods were on the approach embankments.
- The spans of the bridges were found to be within the river regime.

4.1 MSEW with geosynthetic reinforcement and gabion facing

From the above, the authors observed that the weakest link in the strength of the bridges that were washed away were the approach embankments. The authors concluded therefore, that in order to address these

bridge failures due to flash floods, it will be necessary to engineer the bridge approaches to more resilient structures. Therefore, in this paper, the authors propose the application of geosynthetic reinforced earth structures (commonly grouped as mechanically stabilized earth walls, MSEW) with gabion facing (or engineered approaches to bridge crossings), for adoption as a potential solution to the problem of bridge failures due to flash floods. MSEWs are a proven construction technology and represent an innovative method of resolving familiar as well as unfamiliar and challenging problems in bridge design. Reinforced earth is a composite material formed by incorporating reinforcing strips, either inextensible or extensible reinforcement, within a soil mass by means of frictional interaction between the soil mass and the reinforcement strips (Vidal, 1969). Contrary to the conventional way where soil is regarded as mass contained by force, the earth itself is reinforced to become an integral part of the structure.

Geosynthetics placed within layers of compacted backfill provide the necessary tensile strength. The resulting structure is strong and resilient and therefore, presents exceptional seismic responses and effectively absorbs vibrations (Leshchinsky et al., 1991). These structures are now used in a range of applications from transport, energy, hydraulic, military, mining infrastructure, in the construction of bridges, ore storage silos and reclaim bunkers, haul road overpasses, dams and weirs, blast and explosive barriers and landscaping (Maccaferri Southern Africa, 2007).

Reinforced earth techniques have gained substantial acceptance as an alternative to conventional masonry and reinforced concrete cantilever retaining wall structures due to their simplicity, speed of construction, significant load-bearing capacity, flexibility, and resilience by providing exceptional inner seismic response and effectively absorbing vibrations from even bullet trains and explosions (Reinforced Earth Company, 2009). In addition to technical and performance advantages, another primary reason for the acceptance of reinforced earth retaining walls is in their inherent economy in both construction time and materials cost (Koener and Soong, 2001).

4.2 Applications of the MSEW with Gabion Facing

Since its invention in 1963, the reinforced earth technique has been quickly accepted on a worldwide basis as an economical and efficient solution and has been extensively used since then in retaining walls and bridge abutments for highways, expressways, and railroads as well as for other structures such as industrial, civil, defense and water works projects (Reinforced Earth Company, 2011). This is a well-known operating process generalized and accepted all over the world. Some applications of the techniques are shown in Figure 3.

Figure 3: Applications of MSEW (Reinforced Earth Company, 2011).

4.3 Components of the MSEW

Mechanically stabilized earth walls have basically three main components (see Figure 4). The three components are;

- Reinforcing element (Geogrids).
- Structural fill.
- Facing element (gabions).

Depending on the function of the structure, additional components may be needed and included.

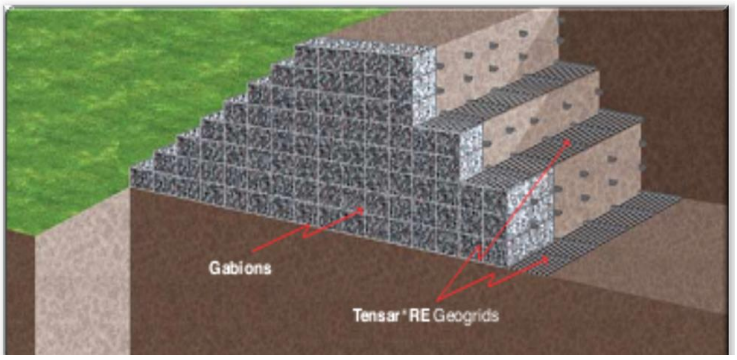

Figure 4: Components of the MSEW (Dhanda, 2011).

Geosynthetics are planar products manufactured from synthetic polymers such as polypropylene, polyester, polyethylene, polyamide, and polyvinylchloride. These materials are highly resistant to biological and chemical degradation. Polymeric reinforcement is normally provided with a black coating to protect it against ultraviolet rays (Koerner, 1998). Geosynthetics are used with soil, rock, earth, or other geotechnical-related materials as an integral part of a civil engineering project, structure, or system. There are numerous types of geosynthetics with versatile applications.

Gabions are "stone-filled wire baskets" and form flexible structures that can deflect and deform to a certain limit in any direction without rupture. They can withstand the movement of the ground without excessive structural deformation (Papetti, 1987). This feature qualifies the gabion structure to be built with minimum foundation preparation. Gabion structures behave as perforated barriers, allowing water to gradually pass through them. This is a valuable characteristic in that hydrostatic pressure never builds up behind or under the structure and cause failure to the gabion design (Global Synthetics, 2008). Figures 5 shows coastal defence applications of the gabions.

Figure 5: Gabions used for coastal defence (Maccaferri, 2010)

The gabions must be filled with rock ranging between 100 mm and 250 mm. In all cases, oversize rocks shall not be larger than 300 mm and the undersize shall not be smaller than 100 mm. Rocks should be hard, angular to round, durable and of such quality that they shall not disintegrate on exposure to water and other weathering effects during the service life of the structure. Care should be taken when placing the stone to avoid damaging the coating on the gabion mesh wire (Maccaferri, 2010). The level of coating and the thickness of the mesh wire are all dependent on the volatility of the environmental conditions.

To mitigate the cost and limitations of concrete reinforced structures, the alternative solution would be to modify the whole approach towards bridge design and construction and introduce the MSEW with geosynthetic reinforcements and gabion facing as one integral unit for both the abutment and the approach embankment. This approach can address many of the key issues that present threats to the integrity of the bridge structure, especially during flash floods. This design would yield the best results if it is coupled with a prefabricated steel deck. It would guarantee a clear span and eliminate the need for intermediate piers.

5. Summary and Conclusions

Almost every year, Zambia loses bridges across the country due to flash floods during the rainy season. This destruction is a big drain on the national budget, in addition to disrupting flow of traffic and commerce. It is possible that the repair/rebuilding works, subsequent to failure are performed without a detailed root cause investigation (RCI). In the absence of a proper RCI, it is possible to repeat the same design flaws that were inherent in the original structure, and therefore, the integrity of the bridge subsequent to similar forces is compromised. Without any action, we risk the danger of relaxing into a narrative where it will be expected and accepted that during the rainy season bridges are expected to collapse, and pay no attention to RCIs, to the detriment of the country. In this paper, we conducted a limited RCI and observed that bridge failures due to flash floods in the country are as a result of the bridge approaches being washed away.

The mechanically stabilized earth walls (MSEW) with geosynthetic reinforcements and gabion facing structural design presents the advantages of speed and simplicity in the construction of bridges, and guarantee a more flexible and resilient structure. The geosynthetic reinforcement presents high tensile capacity which reduces the need for high engineered fills, as well as providing seismic resistance and

flexibility to the structure. These different components can be applied independently to different existing bridge crossings.

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Identifying Causes and Consequences of Real Estate Project Abandonment in Nigeria

Idu Robert Egbenta[1]

Abstract

The rate of economic growth and development of any nation lies on the level of sophistication of its real estate development as it provides the basic services that enhance economic wellbeing of the society such as wealth creation. Real estate development is an exciting but occasionally frustrating, increasingly complex activity involving the use of scarce resources –land and finance. Therefore, when they are abandoned, they become a threat and cause nuisance and slow-down in political and socio- economic and environmental development activities. The continuous abandonment of real estate development projects and the spate of collapsed buildings killing residents is on the rise in developing countries especially Nigeria and it is becoming worrisome to researchers, policy makers and investors. The pertinent issue is what causes abandonment of real estate projects and its attendant consequences on the entire economy? The study therefore explores these using a literature review. The findings show that the causes of abandonment of real estate projects include lack of fund, improper project planning, community interference, land disputes, death of investor, inefficient site management, lack of clarity in project scope, lack of communication and substandard contract. The consequences include nuisance, decrease in business activities, increase in health issues, environmental degradation, increase in crime, decrease neighbourhood aesthetic. By identifying these factors, the findings are envisaged to be useful to real estate developers in ex-ante preparation and decision-making to invest on worthwhile projects. A comprehensive feasibility appraisal of real estate projects should be undertaken before commencement so that these causes and consequences may be avoided. Further studies are recommended to determine the impact of the factors on project abandonment using empirical approaches.

Keywords: abandonmnent, development, housing, real estate

1. Introduction

The rate of economic growth and development of any nation lies on the level of sophistication of its real estate development as it provides the basic services that enhance economic wellbeing of the society. Real estate activities contribute to the gross domestic product (GDP) of economies through construction and building services by property managers and estate agents etc (Pirounakis, 2013). In the area of investment, any kind of spending in real estate tends to expand GDP by more than the value of the initial expenditure (Reeve, 1986). Also there is an indirect importance of rental income as it helps to stimulate the investors to build more. In the same vein, it is important not to diminish the indirect contributions of real estate in social, economic and political activities, as there is need for space to operate either for profit making or otherwise. Real estate development is an exciting but occasionally frustrating, increasingly complex

[1] Department of Estate Management, University of Nigeria, Enugu Campus, idu.egbenta@unn.edu.ng

activity involving the use of scarce resources –land and finance (Abdul-Rahman,Wang and Ariffin 2015). Therefore, when they are abandoned, it has consequential effects on the GDP and employment and becomes a threat and causes nuisance and slow down of political and socio- economic and environmental development. Accordino and Johnson (2002) in a study of 200 most populous cities in United States, found that vacant and abandoned property is a significant problem by elected and appointed officials in the nation's largest central cities. This type of property affects many aspects of community life, including housing and neighborhood vitality, crime prevention efforts, and commercial district vitality. Single- and multi-family housing, retail properties and vacant land are the most problematic types of vacant and abandoned property for most cities

Dumo (2017) argued that the continuous abandonment of real estate development projects and the spate of collapsed buildings killing residents is on the rise in developing countries especially Nigeria and it becoming worrisome to researchers, policy makers and investors. Abandonment of real estate and other construction projects remains a serious problem in Nigeria. This demonstrates the riskiness of real estate project. Abdul-Rahman,Wang and Ariffin (2015) argues that housing industry is one of the most dynamic, risky, and challenging industries. The pertinent issue is: what is responsible for the abandonment of real estate projects and its attendant consequences on the entire economy? The aim of the study is to analyse existing studies from the body of literature to identify the remote causes and consequences of real estate project abandonment.

2. Concept of Abandonment of Land Development

There is no single definition of the term abandonment, there are several interpretations to the meaning. Hence, it is worth noting, though, that the term abandonment itself needs some clarification. Juneau, Moncla, and Gayla (2003) believed that it is the act of intentionally and permanently giving up, surrendering, deserting or relinquishing property, premises, a right of way, a ship, contract rights, a spouse and/or children. Okene (2006) emphasises that one strange concept which has done untold havoc to the psyche of a large section of Nigeria is that of "abandoned property'. Abandoned building projects can be described as the project that has started at an earlier date, but which the construction work for one reason or the other has stopped and such is not limited to buildings alone; roads, industrial structures, bridges, factories, dams, electricity, communication projects and so on are equally on the list. Abandonment of land development means the giving up or withdrawal from continuing with the development of land without intending to return to it. Why do developers abandon their development? Abandonment of land development arises out of the over-optimism of developers. From economist perspective, it is as a result of under estimation of costs of the development or over-estimation of returns from the development or both in certain cases (Barlowe, 1978). Certain developers fall prey to the problem of miscalculation or estimation of the total cost required for the project and the net returns from the development. The poor forecast of the total cost and net returns lead to abandonment of development due to neglect or inadequacy to conduct feasibility and viability appraisal of projects before embarking upon the development. However, there are several reasons beyond these problems, which the paper tends to emphasis later. Feasibility and viability of development are essential stages in the development process.

Economists also view the abandonment of project as a situation where total revenue (TR) is less than the total cost (TC). In this situation the investor or developer no longer obtain any profit or satisfaction from the project. From the illustration in Figure 1, at point TI the total revenue of the project is equal to the TC, which is the point of equilibrium, below that point, the developer or investor is operating at a loss and may decide to abandon the development or investment. However, in physical development this situation may not really be the case. The reasons could be different depending on the prevailing market situation,

economic and political situations, high cost of materials, social and cultural problems, legal as well as natural phenomenon and a lot more.

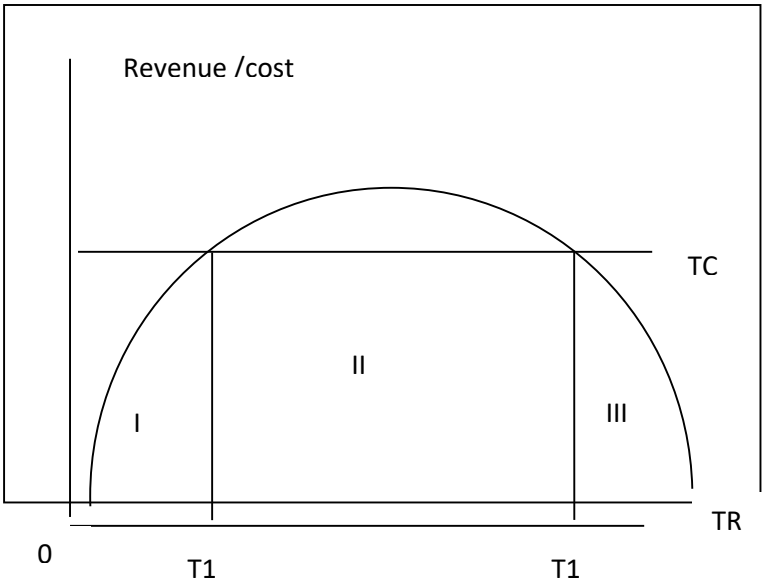

Figure 1: Total cost exceeding revenue (Source: Barlow, 1978)

It also when an owner or developer is ceasing to provide the required maintenance management to a developed property, O'Flaherty (1993). Spealman (1993) also define Abandonment as the act of discontinuing any activities or maintenance work and operating services or the loss of an owner's right to a building or demolition of a building. Nwachukwu (2010) defined abandonment as a refusal or failure to complete a contract before a practical completion dates. Furthermore in Malaysia, the ministry of housing and local government (MHLG) considered projects to be abandoned: when there is construction activities for six months or more, when the developer wounds up, the developer declares an inability to complete the project and the when MHLG of Malaysia define the projects abandoned in pursuit to the housing development act. From the ownership perspective, Olapade and Otunola (2012), described abandonment to mean an owner ceasing to provide maintenance and operating services to a building, or the loss of an owner's legal right to a building it is when a property owner abandons the basic responsibility of ownership, such as routine maintenance or mortgage and property tax, the projects is called abandonment (Winter, 2017). Hamzah, Chen and Nur (2015) suggested that abandonment of projects is when the completion is not completed and ready for occupation on schedule. Ojo and Aroge (2015) defined abandonment as the demolition of a building. They further explained that abandonment refers to structures on which services on which taxes and mortgages are no longer paid, and for which services are neither paid for nor provided. Ihual and Benebo (2014), Dumo (2017) believed that abandoned project in U.K and USA refer to building that are unoccupied and shows physical distress i.e. boarded up, burned, exposed to the element or have deteriorated. Abandonment is not only a loss to an owner and community but also to the government and hence the economy of the nation. In a different vein, Juneau and Moncla, Gayla (2003) assert that, in law abandoned property is any personal property left by an owner who intentionally relinquishes all rights to its control. Real property may not be abandoned. At common law, a person who finds abandoned property may claim it.

2.1 Options of abandonment

There are many options opened to investors to cope with this situation where a developer cannot make profit or derived satisfaction from the project. The assumption is that it is only when these option fail the investor is would be advised to abandon the project. These options include:

i. It will be better to continue with the development, or investment notwithstanding the losses. The argument is does it pay for an investor to continue developing while he is losing money? The answer is that all depends on the length of time which is being considered. In the long-run if the efficiency of the investment does not improve, it is better to leave or abandon the investment or development. However, in the short run, the investor should not leave or abandon the development believing that whatever caused the problems it would be resolved.

ii. The developer may decide on outright sales of the project or development and write off the loss or bear the burden. This option is advisable only at the long-run when the investor can no longer met the fixed costs such as operation and maintenance of the development.

iii. Another option is to seek for alternative lower use. There are many alternative uses to which land development may be put into. The investor may decide to convert the development into an alternative lower use. He should not consider the money already sunk into the project but look ahead probable he can recover the capital from the lower use investment. In this case, the lower use would be regard as having the highest and best use compared with the former. This could be that the lower use has a lower operating cost and high return than the former.

iv. Abandon the development. The investor may decide that he can no longer bear the losses which are accruing from the project and thus abandon the project and looks for another profitable investment, in spite of the huge capital outlay sunk in the project. However, this is an extreme case without economic and social justification. Abandonment of project would result in the degradation or termination of some public service, which is usually not acceptable by the provider of end users. Good example is Taiwan High-Speed Rail Project, which links national capital Taipei and southern city Kaohsiung with 345 km of high-speed rail. Private partner had approximately 1 year time after the contract signing date to abandon the project which cost the government 5% of the initial cost. In Nigeria, is the typical case of 360 Km supper high way road linking the southern part of Cross Rivers State to the Northern part of the state which government could not commence the project 4 years after ground break and signing of contract? The root cause of this abandonment option is attributed to additional information and research that the projects are not feasible and the end users do not need them. Changwen, K; Wang, Z and Cheng G.(2007) finds that financing and abandonment options create important value in the real estate projects of China, and produce enormous profits for the developers

It is upon this extreme situation that this paper seeks to analysis its causes and consequences in Nigeria where there are many abandon real estate developments littered round nock and cranny of every city in Nigeria. The development projects are classified as abandoned when the expected activities to be performed for the completion of the development is stopped because of many difficulties surrounding the development. Ayodele and Alabi (2011) explained that development of infrastructural projects are intended to provide new product and service to the community and at the same time promote the beauty of the developed environment, but this benefits are undermined and not achieved because of its regular abandonment.

2.2 Causes of project abandonment

Generally many infrastructural developmental projects by their provisions and completion are predicted they would provide the needed products and services, and that should sustainably enhanced other developmental activities including real properties and its values in any economy. But, for these development projects, certain issue has remained as the bane to their abandonment in the Nigeria economy (Ayodele and Alabi, 2011). Chisom , Nwachukwu and Emoh (2018) lamented that is not yet understood why projects are abandoned after commencement These projects are project which if completed would have helped our economy in no small measures. Huges (1986) believes that one of the major causes of property abandonment is the improper understanding and utilization of the basic project managerial principles such as improper focus of the management by rewarding the wrong actions for good and the lack of communication of the project goals that contributes to the situation. While Chan *et.al.,* (2002) argued that the project abandonment result from lack of the following: project team promise; contractor's competencies; understanding of risk and liability assessments; client's competencies; end users' needs; and the end users imposed restrictions on the project development. Although, all development project environments are different and every organization operates differently, therefore, a set of causes may not be transferred from one project development environment to another. This calls for a careful investigation as to what causes a particular project to be abandoned. Other than this the use of a broader procedure for subsequent project development should becomes imperative.

Amoatey, Ameyaw, Adaku, and Famiyeh (2015) assess the causes and effects of delays in public sector housing projects in Ghana. The results of the study showed that the critical factors that contribute to project delays in Ghana are; delay in payment to contractor/supplier, inflation/price fluctuation, price increases in materials, inadequate funds from sponsors/clients, variation orders and poor financial/capital market. The critical effects of delays are cost overrun, time overrun, litigation, lack of continuity by client and arbitration. Yap and Tan, (2009) hypothesized that the actual causes would involve factors from other categories related to project characteristics, procurement process, project management and project participants. They stress that the causes of abandoned construction projects identified from existing literature mainly focus on issues concerning mismanagement, unfavourable government policies, inefficient public delivery system, and unfavourable economic conditions.

Yap, Tan and Chai (2010) lamented that abandonment of construction projects remains a serious problem in the Malaysian construction industry. It affects not only the immediate house buyers but also other project players (e.g. client, contractors and consultants) and the general public. In this regards Abdul-Rahman, Wang and Ariffin (2015) stress that due to the inherent risks involved in construction projects, it is essential to recognize the risks that cause problems associated with abandoned housing projects. Therefore, in assessing the inherent risk the results show that many risks are involved in housing project, including risks related to environmental impacts, construction, politics, law, management, finance, materials, and economy, of which the probability of risks from unexpected ground condition, project delays, bureaucracy, contractual disputes between developer and landlord, weakness in management by inexperience developer, and financial crisis is very high. It was also found that all relevant parties involved in housing industry are required to have extensive cooperation in advance and should perform systematic risk management strategies in order to mitigate the risks leading to problems associated with abandoned housing projects.

Nevertheless, the Nigerian development projects environment may seem similar; and presenting the same threats to almost all developmental projects, the world over. These believe has generated several commentaries as to what really causes project abandonment and the result seem interesting. Efenudu (2010) believes that inconsistencies in government policies as a factor that causes the development projects abandonment is mostly connected to where government leaderships changes. This factor can be linked only

to government projects but in strict situation it can affect private developers as government policy can affects any spectrum of the society. This argument points to the fact that government has role to play in the abandonment of projects.

Table 1: Roles of Government on Project Abandonment

FACTORS	RESPONSES	PERCENTAGE	RANK
Non/Delayed payment	90	36	1
Corrupt officials	50	20	2
Politics	50	20	2
Procurement method	40	16	4
Prequalification procedure	20	8	5

Source: Olapade and Otunola (2012)

Table 1 confirms that the government plays a role in project abandonment because it is financed by the government for none and delay payment of fund and it ranked 1st and seconded by politics abandon procumbent methods. This was a confirmation of early study by Odenyinka and Yusuf (1997). This can be attributed to bureaucracy in government ministry in the release of fund. The question what if it is not government projects? What part would be played by the government? That is to say that, finance and timing constitute another factor causing project development abandonment. Here, three types of timing problems usually interfere with effective implementation of development project such that they include but not limited to the following: delays between project identification and start-up; delays during project implementation; and inappropriate time phasing of project activities (Efenudu, 2010) Finance is the sustaining factor for any project accomplishment and where such is insufficient or inappropriately allocated; the projects tend to suffer abandonment scenarios. Therefore, it important that proper allocation of the required funds is made for any development projects to avoid the projects crippling into self-conceptualized projects. While the data analysis showed that non-functional Government policies, defective procurement procedures, incompetent contractors, defective design and so on contributed significantly to project abandonment. It was concluded that non-utilization of competent consultants and contractors, inconsistencies in Government policies, poor location of infrastructural facilities, defective cash flow and lack of adequate control in monitoring resources accounts for thousands of abandoned projects.

Another serious cause of development projects abandonment is the continuous community interruption and interference in project developments. The community leaders, youths and the women groups usually interfere on project development. This case is delicate as sometimes they demand for compensation. Ideally, compensation is expected to be paid before any development project commences; otherwise, it becomes a contentious issue. In another development, the issue of community interference could be unemployment of the youths in the construction projects. This incidence sometimes undermines the benefits of these development projects.

The other causes including unjustified project aim not met, unplanned urban areas, payment delays, death of the investor/client/owner, land disputes/legal issues and changes in investment purpose, improper project planning and design, climatic condition, improper project costing, increasing material costs and sometimes lacking, natural disaster occurrence, a lack of stakeholders' involvement, a lack of project mission communication, a lack of risk assessment, a lack of need assessment, project manager incompetence, and bureaucratic bottleneck. Olapade and Anthony (2012) stated that in Nigeria many housing projects are either uncompleted or out rightly abandoned. Efenudu (2010) also pointed out that another facilitating factor to development projects abandonment is the organization/management incompetence. The technical

management teams are those on the provision for temporary management of the development projects and it is expected that these are qualified personnel to help with the tracks for all the project development work breakdown structure. But, most constructing organization avoids these groups because of the high cost of employing those with the required expertise. However, they prefer to use those that have little or no knowledge just to maximize profit by reducing total capital outlay into the development. This afterward brings a diminishing effect that the project is terminated by the project owner, hence abandoned. This argument has been confirmed by Olapade and Otunola (2012) on the role play consultant on project abandonment in Nigeria (see table 2).

Table 2: Roles of Consultants on project abandonment

FACTORS	RESPONSES	PERCENTAGE	RANK
Under pricing of bill	80	32	1
Inadequate Machines & Equipments	60	24	2
Diversion of Project Resources	50	20	3
Poor Contractors Pre qualification	40	16	4
Inadequate manpower	20	8	5

Source: Olapade and Otunola (2012)

Some reasons advanced by Oyelola (2010) and Makalah (2008) for failed construction projects are: incorrect estimation; lack of available skilled personnel; inadequate planning; poor risk management; misunderstanding of the work requirement; poor quality control by regulatory agencies; corruption and communication gap among the personnel. Other factors are cost; the developer and the contractors; inability of clients to engage contractors or designers' capability to do the work; failure on the part of contractors to obtain vital inputs such as materials, manpower and machines.

There are several empirical studies that buttress the causes and consequences of project abandonments. Ojo and Aroge (2016) asserted that abandoned government projects are considered to be one of the serious problems affecting the development of Ondo State, Nigeria given the numbers and the value of the projects involved however, while investigating the effects of government abandoned projects on socio-economy of Ondo State, Nigeria, the results showed that underestimation of scope ranked highest with the mean 4.2. Other causes of abandonment are shortage of site workers (4.01) as some of the major causes of government industrial abandoned projects due to resources challenge, fraudulent practices and bribery and corruption (4.14). Also, bureaucratic bottleneck in managing the projects (4.14), lack of clear responsibility (4.14), communication problems and poor coordination (3.90), lack of project control and monitoring (3.90) are the major causes of government industrial abandoned projects. Buildings will certainly depreciate and might afterward be abandoned as they mature except they are accurately maintained. For instance, the existence of abandoned structures has been observed to promote arson and other crimes, waste dump, and property value decline where they are present (Adedibu and Akindele, 2007). Drawing from Akindele (2013) who pointed out that the main precarious or hot point in Abuja, Nigeria are typically those areas wherever development is not complete, where there are shanty developments and abandoned buildings are the residence of miscreants.

2.3 Effects and consequences of abandonment

One of the clear effects of project abandonment is the waste of resources. According to Olapade and Anthony (2012), the misuse of resources here are in the form of capital, material and human authority. He further opined that apart from that abandonment of a building project tends to encourage prohibited activity which consequently affects the security and comfort of a society. Therefore, when projects are abandoned it becomes a sore eye to glance at damaging the artistic visualisation of it. The author further explained that

there is an effect on the socio-economic owing to abandoned projects, where it is overwhelming looking at the enormous amount of funds and resources lost on the part of the client who has invested on that particular project.

Ewa (2013), while investigating the root causes of project abandonment in tertiary institutions in Nigeria, found out that the causes are lack of articulated vision and objectives, adequate planning for the project at inception, adequate funds and budgetary allocation before projects are embarked upon, inefficient and effective legal system, poor contract documentation, corruption and compromises, lack of municipal services, non release of government white papers on investigations carried out on abandonment of projects, lack of true leadership, lack of continuity and Institutions' long term strategic plans to drive the institutions, ambiguity in contract documentations. If these causes are inherent in projects in tertiary institution one may ask what prompt the commencement of the project in the first instance. One did not see the place of corruption here as it could be over side in the place of the researcher, if not it should be the root cause of project abandonment. The initiation of the project could be intentionally to defraud the government.

Ihuah and Benebo, (2014) demonstrated that there are at least twenty-two (22) causes of projects abandonment, Nigeria and that the resulting effects of the abandonment have at least eight (8) far-reaching effects on real properties, delay in payment ranked 1 and bureaucracy the least. Confirming the above study Chisom, Nwachukwu and Emoh (2018) find out that there are at least fifteen (15) causes of real estate projects abandonment and that the resulting effects of the abandonment have at least eight (8) far-reaching effects on real estate properties. Isibor, Ikpenfan and Okafor (2016) while examining causes and effects of financing abandoned buildings projects in Nigeria, found that lack of adequate fund allocation and delay payment rand the first causes. Other factors are cultural clash among parties involved in project (Chan and Tse, 2003) "litigation" (Elinwa and Joshua, 2008), and "fraudulent practices and briberies" (Toor and Ogunlana, 2008).

In the perspective of the government, carrying out development project is to show the presence of the government in such host community. Isibor, Ikpenfan and Okafor (2016) argued that the menace of abandoned, projects has been an issue of concern in Nigeria's infrastructural growth and this can hamper the achievement of any government. Naturally, it is good to carry out a capital project, but the government should not bite more than it can chew. Rhetorically one may ask, "Why embark on multiple projects at a time knowing full well that the available funds would be insufficient to fund all of the projects at one time?" The consequences of this action are many. Isibor, Ikpefan and Okafor (2016) argued that projects abandonment in Nigeria have resulted to colossal waste of scarce resources, environmental deterioration and decay of road and infrastructure, ravaging flood, displacement of homes and business centres and offices, destruction of buildings, churches, schools, market and other projects which are supposed to bring development and aesthetic beauty to the community. Olapade and Otunola (2012) opined that construction projects, which would have impacted positively on the economic and overall social development of the nation litters the corners and open spaces of the country. This significantly affects the housing area by reducing its beauty in addition to creation of social problems, spread of disease and threat to the environment.

Abdul, Raimi and Ibisola (2018) investigated the effects of abandoned urban infrastructure on environmental development in Ogun State Nigeria and found that the effects were to be environmental degradation, a decrease in business activities, and an increase in health issues. The study further confirmed that for example the residents of the Idi-Aba housing scheme acknowledged that the abandoned houses within the estate and its neighborhood have negative effects on the well-being of the residents of the estate and people within the environment. They mentioned that the abandonments have created hideouts for criminal activities such as smoking Indian hemp, gambling, etc., and they believe that the abandoned houses

and schools also disfigure the face of the housing due to the fact that the place is bushy and unkempt. Other effect are disappointment of populace ,Lowering of living standard ,Structural failure (collapse of building), Declining property condition, Criminal hideout, Menace to beauty of environment, Migration, Pollution of environment, Health problems, Traffic congestion and Defacing aesthetics of urban centers.

Abandoned construction sites are habitat for rodents, reptiles, dump site for refuse thereby polluting the environment and negates the aesthetics of the landscape. They may serve as hide outs for hoodlums, robbers and miscreant people. This study affirmed that several construction projects which would have impacted positively on the economic and overall social development of the nation litters the corners and open spaces of the country. This significantly affects the housing area by reducing its beauty in addition to creation of social problems, spread of disease and threat to the environment. In another vein it leads modification of rural and urban landscape which is a great cultural loss as it was moulded by human action for centuries and the loss of their traditional features and characteristic (Corbelle-Rico and Maseda, 2008). Many factors accounted for this, ranging from errors in prequalification and procurement procedure, to misappropriation of finance to incompetent consultant. It also shows that the consequence is that it negatively de-motivate investment in real property, employment in real estate and deprive government the expected revenue from property taxation.

Alao, Jagboro, Opawole (2018) examined the effect if the period of abandonment on the final cost and duration of resuscitated tertiary educational building in Nigeria. The findings show that the general population were disappointed on the over-stretching of existing facilities. The study showed a directly proportional and an exponential effect of period of abandonment on percentage cost overrun of resuscitated projects, which were represented by $y_c = -329.755 + 19.545x$ and $y_c = 6.1662e_{0.0506x}$, respectively. A linear relationship between period of abandonment and percentage time overrun was represented by $y_t = 0.467 + 0.816x$. Accordino and Johnson (2002) argued that vacant and abandoned property is increasingly recognized as a significant barrier to the revitalization of central cities. Mumunicipalities bear significant financial cost when properties become vacant or abandoned (Gottlieb and Rhiew and Natarelli ,2012).

3. Conclusion

One thing that stands out from this review is that many investos or developers take the abandonment option of project management. Abandonment option enables the investor to stop the project if it turns out to be loss-making. Failure can in itself be as revealing as success. Historians would argue that abandoned projects area an eloquent reminder that history as we know it is but one of the many possible and equally plausible stories. Their argument may be true in that some project may be abandoned due to pressure of technological progress, useless or purposeless project, scuttled by misfortune or catastrophe, which the cure of these projects is feared as more than the disease. The finding from these review is that the causes of abandonment of real estate projects includes: lack of fund, improper project planning, community interference, land disputes, death of investor, inefficient site management, lack of clarity in project scope, lack of communication and substandard contract, while the consequences includes: nuisance, decrease in business activities, increase in health issues, environmental degradation, increase in crime, decrease neighbourhood aesthetic. The studies conclude that the remote causes of this abandonment are that a comprehensive feasibility appraisal of real estate project was not undertaken before commencement. It suggests that there is the need for studies on why developers fail to conduct feasibility study on projects before embarking on it. It is found that the relevant literature available is mainly news articles, which lack credibility and focuses mainly on abandoned real estate projects, which were focused on government project with little attention on private developers. It is therefore recommended that further studies be undertaken on abandonement of

real estate construction projects in Nigeria both private to public sectors development, therefore, required to confirm or otherwise those causes identified in the literatures.

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Impact of Household Energy Efficiency and Behavioural Scenarios on CO_2 Emissions of the Zambian Energy System

Ismo Heimonen[1], Albert Malama[2], Nusrat Jung[3], Lilias Makashini-Masiba[4], Bwalya Zimba[5], Brian Katongo[6], Xoliswa Kayumba-Kauert[7], Chimuka Milandu[8] and Priscilla Kachapulula-Mudenda[9]

Abstract

The electricity infrastructure of Zambia is facing a huge challenge when electrifying the non-electrified areas and serving the existing areas with increasing energy needs. The key issue in the development process is to improve the energy efficiency of the households and have an impact on the behaviour and attitudes of the households leading to energy savings and sustainable consumption. The current status of the energy consumption of the households was studied by a questionnaire survey conducted in 600 households in 3 provinces (Western, Copperbelt, Central) and two towns in each. The user study describes the current state of the technology in the households, the current status of the electricity consumption and scenarios of the near future household appliances and the corresponding electricity use. In the simulation study, the average household electricity use model was defined and adjusted to fit with the total use of Zambian household sector. The CO_2 emission model was done using the simple emission factor method, in which the factor depends on the share of different types of electricity production typologies. The simulations consist of different cases and scenarios: different household appliances and investment in new ones, different use-time of the appliances, different scenarios in population and infrastructure as well as different scenarios in energy-type production shares (share of renewables vs non-renewables). The finding showed that energy consumption of the lighting could be decreased by 20-43% which would decrease the CO_2 emissions due to household electricity use by 39000-81000 ton (2017 emission factors) if the improvements were done in all the households. The use of more energy efficient appliance such as lighting, refrigerators and TVs would decrease the electricity consumption by -74 % of the base case situation. This would decrease emissions by 141000 ton CO_2.

Keywords: household, energy, electricity, behaviour, electricity, CO_2 emissions

1. Background

The electricity infrastructure of Zambia faces a huge challenge in serving the non-electrified areas and serving the existing areas with increasing needs of energy. The key issue in the development process is to improve the energy efficiency of the households and give an impact on the behaviour and attitudes of the households leading to energy savings and sustainable consumption. VTT Technical Research Centre of Finland and the Copperbelt University (CBU) conducted a study on energy efficiency and energy-related

[1]Senior Scientist; VTT Technical Research Centre of Finland Ltd; P.O. Box 1000, 02044 VTT, Finland; ismo.heimonen@vtt.fi
[2]Professor; Copperbelt University; Jambo Drive, P.O. Box 21692, Kitwe, Zambia; albert.malama@cbu.ac.zm
[3]Visiting Assistant Professor of Civil Engineering, Purdue University, Lyles School of Civil Engineering, 550 Stadium Mall Drive, West Lafayette, IN 47906-2051, USA; nusratj@purdue.edu
[4-9]Lecturer; Copperbelt University; Jambo Drive, P.O. Box 21692, Kitwe, Zambia;lilias.masiba@cbu.ac.zm; bwazi30@gmail.com; bryanbupe2006@yahoo.co.uk; xolisk@yahoo.com; milanduc@yahoo.co.uk; priscilla.kachapulula@gmail.com

behaviour in households in Zambia. The project called "Showing the sustainable lifestyle behaviour and technologies for energy-efficient households in Zambia" is part of UN 10YFP Programme in Sustainable lifestyle and education (SLE). The project objective was to show the influence of lifestyle, behaviour and technology on household energy performance and highlight the potential of energy efficient technologies for the wide public. The expected impact in the mid-term and long period is the mitigation of greenhouse gas emissions and global warming through improved energy efficiency and energy savings at household level. This paper discusses the impact of energy use and energy saving scenarios on CO_2 emissions in Zambian households.

1.1 Energy consumption of households in Zambia

In Zambia, electricity is mostly consumed in the mining industry (55%) and domestic (31%) (ERB, 2016). The total consumption in 2016 was 10 857 GWh. In 2015, 31,4 % of households were connected to the grid, 68,5% being outside the grid (LCMS 2015). In urban areas, 67,3% were connected to the grid and in rural areas, only 4,4 % were connected. The highest proportion connected to the grid was in Lusaka (70,6 %) and Copperbelt (58,9) Provinces. The lowest proportion was in Western (6,0 %) and Luapula (6,5%) Provinces. The total number of households in 2015 was 3 014 965, of which 57 % are in rural areas and 43 % in urban areas. The electrified households (947 000; 31,4% of households) used 3482 GWh electricity in 2015, which is average 3678 kWh/a per household connected to the grid. The average size of households in Zambia is 5,1 persons (lowest in Lusaka Province 4,7 and highest in Southern Province 5,5). Thus, sharing 3678 kWh/a for average 5,1 persons in the household gives 721 kWh/a per person. If the total consumption is shared for entire population 15 473 905, the average is 225 kWh/a.

1.2 Electricity production and CO_2 emissions of Zambia

The CO_2 emission factors for purchased electricity can be calculated based on the production profile of the country. The International Energy Agency (IEA) statistics give international value for the electricity production, but this figure does not explain the structure of the production. The international IEA emission factor for purchased electricity is 506 gCO_2/kWh, WWF (2019), (original source IEA). This is the global emission factor for purchased electricity calculated based on IEA statistics using five-year specific emissions between 2007 and 2011. This value is not valid for Zambia, where hydropower plants do most of the production. The more detailed analysis at the country level requires the knowledge of the electricity production methods (different fuels), the share of each type of production and country-specific emission factors for different production types. SA DOE (2016) and Quadrelli (2006) also explain the methodologies to define country-specific emission factors and give examples of emission factors for stationary combustion coal and gas based production. Quadrelli (2006) gives the tables of IPCC default emission factors for different fuels. In Zambia, part of the electricity is produced by off-grid solar systems and Möllersten (2017) presents the methodology to calculate avoided CO_2 emissions by off-grid production.

In Zambia the Energy Regulation Board ERB (2016, 2017) publishes the share of energy production for each year (Table 1), and the same data is available from African Energy Database AFREC (2018). Most of the electricity is produced with hydropower plants. The remarkable change in production happened in 2016 when 11% of the production capacity was based on coal and the share of hydropower decreased from 94% to 84%. This was as a result of severe energy shortages that the country experienced which resulted in the shift to coal to increase electricity production.

1.2.1 Emission factors

The fuel-based emission factors weighted by production share gives the emission factor 16-54 gCO_2/kWh for the years 2015-2017, Table 1. The table shows how dramatically the emission factor changes if the share of renewable production decreases, as it happened from 2015 to 2016/2017.

Table 3: Emission factors based on the share of production capacity in 2015-2017

Year	**Emission factor gCO_2/kWh**	**share 2015** [4]	**share 2016** [4]	**share 2017** [5]
Hydropower	0	94,1 %	84,5 %	83 %
Diesel	266,4 [1]	3,8 %	3,1 %	3 %
Heavy fuel oil	263,9 [2]	2,1 %	1,8 %	4 %
Coal	360 [3]	0 %	10,6 %	10 %
Emission factor (g CO_2/kWh) based on the share of production capacity		15,7	51,2	54,5
[1] Zhou (2009, [2] Herold (2003), [3] SA DOE (2016), [4] ERB (2016), [5] ERB (2017)				

With the factor of the year 2016, the emissions caused by electricity production for household consumption was 173 000 ton CO_2 (3382 GWh x 51,2 ton CO_2/GWh). This is 4-5% of the CO_2 emissions of Zambia. (The total value 4,5 Mton in IndexMundi (2018), 3,44 Mton in UNEP (2018)).

2. Methodology

The purpose of the case studies presented in this paper is to demonstrate the current energy efficiency of household cases and the impact of these cases and scenarios on energy consumption at country (Zambia) level. Figure 1 presents the workflow of the study. The user study conducted in 3 provinces and two towns in each describes the state of the technology in the households, current status of the electricity consumption and scenarios of the near future household appliances and the corresponding change in electricity usage. In the simulation study, the average household electricity use model was defined and adjusted to fit with the energy use of the Zambian household sector. The CO_2 emission model was done using the simple emission factor method, in which the factor depends on the share of different type of electricity production typologies. The simulation consists of different cases and scenarios: different household appliances, different use-time of the appliances, different scenarios in population and infrastructure and scenarios in energy-type production shares (share of renewables vs non-renewables). The electricity consumption is presented at the household level and national level, while the CO_2 emissions are presented at national level. The case results aim at having an impact on the choices that could be made by end users, e.g. if selecting traditional equipment or energy efficient equipment for the household.

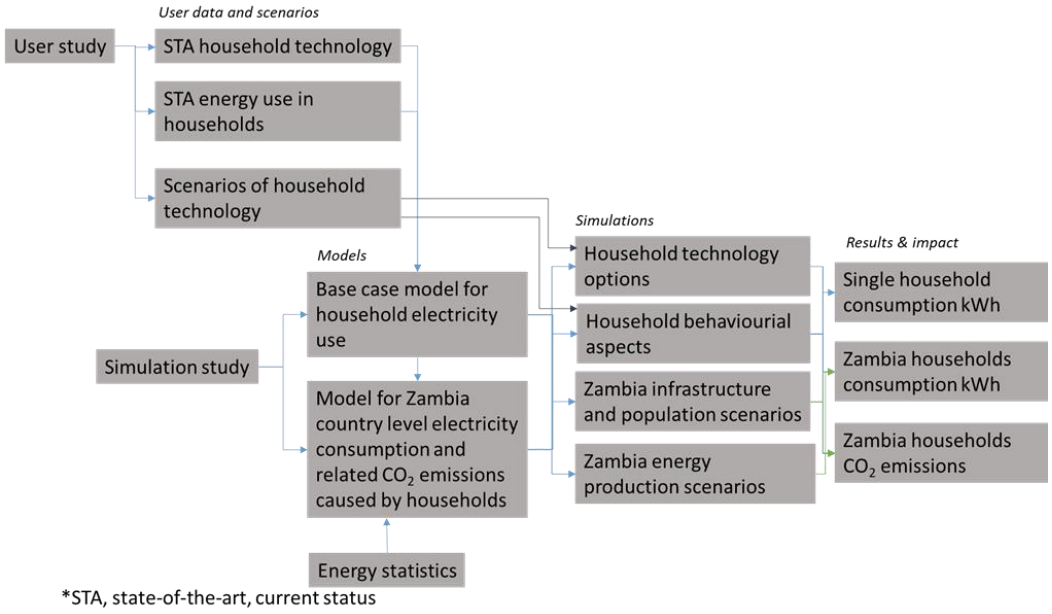

Figure 1: The approach for the simulation study

3. Energy behaviour of households based on the user study

3.1 Typical household appliances in Zambia

As indicated above the user study was conducted in three Provinces to study the conventional household technologies used in Zambian households. Figure 2 presents the results indicating the variety of household appliances used by homeowners during the field survey conducted in 2018. Most of the houses seem to be equipped with lighting, radio, refrigerator, cooker, pressing iron and television. The households also have Mbabula, which is a small size appliance used for cooking and uses charcoal as fuel. This is typically used if the electricity supply is off or there is no cash available to purchase prepaid electricity. Figure 2 also presents the futuristic scenarios of household appliances which the households are planning to buy during the next five years. The figure shows that households will invest in new appliances even though they currently own similar appliances. For example, 83 % of the households have the refrigerator (which means 17% do not have), and 35 % will buy a new refrigerator during the next five years. This means the households will have more than one refrigerator or they intend to replace the existing one.

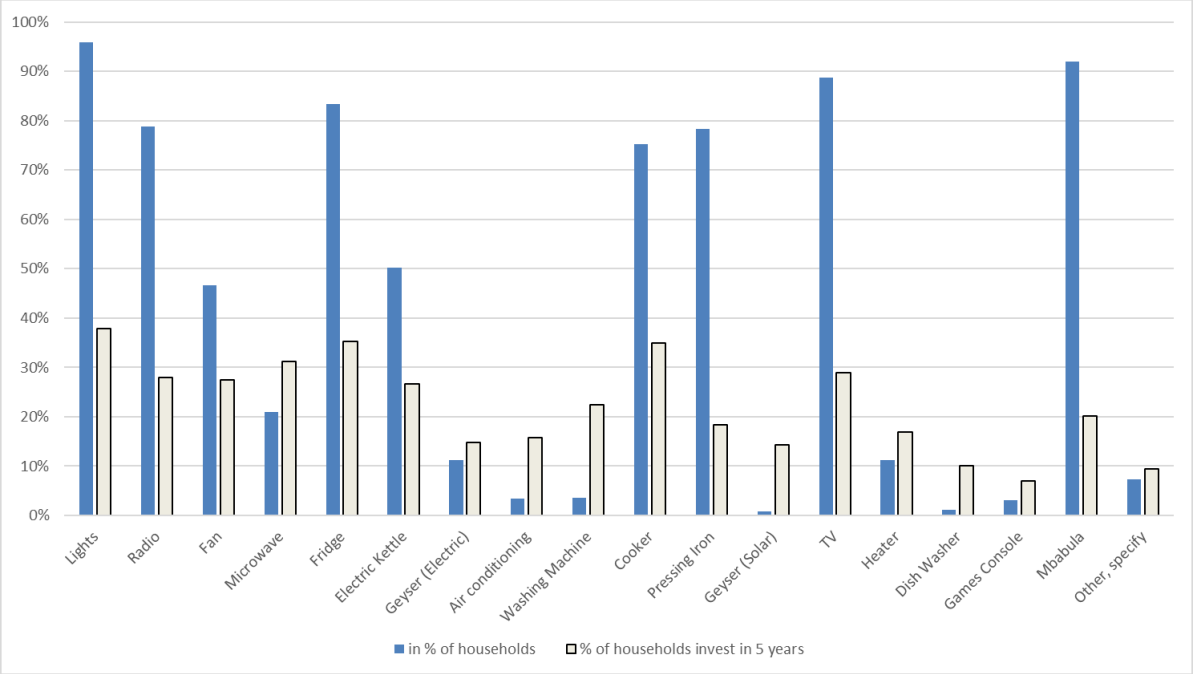

Figure 2: Variety of the household appliances and investment plans in the households during the questionnaire study in 2018

3.2 Energy use and behaviour in households

The results also show the household average electricity consumption based on the user questionnaire study: Western Province consumes 2172 kWh/year, Central Province consumes 2580 kWh/year while the Copperbelt Province consumes 3625 kWh/year. These consumption figures give a weighted average (weighted by the number of electrified households) of 3390 kWh/a. The base case consumption at average household level is assumed to consist of the following: lighting 10 W/m2 switched on 5 hours per day, average house size of 84 m2 (based on user study), refrigerator 350 W running 15 % of the usage time (3,6 hours per day; 9 minutes per hour), radio 10 W open 4 hours per day, electric kettle 1200 W used 5 minutes per day, cooker 1000 W used 2 hours per day, TV and entertainment 350 W used 4 hours per day and pressing iron 1100 W used 15 minutes per day. This base case leads to the energy consumption of 3385 kWh/year at base case household.

3.3 Country-level calculations and base case description

Country-level calculation model is based on table calculation approach. Each province has a given number of households (N) of which certain amount is electrified (n %), and an average consumption per household (kWh) is assumed. All the provinces are assumed to have similar energy consumption profiles of household consumption to the studied reference provinces (Western - low, Central - med, Copperbelt - high; the rest of provinces are assumed to have some of these profiles). It is assumed that the 3 selected provinces capture the full spectrum of the provinces in terms of household profile and behaviour. The base case electricity consumption of the calculation model will be adjusted so that the country level consumption fits with the energy statistics of Zambia.

The following necessary information for the calculation comes from Living Conditions monitoring survey LCMS (2015): the amount of households (N) in each province (Table 14.1 and Table 14.2 in LCMS2015) and the number of electrified households (n %) in each province (Table 14.7 in LCMS2015). The provinces

are assumed to have the following consumption levels - assuming the electricity consumption has a correlation to household income (LCMS 2015, Figure 10.4):

- Copperbelt and Lusaka, high energy consumption 3625 kWh/year
- Central, North Western, Southern, Muchinga and Easter, medium energy consumption 2580 kWh/year
- Northern, Western and Luapula, low energy consumption 2172 kWh/year

These assumptions lead to the total electricity consumption of electrified households at national level of 3135 GWh/year. In 2015, the total consumption of the household sector in Zambia was recorded at 3482 GWh/year, and in 2016, it was 3383 GWh/year (ERB 2016). The difference between consumption in the year 2016 and the developed model is 30,5 kWh/month/household leading to a difference of 10 % of the total consumption. The calculation model was adjusted to fit with 2015 consumption by multiplying all the provincial consumptions by 1,11, which leads to Zambian level household consumption to be at 3482 GWh/year. The model is not exact because the amount of population and electrified household is from the year 2015 from source LCMS (2015) and energy data is from source ERB (2016).

4. Simulation cases and selected scenarios

The energy use scenarios at the household level have been selected for five categories:

1. The base case at average household: This is the reference case with which other cases are compared. Electricity consumption is the same as the average consumption of user study households.
2. Household technology scenarios: Scenarios of new investments in appliances and replacement of existing ones.
3. Behavioural scenarios: Scenarios of investments in energy efficient appliances and scenarios of decrease of energy use by decrease in using time.
4. National population growth and infrastructure scenarios. The amount of households is assumed to increase. These scenarios do not have influence at the household level but at national level.
5. National energy production infrastructure scenarios. These scenarios have an impact on CO_2 emissions at national level, but not at the household level.

The scenario study included 28 cases, and for all these cases, six different electricity production infrastructure assumptions using different CO_2 emission factors. Five cases were selected for this paper to show the impact of energy efficient household devices on CO_2 emissions at household and national level.

4.1 Household appliance in the near future investments with traditional technology vs energy efficient technology

If the estimated new investments are increasing the number of appliances and if the investments are made for appliances which are not energy efficient, the energy consumption is estimated to increase by 46 % (from base case 3674 to 5365 kWh/year) (Figure 3). In case, the new investments are made towards purchasing energy efficient appliances, the increase in the amount of electricity use compared to the base case is estimated to be only 15 % (to 4221 kWh/year). The benefits of investing in energy efficient appliances are energy saving of 1085 GWh/year (1144 kWh/household/year), which corresponds to 59000 ton CO_2/year (62 kg CO_2/household/year).

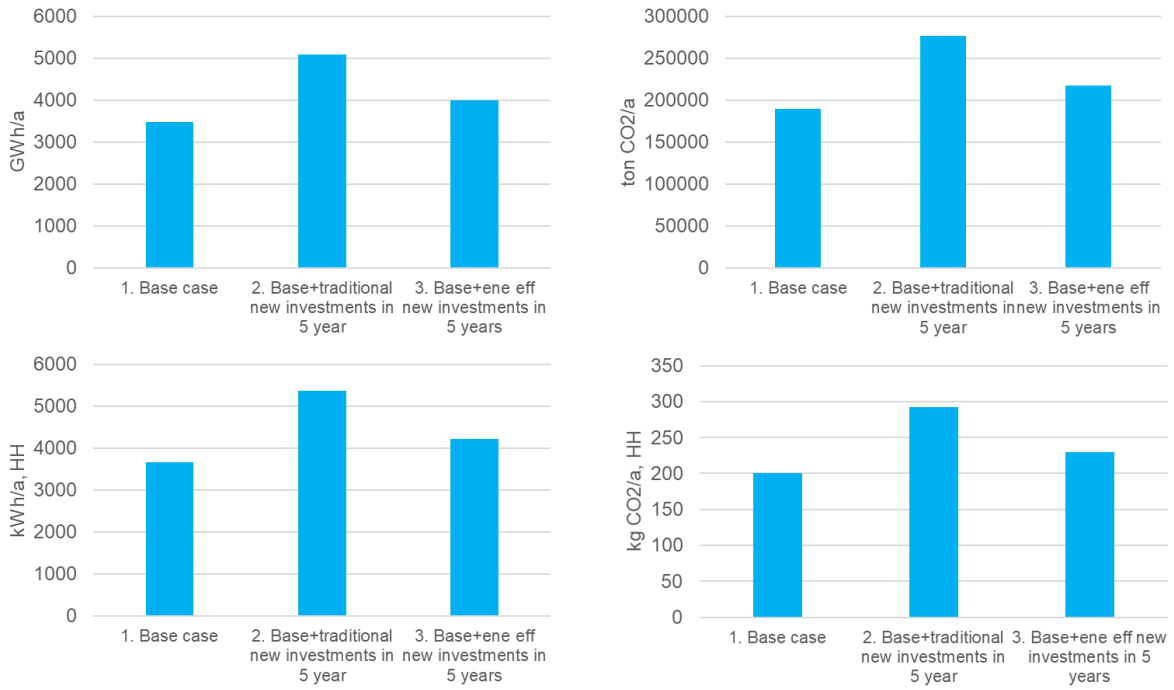

Figure 3: Impact on electricity consumption and associated CO_2 emissions at the household (HH) and national level: Investments on new household appliances with traditional or energy efficient technology.

4.2 Base case traditional lighting replaced by energy efficient lighting

If all the lighting fixtures (100 %) are replaced by energy efficient lights, it will lead to energy savings amounting to 1497 kWh/year/household (-41% from 3674 to 2177 kWh/year/household), Figure 4. The benefits of investing in energy efficient lighting is 1419 GWh/a (1497 kWh/year/household), which corresponds to 77300 ton CO_2/year (82 kg CO_2/household/year).

4.3 The main household traditional technology appliances replaced by energy efficient ones

The earlier case in section 4.2 showed the impact of changing traditional lights to energy efficient ones. The more extensive, but in practise unrealistic case, is replacing all the main appliances with energy efficient ones. Replacing 50 % of the main appliances of base case with energy efficient ones leads to lowering of consumption to 2306 kWh/year (-37 %) and replacing 100 % leads to lowering of consumption to 864 kWh/year (-74 %). The maximum energy saving is 2737 kWh/a/household (Figure 5), which at national level corresponds to 2593 GWh/year and 141000 ton CO_2 (149 kg CO_2/year/household) in emissions.

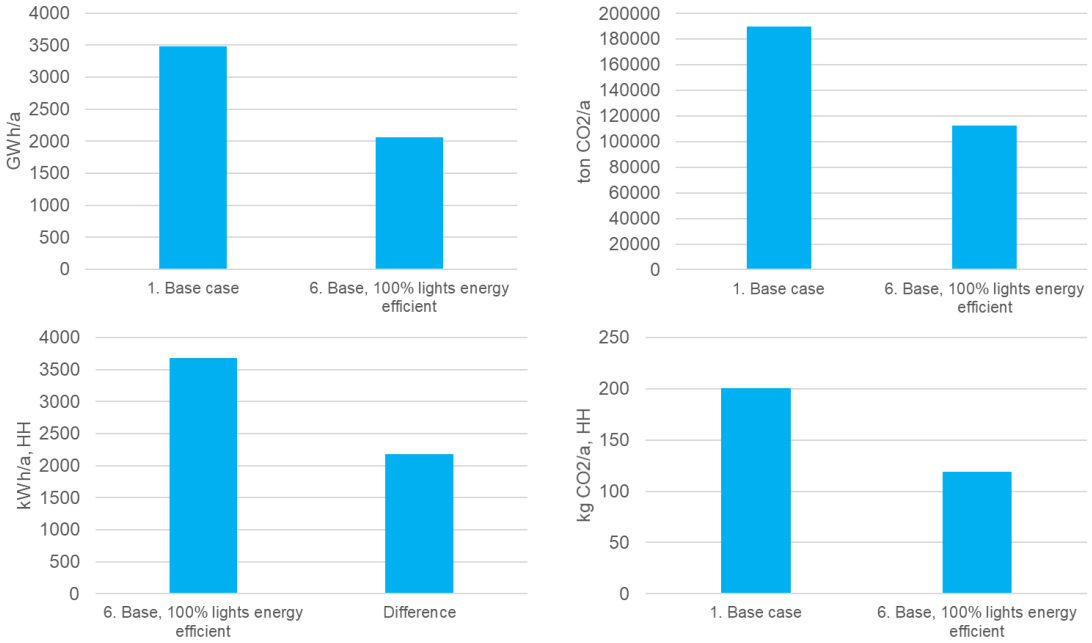

Figure 4: Impact on electricity consumption and associated CO_2 emissions at the household (HH) and national level: Traditional lighting replaced by energy-efficient lighting.

4.4 The constant yearly increase in the number of households with traditional or energy efficient technology

If the yearly increase in amount of households is +3 % of the previous year, after five years the increase is 16 %. In the case where traditional appliances are taken in use, this leads a 16 % increase in electricity consumption. In case energy efficient appliances are used by these new households (3 % new ones), the consumption grows by only 0,8 % in a year and 4% in 5 years (figure 6). The same analysis for the case of rural electrification: The yearly increase of 7% in electrification of households leads in 40% increase in electricity consumption in 5 years. With traditional appliances in households, this leads to an increase in electricity consumption of +40%. In case all the new households apply energy-efficient technology, the yearly increase is only 2 % and in 5 years only 10 %.

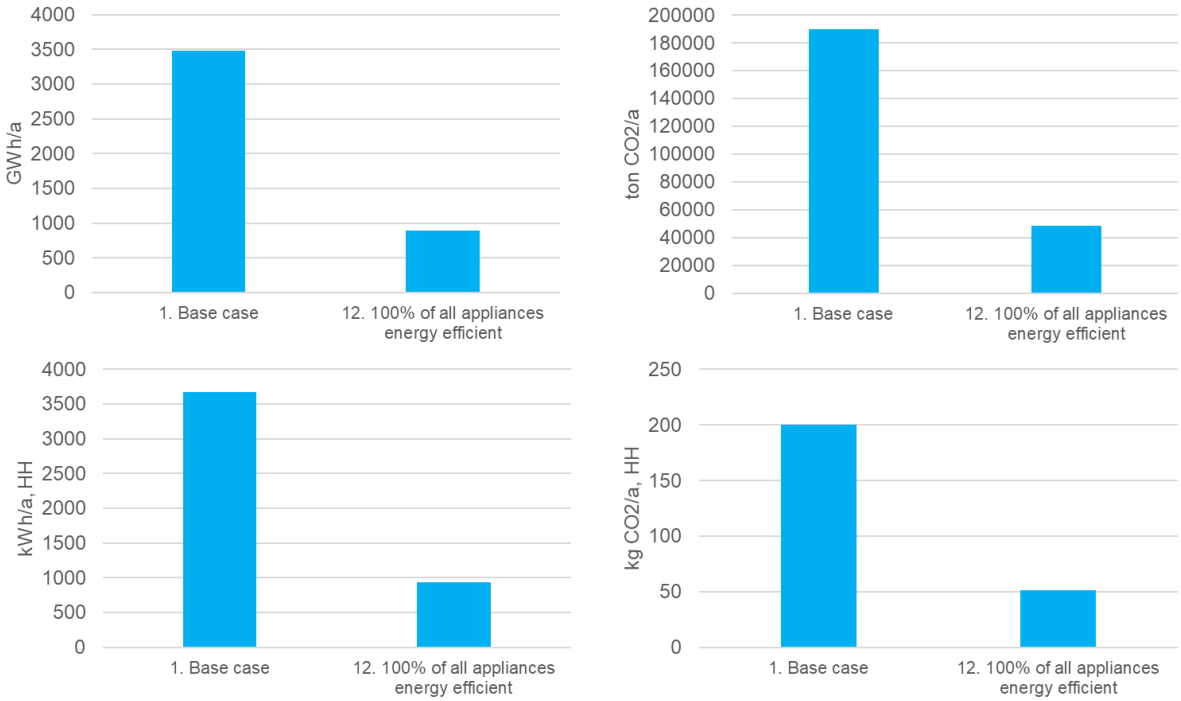

Figure 5: Impact on electricity consumption and associated CO_2 emissions at the household (HH) and Zambia level: The main household traditional technology appliances replaced by energy efficient ones.

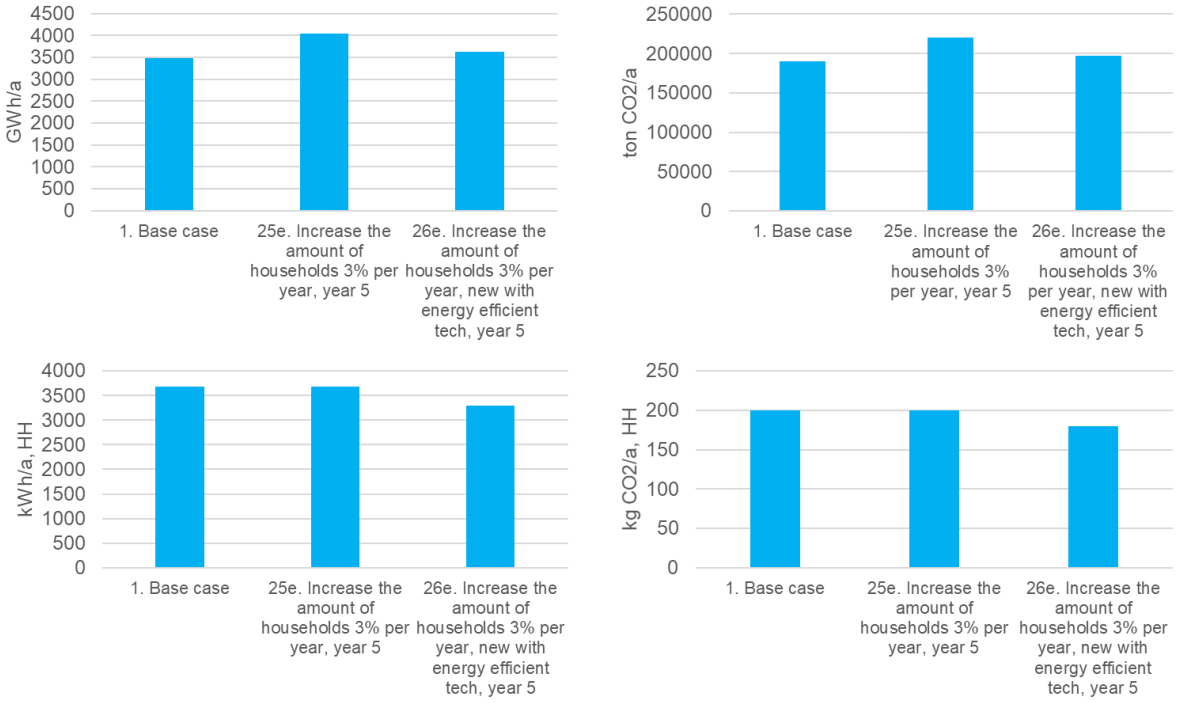

Figure 6: Impact on electricity consumption and associated CO_2 emissions at the household (HH) and Zambia level: 3 % increase in the number of households in 5 years with traditional tech and energy efficient technology.

5. Conclusion

The scenario simulation results give an idea of the influence of the selection of the energy efficient household technology and the behavioural aspects, e.g. time/length of use, on energy consumption. The analyses with the case households showed that energy consumption of the lighting could be decreased 20-43% which would decrease the CO_2 emissions due to household electricity use by 39000-81000 ton CO_2 (2017 emission factors) if the improvements would be made in all the households. If more energy efficient appliances are used, i.e. lighting, refrigerators and TVs, the electricity consumption would decrease by -74 % of the base case situation. This would decrease emissions by 141000 ton CO_2. The study also showed the sensitivity of the total CO_2 emissions on the production infrastructure: share between renewables (RES, e.g. hydro, bio, solar) and non-renewable (e.g. coal, gas, oil). The results also showed that households can have a direct influence on energy savings and energy consumption at household level. They cannot however, have a direct influence on energy production infrastructure and CO_2 emissions, which are very much dependent on policy level decisions, investment decisions in the energy sector and operation strategy of existing power generation units. It is hoped that the results of this study can be used to formulate policies that would help households to reduce energy consumption and CO_2 emissions. The study also showed there is a lack of detailed energy consumption data of Zambian households. The improvement in energy efficiency would be easier if the detailed information would be available, e.g. which appliance groups are using energy and how much, and in which sub-consumption to focus on the development.

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Engineering Skills Development through Mega Construction Projects (MCPs)

Tshepo Jeremia Lephoto[1] and Nthatisi Khatleli[2]

Abstract

There is a notable engineering skills deficit (ESD) in South Africa. Among other interventions, the proliferation of skills development policies, engineering skills development programmes (ESDPs), and the use of expatriate engineering professionals in Mega Construction Projects (MCPs), have been the main interventions promulgated by the government. This study sought to investigate the effectiveness of expatriate professionals in transferring engineering skills to candidate engineers in South African MCPs. This study is of particular significance to the construction industry in South Africa, and can contribute towards addressing the current ESD. Due to the nature of questions which this study pursued to answer, a case study strategy was adopted. A mixed-method data collection was used, with the aim of enabling the findings to complement each other in the form of questionnaires and in-depth interviews. Quantitative data involved numeric scores from questionnaires and qualitative data included interviews which aimed at assessing the structure of the ESDPs in South African MCPs and to also assess the sentiments of the beneficiaries. Secondary data from annual reports were used to investigate the throughput of engineering skills since the inception of the South African MCPs. Candidates' opinions were that there are no institutional arrangements which bind expatriates to honour their commitment to engineering skills transfer. An absence of institutional arrangements, a lack of understanding of the unique South African culture and problems related to communication barriers problems appear to be the main factors which cause expatriates to be less effective than potentially possible. The central conclusion to be drawn from the discussion is that there is a relative ESD which could increase if ESDPs are not properly structured.

Keywords: Engineering skills development, mega construction projects, expatriate skills transfer.

1. Orientation of the study

1.1 Background to the problem

South Africa is facing a high unemployment rate and an enormous engineering skills deficit (ESD), notably among previously marginalised groups. For four consecutive years since 2007, ESD has been singled out as an obstacle to socio-economic growth in South Africa (Thornton, 2007, 2008, 2009, 2010). This continued ESD can be partially linked to constraints inherited from the apartheid regime, instituted between 1948 and 1994. The apartheid government passed legislative Acts such as the: Industrial Conciliation Act of 1956; Native Building Workers Act of 1951; Native Labour Regulations Act of 1911; Apprenticeship Act of 1944; and Mines and Works Act of 1911 (Deane, T., 2005). These aforementioned Acts reserved skilled engineering work for the White population and prevented Black Africans from becoming engineers. The Bantu Education Act of 1953 further provided an education system which was organised on racial lines and prevented Black Africans from undertaking engineering studies. High-quality education was for so many decades the preserve of the White population. These structural deficiencies in turn created long-term ESD patterns and racial disparities in South Africa. The post-

apartheid challenge is to transform these racial disparities which were promoted by the apartheid regime and provide a more equitable society.

South Africa's first attempt at redeeming this situation could be traced as early as 1997 when the National Skills Development Strategy (NSDS) was announced as a national strategic response to skills development problems (DoE, 1997). The announcement of the NSDS (1997) led to the establishment of two key skills development policies in South Africa, namely: Skills Development Act of 1998 as amended in 2008; and Skills Development Levies Act of 1999 as amended in 2010. Recent attempts are captured in the amended NSDS III, which is significantly different from its two predecessors (NSDS I and NSDS II). In addition to these strategic responses to the ESD problem, government has also embarked on a large infrastructure spending mandating, among other things, affirmative action and engineering skills development through Mega Construction Projects (MCPs).

South African MCPs such as the Gautrain Rapid Rail Link and Eskom Capacity Expansion Programme present current and future opportunities for engineering skills development in the country. While South Africa has made remarkable strides in transforming racial exclusions which were promoted by the apartheid regime, the ESD problem is still prevalent. Collectively, the NSDS III and the NDP vision 2030, concur that despite the remarkable strides made since the advent of the new democracy, the plague of inequality continues to prevail, unemployment rate remains high and the ESD problem is still prevalent. Government has, however, committed themselves and made numerous strides to address the ESD problem. Yet, important challenges remain with key milestones to be achieved.

The plague of inequality continues to prevail and the ESD problem is still prevalent, notably among previously marginalised people. There is, however, unanimous consensus that engineering skills development has a key role to play in addressing the triple problems in South Africa, namely: unemployment, poverty and inequality. There is also growing consensus regarding the ESD problem. Among the reasons cited to explain this ESD are: the legacy of apartheid, emigration of skilled professionals, affirmative action measures, poor graduate training and unemployment. This study sought to investigate the effectiveness of the use of expatriate professionals in contributing towards engineering skills development in South Africa.

1.2 Problem statement

There is a notable ESD in South Africa. Among other interventions, the proliferation of skills development policies, engineering skills development programmes (ESDPs), and the use of expatriate engineering professionals in MCPs, have been the main interventions promulgated by the government. The effectiveness of expatriate professionals in transferring engineering skills to candidate engineers in South African MCPs has to be investigated. Thus the aim was to investigate the effectiveness of utilizing expatriate professionals in transferring engineering skills to candidate engineers in South African MCPs.

1.3 Research objectives

Key objectives for this study were to:

1) Investigate policies which inform the use of expatriate professionals in South African MCPs;
2) Assess the structure of the ESDPs in South African MCPs;
3) Assess the sentiments of the beneficiaries; and
4) Investigate the throughput of engineering skills since the inception of the ESDPs in South African MCPs.

2. Literature Review

In 1994, when the first democratically elected government came to power, education and training were split between the Department of Education (DoE) and the Department of Labour (DoL). The DoL was in charge of skills development and introduced a National Skills Development Strategy (NSDS) in 1997 (DoL, 1997). This strategy recognised human capital as vital to socio-economic development (SED) and was aimed at enabling previously marginalised groups to participate more fully in the South African economy (Tager, N., 2003). The Skills Development Act, announced in 1998 and amended in 2008, provided an institutional framework to device and implement the NSDS (1997) (DoL, 1998). The Skills Development Act of 1998 put in place a national regulatory framework that comprised a National Skills Authority (NSA) and various Sectorial Education and Training Authorities (SETAs). This Act further provided a financing mechanism to implement the NSDS by means of a levy-grant system and a National Skills Fund (NSF). The NSA was a replacement of the apartheid National Training Board (NTB), while SETAs replaced the former Industry Training Board (ITB) (Kraak, 2004). The NSA provides coordination at national level, while SETAs oversee sectorial coordination.

Despite all these policy reforms by post-apartheid government, the ESD problem in South Africa is still dominant. With efforts to improve on previous strategies, an amended NSDS III was released by the former Minister of Higher Education and Training, Dr. B. E Nzimande, in January 2011. The NSDS III acts as the overarching strategic guide for engineering skills development and provides direction to construction sector skills planning and implementation for SETAs (DHET, 2011). The strategy further acts as a framework for the skills development levy resources utilisation by SETAs and the NSF. The NSDS III further provides a framework for planning and implementation of ESDPs consisting of (DHET, 2011):

1) Seven key developmental and transformation imperatives which provide the focus for skills development programmes;
2) Seven pillars which offer a basis for the structuring of skills development programmes; and
3) Eight Human Resource Development Strategy for South Africa (HRDS-SA) commitments which inform and guide the NSDS III.

However, the NSDS III is a subcomponent of the HRDS-SA, and operates concurrently in support of this strategy. The 2010 - 2030, HRDS-SA details a number of strategic objectives, indicators, and indicative actions which assign clear responsibilities which need to be reflected in SETAs and NSF plans (HRC-SA, 2010). Among other strategic objectives for the HRDS-SA, strategic objective two aims at improving the supply of high quality skills, particularly scarce skills such as engineering (HRC-SA, 2010).

To gain some perspective on ESDPs, various studies (Woorland, I., Kneebon, P. and Lee, D., 2003), (Kraak, 2004), (Kraak, A., 2008), (Erasmus, 2009), (Rasool, R. and Botha, C.J., 2011) and (Foko, 2015) were considered, and implications of their conclusions were explored. One of the central doctrines of Andre Kraak's work (Kraak, A., 2008) has been that the emphasis on ESDPs is not sufficient in South Africa. Kraak (2004) further highlights the importance of the Skills Development Levies Act of 1999 and affirms that levy-grant system gives government influence on skills development. Kraak (2008) further argues that the SETAs are an improvement over the ITBs, whose legacy included a decline in enterprises undertaking skills development initiatives and adopting a short-term approach to skills development. Erasmus (2009) shares a different view relating to the establishment of the NSA, SETAs and NSF. According to Erasmus (2009), SETAs are supposed to be the intermediaries in the relationship between skills development and SED requirements.

According to Erasmus (2009), a labour market analysis conducted by the SETAs is based only on reports from workplace, and not research (Erasmus, 2009). Kraak (2008) affirms Erasmus's (2009) findings and further aligns the failure to produce credible estimates with poor labour intelligence and inadequate research expertise from SETAs. According to McGrath and Akooje (2007), SETAs were set up in response to an identified need to advance the workers skills development agenda post-apartheid and thus represent a vehicle for addressing the ESD and growth imperatives in South Africa (McGrath, S. and Akooje, S., 2007). Foko (2015), however, shares a slightly different view and argues that South Africa has made tremendous progress in skills development, notably from the educational system owing to the Bantu Education Act of 1953. Studies conducted by Kraak (2004 and 2008) and Erasmus (2009) align with the critique of Woorland, Kneebone and Lee (2003) who find data provided by CETA as not being reliable (Woorland, I., Kneebon, P. and Lee, D., 2003) and argues that the construction SPPs is developed internally and is often not properly assessed for quality.

Despite a number of skills development strategy reforms such as the NSDS (1997), South Africa continues to face considerable ESD (Rasool, R. and Botha, C.J., 2011). Kraak (2008) characterises South Africa's skills typology as one that comprises a differentiated basket of high, intermediate and low-skill training programmes. There appears to be challenges with the current role of CETA, NSA and NSF. Intervention are required to enforce their legislative mandate which is: engineering skills development. Despite various policy interventions by post-apartheid government, the ESD problem in South Africa still persists. A myriad factors contributing to the persisting ESD in South Africa have been identified. However, only four of these are briefly examined in this study: the legacy of apartheid, emigration of skilled professionals, affirmative action measures, and poor graduate training.

3. Research Methodology

This study adopted a mixed-methods approach and was guided by the research questions and objectives for this study. A sequential mixed-method data collection approach in the form of a structured online survey questionnaire (quantitative data collection), document secondary data (quantitative data collection) and follow-up semi-structured interviews (qualitative data collection) was adopted to validate quantitative data with qualitative data and to also address different research questions. This strategy involved collecting data in an iterative process whereby the data collected in one phase contributed to the data collected in the second phase. In the first phase, quantitative data were collected using a structured online survey questionnaire and in the second phase, follow-up up semi-structured interviews were conducted to collect qualitative data. The third phase was independent and included collecting document secondary data from annual reports.

A structured online survey questionnaire was used to investigate policies which inform the use of expatriate professionals in South African MCPs and to also assess the sentiments of the beneficiaries. Questions in the structured online survey questionnaire were entirely close-ended, and the responses categories were developed from literature findings. The subsequent semi-structured interview instrument aimed at assessing the structure of the ESDPs in South African MCPs and to also assess the sentiments of the beneficiaries. The interview consisted of individualised questions intended to explore particularly interesting or ambiguous survey responses as well as standard questions exploring general perspectives on the purpose and future for engineering skills development through South African MCPs. Document secondary data from ECSA annual reports were used to investigate the throughput of engineering skills since the inception of the South African MCPs.

According to Fellows & Liu (2008), the purpose of data analysis is to provide information about variables, relationships between them and to provide evidence of the relationship to aid understanding. In this study, the purpose of data analysis was to summarise data so that it is easily understood and provides the answers to research questions. Thus, during data analysis, thorough knowledge of the study material had already been accumulated through literature review which created a suitable foundation for the content of the data and its meaning. This was to ascertain what in the data is relevant when trying to answer the research question (Malterud, K., 2001). This study made use of the following data analysis techniques:

(a) Tukey's (1977) Exploratory Data Analysis (EDA) approach for quantitative data; and
(b) Thematic analysis approach for qualitative data.

4. Data Presentation, Analysis and Interpretation

4.1 Policies which inform the use of expatriate professionals in South African MCPs

The first objective of the study was to investigate policies which inform the use of expatriate professionals in South African MCPs. Findings from both the questionnaire and the interviews indicate a consensus that the majority of the respondents agree that the dawn of South Africa's skills development policy framework is by no doubt linked to the apartheid legacy. It is evident that the NSDS, which led to an establishment of the HRDS-SA, informs the use of expatriate professional in South African MCPs. This strategy uses the net difference between immigration and emigration of qualified engineers per annum as an indicator on progress.

4.2 Structure of the ESDPs in South African MCPs

The second objective of the study was to assess the structure of the ESDPs in South African MCPs. Several respondents in both the questionnaire and the interviews stated that they were not aware of or only vaguely aware of ESDPs in South African MCPs.

4.3 Sentiments of the beneficiaries

The third objective was to assess the sentiments of the beneficiaries in South African MCPs. Despite the well-known benefits on mentorship, particularly with regards to engineering professional development as described by ECSA, it is surprising that few respondents in the interviews indicated that they had dedicated expatriate mentors. Findings from the questionnaire, however, indicate a consensus that the majority of the respondents agree that they understand the requirements for one to register as a professional engineer with ECSA. Furthermore, the majority, namely 24 (38.7%), of the respondents in the questionnaire indicated that they are registered as professionals.

4.4 Investigate the throughput of engineering skills since the inception of the ESDPs in South African MCPs

The fourth objective was to investigate the throughput of engineering skills since the inception of the ESDPs in South African MCPs. In this study, the issue of throughput of engineering skills is located within its wider social and institutional contexts, and is measured through registration with ECSA. Findings from both the questionnaire and the interviews indicate a consensus that the majority of the respondents agree that the continued ESD in South Africa can be partially linked to constraints inherited from the apartheid era, emigration of skilled engineering professionals, poor graduate training and poor

basic education. Findings from document secondary data also indicate that the throughput of black candidate and professional engineers has been consistently increasing over the period 2009 – 2017.

5. Discussion, Conclusion and Recommendations

5.1 Discussion

The skills development policy framework is backed by financial resources through the skill development levy-grant system, but the implementation needs to be improved to ensure these resources are used effectively. Indeed, there are several reasons why the use of expatriate professionals in transferring engineering skills to candidate engineers in South African MCPs alone may not generate an effective engineering skills development. However, the optimal response is not necessarily to subsidise engineering skills development through the levy-grant system or government to directly supply ESDPs. The policy response could be, instead, to establish an effective institutional and regulatory framework with clear delegation of roles and responsibilities between expatriates, beneficiaries and the different institutions involved in the provision of ESDPs in South African MCPs.

Given the ESD and its impacts on timeous completion of South African MCPs, it is imperative that a properly structured ESDP should be implemented. At the root of the problem is the fact that local beneficiaries do not have any control over the choice of expatriates who transfer engineering skills to them. Similarly, expatriates are rarely held accountable for the engineering skills transfer. Overlaying this problem is the lack of delineation of roles and responsibilities between government, expatriate professionals and local beneficiaries of which engineering skills transfer is a key objective in South African MCPs. Moreover, the use of expatriate professionals in transferring engineering skills to candidate engineers in South African MCPs will not be effective if it does not provide the right set of incentives and margin of flexibility for those involved in the transfer of engineering skills.

Indeed, skills transfer will only be relevant if the ESDP can ensure that expatriates actually deliver appropriate engineering skills and expertise to the intended local beneficiaries stipulated on project specific institutional arrangements. It may be that, given the complexity of international assignments such as MCPs, expatriates do not have time to engage in developmental relationships or the local beneficiaries do not know how to initiate a mentorship relation. Real or perceived cultural differences between the expatriates and local beneficiaries may also hinder the mentorship process. Throughput of engineering skills, needless to say, is a more complex and contested issue than it might seem. How the throughput of engineering skills is measured is itself a matter for debate. In this study, the issue of throughput of engineering skills is located within its wider social and institutional contexts, and is measured through registration with ECSA. This study argues that the challenge of improving the throughput of engineering skills is a national priority and critical to long-term socio-economic inclusion and transformation in South Africa.

5.2 Conclusion

The central conclusion to be drawn from the study is that there is a relative ESD which could increase if ESDPs are not properly structured. In the short to medium term, the post-apartheid government should focus on attracting highly-skilled engineering professionals by pursuing proactive immigration policies and to also adopt appropriate governance agreements which should devise institutional arrangements that improve accountability on engineering skills development in South African MCPs. There is also a need to establish an effective institutional and regulatory framework with clear delegation of roles and responsibilities between expatriates, local beneficiaries and the different institutions involved in the provision of ESDPs in South African MCPs. ECSA could similarly play an extremely valuable role in

facilitating a high-level engagement with important stakeholders with the aim of establishing a strategic partnership to strengthen and support ESDPs in South African MCPs.

5.3 Recommendations

The following recommendations are made from this study:

- The post-apartheid government should focus on attracting highly-skilled engineering professionals by pursuing proactive immigration policies and to also adopt appropriate governance agreements which should devise institutional arrangements that improve accountability on engineering skills development in South African MCPs.
- There is also a need to establish an effective institutional and regulatory framework with clear delegation of roles and responsibilities between expatriates, local beneficiaries and the different institutions involved in the provision of ESDPs in South African MCPs.
- ECSA could similarly play an extremely valuable role in facilitating a high-level engagement with important stakeholders with the aim of establishing a strategic partnership to strengthen and support ESDPs in South African MCPs.

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Building Collapse in Nigeria: A Regulators Perspective

AbdulHafeez Ibrahim[1]

Abstract

Building collapse has become a regular occurrence in Nigeria. Lives and properties have been lost. Development control agencies are established to ensure that standards are complied with, anywhere buildings are being constructed. This paper adopted the mixed method of research to assess the control measures put in place by Kaduna State Urban Planning and Development Agency, Nigeria, to avert the incidence of building collapse. A recent case of building collapse in the area was also investigated. Information was obtained through site observation to fill checklist on building site. The paper also looked into the approval process and construction stage of building works. Applications submitted for building permits were also reviewed. The study found that most (70%) building projects were undertaken without approval. The study concludes that most drawings (architectural, structural, mechanical and electrical designs) are not produced by the respective registered engineers. There was low involvement of Builders and Civil Engineers in the supervision of building works within the study area. The study recommends strict enforcement of building regulations and prosecution of defaulters.

Keywords: Building collapse, building control, development control agency, Kaduna State

1. Introduction

Shelter, is one of the basic needs of mankind. The need for a decent and safe shelter cannot be overemphasized. Shelter in form of buildings, need to be properly planned, designed, constructed and maintained to obtain the desired satisfaction, comfort and safety. The building has failed if the building failed to perform any of its principal functions of satisfaction, safety and stability (Olagunju, Aremu and Ogundele, 2014). When shelter/housing which is supposed to protect man becomes a threat to his life, it calls for serious concern.

The rate of the incident of building collapse in Nigeria has become both a national and international embarrassment to Nigeria as Nigeria claim to be the giant of Africa. The built environment, in any country, determines the nature and pace of national development and the citizens' quality of life (Otubu, 2014). According to Oyedele (2017) the rate of building collapse is a reflection of the level of organization, the performance of the building control activities and degree of sophistication of the construction professionals in any country. The incidence of building collapse in Nigeria is reaching an epidemic proportion. NO major city in Nigeria have been able to avoid one case of Building collapse in the past four years. The incessant building collapse incidents in the country is a source of concern to citizens and all stakeholders - the professionals in building environment, government, developers, and users. On 15th April 2019 a Three storey building collapse in Jos Plateau state of Nigeria killing twelve people and injuring several more (Punch Newspaper, 2019). These brings the total number of Building collapse in Nigeria between December 2018 and June 2019 to Five.

[1] Doctoral candidate; Department of Building; Ahmadu Bello University Zaria; Mscenv10656@yahoo.com

Each case of building collapse comes with loss of lives, property and loss of investment in construction. Oyedele (2017) has laid the blame of building collapse on the government ministries and agencies on inefficiently monitoring and supervision of construction works.
According to Gana (2014) development control agencies are established by the Government in the country to set standards for construction, and monitoring to ensure that standards are complied with where structures (buildings) are to be constructed in the state/country.

The causes of building collapse, can either be natural made and artificial. The natural causes can be due to a natural disaster e.g earthquake, hurricane, tremor, storm, typhoon, flooding, erosion, wildfire etc. The artificial is man-made either by action or inaction of man (human). In Nigeria where the incidence of natural disaster in minimal, the latter is the most common cause of building collapse.

A study by Gana (2014) studied sixty -one cases of building collapse between 1974-2010 findings showed that forty-nine cases were caused by design and construction problems which is under the purview of building control/regulatory agencies. According to Jambol (2010) 95% of collapsed building occurred during the design and construction stage. An analysis of collapsed buildings in Nigeria (1971-2016) by Omenihu, and Onundi (2016) also revealed that 60% of causes of building collapse was as a result of activities at the design and construction stage.

The aim of the study is to assess building collapse from a building/development control regulators perspective, to see the actions taken by a development control Agency in curbing the incessant building collapse in Nigeria. This paper looks at the causes of building collapse from the design and construction stage of the building production process. The objective includes;

i. Assessing the quality of design submitted for approval by developers and
ii. Assessing the compliance of construction work with the approved designs and specification.

2. Literature Review

2.1 Building collapse

Building collapse is a situation where building under construction or completed tears apart or crumbles without the influence of any external agent (Oyedele, 2017). Building collapse is a waste of financial resources; in some cases, wastes of human life; waste of time invested in construction. The effect of building collapse according to Jambol (2010) include loss of life, loss of effort put in building production process, loss of investment, people are injured or incapacitated and psychological impact on owner, user, and the society

Collapse in building could be total or partial failure of one or more of its components leading to inability of the building to perform its principal functions of safety and stability. According to Adesanya and Olanrewaju (2014) the factors responsible for building collapse are non-enforcement of building codes, conversion and disregard for approved drawings, use of substandard materials, poor workmanship and quackery.

A study by Kolawole (2018) reveal that building collapse in Nigeria emanates majorly from; overloading, lack of maintenance, illegal alteration or conversion of existing buildings, quackery, use of inadequate/improper foundation, inadequate preliminary site investigation, poor concrete mix ratio,

inadequate structural analysis / design, lack of adherence to material specification/poor building material specification and inadequate supervision by professionals.

2.2 National Building Code

A code is a system of rules both moral and ethical procedure to guide the moral and ethical behavior of the adherers to the system of rules, which must be judiciously meticulously and painstakingly followed to realize the objectives of the rules (Ogunbiyi, 2014). The National Building Code, is a set of minimum standards on building pre-design, design, construction and post-construction stages with a view to ensuring quality, safety and proficiency in the building industry. According to Adesanya and Olanrewaju (2014) implementation of National Building Codes is one of the major tools that need to be used by the government for managing the risk of collapse building in the interest of public safety. National Building code spells out among others the role of each stakeholder in the construction industry.

The aim of National building code is to eliminate or reduce to the bare minimum the incidents of collapsed building syndrome in Nigeria; promote safety and qualitative housing for every Nigerian.

According to National Building Code of the Federal Republic of Nigeria (2006) the need to evolve a National Building Code arose from the following existing conditions of our cities and environment:

(a) The absence of planning of our towns and cities;

(b) Incessant collapse of buildings, fire infernos, built environment abuse and other disasters;

(c) Dearth of referenced design standards for professionals;

(d) Use of non-professionals and quacks;

(e) Use of untested products and materials;

(f) Lack of maintenance culture

2.3 Requirement for Building permit

Kaduna State Urban Planning and Development Agency is an agency of the Kaduna state governments that grants approval for construction and development in the state. For permission/ approval to be granted the applicant has to provide/ submit some information. They include

1. Signed Application Letter (Typed)
2. Copy of Certificate of Occupancy/ Lease Agreement (Planned Areas)
3. Copy of Customary Land Ownership endorsed by a District Head (Unplanned Areas)
4. Two sets of Preliminary Drawings [Architectural, Structural, Mechanical & Electrical]/ Draft Structural Calculation Sheets for Preliminary Approval Only
5. Three sets of Architectural Working Drawings & Details, Sealed, Stamped, and endorsed by the Architect (All Developments)
6. A copy of the Architect's Professional Practice License indicating Project Name and endorsed by him (All Development)
7. Three sets of Structural Working Drawings & Details, Sealed, Stamped, and endorsed by the Engineer (Story Buildings Warehouses, Petrol/Gas Stations & others with special Structural requirements)
8. Soil Investigation Report (Multi-Story Developments that exceeds Three Floors)

9. Copy of the Structural Sheets, Letter of attestation of Design, Sealed, Stamped, and Endorsed by the Engineer (Developments listed on 7 above)
10. Three sets of Mechanical & Electrical Working Drawings & Details, Sealed, Stamped, and endorsed by their respective Engineers (All Developments)
11. Letter of responsibility of supervision by a registered professional (Builder or Civil Engineer)
12. Copy of Site Analysis Report Prepared by KASUPDA Registered Consultants (All Developments)

3. Methodology

The research was achieved using mixed method (quantitative and qualitative method). A checklist was used to assess compliance with approved design (architectural and structural working drawings) on site. A case study approach was used to obtain informing from the incident of collapsed building. Participant observation and document analysis were used during vetting of submitted working drawings and during monitoring activities of Kaduna State Urban Planning and development Agency (Zaria zonal office). The study was carried out between May, 2018 and April 2019. One hundred and twenty sites were visited and Eighty-Nine applications were vetted. The study adopted a convenience sampling for the study.

4. Findings and Discussion

Table 1 shows the result from assessing the quality of design submitted for approval. The working drawings submitted to the monitoring and compliance department within the period under review for vetting and compared with the minimum requirements for granting permit. Table 2 shows the result of the investigation. Sixty-six percent (66%) of the submitted architectural working drawings met the minimum requirement for approval. Sixty (60%) of structural designs/drawings, sixty four percent (64%) of mechanical working drawing and sixty one percent of (61%) electrical working drawings were recommended for approval. Fifty-two percent of the letter of attestation of design (52%), thirty five percent of letter of responsibility for supervision (35%) and twenty two percent (22%) of structural calculation were authentic. Only (8%) of applications had soil test included in the application for building permit.

For architectural designs, Architectural drawing faults found in the drawings include; designs not signed and sealed by a registered Architect, no Architect Registration Council (ARCON) stamp, counterfeit ARCON stamp and seal and practicing licence of Architect not included.

For structural designs; structural drawings were incomplete, drawings do not reflect what is in the structural calculation submitted, structural calculations not sealed and stamped by a registered civil Engineer. Counterfeit stamp and seal were also discovered to be placed on structural working drawings. For Mechanical and Electrical working drawing (M&E) majority of the problems arises from not including the seal, stamp and signature of Registered Engineer on their respective drawings.

The structural engineer responsible for the drawings is required to submit a letter of attestation that the structure was designed by him according to a specific Code. The Engineer is required to sign and put his professional practice seal on the letter. Letter are submitted without the signature and seal of a structural engineer. Problems arises when counterfeit seal or other engineering professionals seal are used in place of the structural engineers' seal.

Only few applicants submit soil test report, this may be because according to the law, it is only mandatory for buildings of Three storey and above.

The results from table 1 shows that drawings are not being designed by the competent and registered professionals in the built environment. It is the registration with the appropriate professional body and council that allows you produce and seal the relevant documents and drawings.

Table 1: Assessment of documents submitted for building permit

		Approved		Disapproved	
S/No		**Nr**	**%**	**Nr**	**%**
1	Architectural working drawing	59	66	30	34
2	Structural working and calculation drawing	53	60	36	40
3	Mechanical working drawing	64	72	25	28
4	Electrical working drawing	61	68	21	31
5	Letter of Attestation of design	46	52	43	48
6	Letter of responsibility for supervision	35	39	54	61
8	Soil test	6	8	82	92

4.1 Assessing the compliance of construction work with standard.

The results from the monitoring activities of the monitoring and compliance department of Kaduna State Urban Planning and Development Agency. Developers were asked to provide their building permit or approved building plan. Table 2 shows that 30% of developers have approval for building. Forty-five percent (45%) of development do not have approval, while 25% of developers have submitted application for approval. This shows that majority (70%) of developers do not have approval. Construction of building without approval have been linked to poor construction work and substandard structure.

Table 2: Building permit/ Approval for Building Permit

S/N		**Frequency**	**Percentage**
1	Approved	36	30
2	No-Approval	54	45
3	Submitted Application for Approval	30	25
	Total	120	100

The monitoring activity comprised three activities, supervision, compliance with architectural working drawing and compliance with structural working drawing. As a condition for granting building permit, a developer must invite the monitoring and compliance department of the agency on intention to begin construction (as early as setting out of the building) and at various stages during construction.

Results from Table 3 shows that the agency was only invited in 19% of construction work surveyed. This finding is similar to Kio-Lawson, Duru John and Eebee (2016) where they declared that most often actual work is started on site without the knowledge of the planning authority whose signature is upon such plan. It is at this point that most alterations are made.

During the monitoring activity enquiry was made about the individual supervising the construction work. The presence of the Civil engineer/ Builder who are the individual saddled with the responsibility of supervising/ managing the building production process on site according to the building code was looked into. The presence of registered professional on site was found in 34% of the site visited. Most of the Engineers who submitted letter of responsibility of supervision were not present on site at the time of the

visit. Use of quacks was a major cause of building collapse according to Omenihu, Onundi and Alkali (2016).

On compliance with Architectural design, eighty nine percent of the visited were complying with the approved design. While there was deviation in eleven percent of the sites visited. It was discovered that in some site they submitted application for fence or bungalow while storey buildings were being constructed. On setback violation, it was discovered that Twenty-eight (28%) of building violated the minimum distance of 1.5m for setback.

On compliance structural working drawings, the foundation dept was found to be inadequate on twenty-seven (27%) of site visited. On the reinforcement bar size in column, rebar size in sixty percent (60%) of the site visited were found to be adequate. While it was inadequate in forty percent (40%) of site visited. On compliance in rebar size in Beams forty- three percent (43%) of site visited were found to be inadequate.

Non-compliance with standard in beams and columns includes using a 12mm steel reinforcement bar in structural members where the minimum should be 16mm placed. It also includes placing lesser number of bars than specified by the structural engineer. This is done to reduce the cost of construction. This is a major cause of Building collapse, where the structural members are under reinforced.

Table 3: Findings on Compliance

S/No		Compliance		Non-Compliance	
		Nr	%	Nr	%
A	Supervision				
i	Invitation before construction work commence	23	19%	97	81
ii	Presence of registered professional on site	28	34	92	66
B	Architectural design				
i	Layout and plan	107	89	13	11
ii	Setback violation	28	23	92	77
C	Structural elements				
i	Foundation dept	88	73	32	27
ii	Colum rebar size	72	60	48	40
iii	Beam rebar size	68	57	52	43

4.2 Case study building collapse

There was a building collapse on Friday 8th June 2018. The building is a proposed one storey building under construction in Zaria, Kaduna State Nigeria. The building was under construction when it collapsed. Before the building collapsed, the first floor was already completed on an earlier date and the casting of floor slab of the second floor was in progress, it was almost completed when the building collapsed. Eye witness report all attest to the fact that there was no prior warning sign from the structure before it failed. The building suddenly caved in leading to the death of three persons and injuring several more.
The engineer who made the structural design was contacted, he came to site and attested to the fact that he designed the building and submitted a letter taking responsibility for supervision. He claimed he was not informed that construction has begun. From the study of the structural working drawing submitted, it met the minimum requirement for approval.

4.2.1 Site inspection

Foundation and Block work
It was observed that 12mm steel bars were used in the foundation. 150mm blocks were used and not 230mm as designed or in line with common practice from the foundation. This shows that all the structural members from foundation (columns and Beams) would have to take the 150mm width of the block work (instead of 230mm).

Beam
From the designed submitted for planning permission all the beams were to be 450x230mm. reinforced with 16mm steel bars (Top and Bottom). It was observed that most of the beams reinforced with with 12mm re-bars. The beams were measured to be 150mm in width which is contrary to design (230mm).

Column
The columns were observed and were found to be 150mmx230mm in dimension. The columns can be seen to be the most affected structural members because they were the most damaged. Further investigation showed that they contained 12mm reinforcement bars. The stirrups were made of 10 mm rebars placed at 350mm c/c. This is also contrary to the design provision of 230mmX230mm section, 16mm reinforcement bars and 10mm stirrups spaced at 150mmc/c.

Finding shows that the building collapsed as a result of failure of the structural members specifically the column. It can be seen that the columns buckled. The load carrying capacity of the column had just been exceeded. The additional floor exerted a lot of load on the columns that it could not withstand.

The following observations were made;

1. The building did not have approval prior to the building development.
2. The collapse was cause by defective structural members. The column was the first structural member to fail because it could not carry the load of the building
3. The client was constructing an additional floor when the building collapsed.
4. The specifications from the structural design were not adhered to. Reinforcement sizes were less than what was in the structural design and the spacing of links and stirrups were more than what was specified by the engineer.
5. The supervising Engineer was not involved in the construction after he had taking responsibility (by writing) of supervising the construction of the building from start to completion.
6. There was no quality control in the whole construction process as the building was not supervised by a competent engineer.

5. Conclusion

The incessant building collapse in Nigeria has become a national embarrassment. When a building collapses, lives are lost, money invested is lost and the public lose confidence in products of the building industry (building). Curbing this problem is the responsibility of all the stakeholders in the industry, which includes; professionals, developers(clients), the government and regulatory agencies. This paper looked at the menace of building collapse from the regulatory agencies' perspective (Approval and Construction) phase. From the study it can be concluded that most of the buildings within the study area are erected without approval, which gives room for quackery and unprofessionalism. Most drawings (architectural, structural, mechanical and electrical designs) are not produced by the respective registered professionals. Drawings submitted are not designed and endorsed by the relevant professionals. Poor quality of design would translate to poor quality buildings. In addition, there was low involvement of Builders and Civil

Engineers in the supervision of building works within the study area. Even the professionals who submitted the letter taking responsibility for supervising these projects were not found on site. They only wrote the letter to fulfil the conditions for approval. And sometimes the client (developers) does not inform these professionals when construction begins. There was also low compliance to structural design specifications. This could be because quarks have overtaken over supervision of building works. This is one major cause of building collapse. No recorded case of successful prosecution of owner/developer of collapsed building have been recorded in Nigeria up till today.

The planning authorities should not approve working drawings that do not bear the stamp and seal of the relevant professional body to indicate that such drawings have been made and or checked by a registered professional. All application should be scrutinized and checked before application for planning approval or building permit is accepted.

Building regulatory and development control agencies are now seen as revenue generating agencies in their respective states. Revenue generation is now the primary role of these agencies rather than the role of checking the quality and safety of building.

The study recommends strict enforcement of building regulations, prosecution of defaulters and the enactment of the National Building Code by the National Assembly and Various state houses of assembly in the thirty-six states in Nigeria.

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Fire Safety Criteria and Attributes for the Evaluation of Factory Buildings in Nigeria

Aminu Umar[1] and Usman Bukar Wakawa[2]

Abstract

Fire is regarded as one of the most devastating catastrophes on lives and properties, despite its uses and important in human life. Failure to understand the fire risk level of a building structure may increase its potential of fire occurrence. Factory buildings in Nigeria continue to experience a fire outbreak because of the failure to understand the risk they are exposed to. This results in loss of lives and properties. However, up to the present, very little consideration is given to the factory building fire safety issues in Nigeria, as portrayed in the Nigeria National Building Codes and Fire Safety Regulations, where the criteria and attributes of fire safety and their corresponding regulations are not clearly stated. This paper is aimed at establishing criteria and attributes of fire safety that will be suitable for the evaluation of fire safety in factory buildings in Nigeria. Using questionnaire survey and review of literature across both engineering and environmental disciplines, the opinion of experts on suitable criteria and attributes for the evaluation of fire safety were solicited. The survey was conducted with 21 number of experts in the building industry Fire Safety Officers that have broad knowledge and experience of fire safety. The extracted criteria and attributes of fire safety were presented to the experts and they were asked to select the most suitable criteria and attributes for the study of fire safety in factory buildings. The different background of the experts provided a true reflection of the suitable criteria and attributes of fire safety in factory building. The finding suggests that factory building in Nigeria could be evaluated using these criteria and attributes.

Keywords: building, fire safety, Nigeria, regulations

1. Introduction

Factory fires are among the most devastating disaster ever experienced in the world that destroyed lives, properties, equipment, finished goods and often halt production. A study has shown that, the approximated downtimes can account for up to 65% of the total damage experience in a fire manufacturing operation. The national research council of Canada gave an account, that in 1995, 10-15% of direct properties were destroyed by fire, whereas Australia estimated about 12.5% of property loss in fire or 68 million Australian dollar equivalent (Falson, 2012). Similarly, in Nigeria many fire incidents occurred, including factory fires which greatly affect the nation's economy. Therefore, provision of occupants' safety and protection of properties in and around the building structures is the paramount important, if fire safety is to be considered (Douglas, 2006b). According to the National Fire Protection

[1]Department of Architecture, Faculty of Environment Technology, Abubakar Tafawa Balewa University Bauchi, Nigeria; arcaminu1@yahoo.com; angilibukar@gmail.com

Association (NFPA) report on 2013 large-loss fire by major property use, the manufacturing process was the second largest in terms of fire loss has the highest number of fire occurrences. Moreover, 17 out of 21 large-loss fires occurred in structures amounting to USD 387.7 million property losses. However, six out of these structures happened in manufacturing properties which includes: a plastic laminate plant, a fertilizer plant, oil reprocessing plant, egg processing plants, a steel mill arc-furnace building and aluminium die-cast plant. The six fires losses cost USD 202.6 million out of USD 387.7 million structural fire losses (Badger, 2014). Table 1. shows the properties use, number of fires percentage loss and its equivalent in US Dollar.

Table 1: 2013 Large-Loss Fires by Major Property Use

Properties Use	Number of Fires	Percentage of Fire	Total Dollar Loss	Percentage of loss
Manufacturing	6	29%	$202,600,000	24%
Special Property	4	19%	$52,720,000	6.2%
Wild land	3	14%	$447,103,000	52.9%
Residential	3	14%	$76,856,512	9.1%
Public Assembly	2	10%	$25,000,000	3.0%
Storage	1	5%	$20,000,000	3.0%
Educational	1	5%	$10,500,000	2.4%
Vehicle	1	5%	$10,000,000	1.2%
Total	21	100.0%	$844,779,512	1.2%

Note: Sums may not be equal to the totals due to rounding errors (Badger, 2014).

The causes of fire is usually unforeseen and often due to the human error; factories and warehouses are usually referred as the places with high risk of fire, due to its open nature, which give room to fire spread easily (Thomson, 2002b). However, the triangle fire incident in New York city in 1911, hard brought about changes in the industrial fire safety from protecting building to safeguarding its occupants (Heller, 2011) and adequate sustenance of their protection (Bayliss and Hardy, 2012).

To protect lives and properties, certain strategies should be put in place and this was divided into four main categories; a). Passive building construction, b) Active fire protection system or service installation, c) fire management and d) control of risk factors (candy and chow, 2005). The “risk factor”, in other word, the fire safety risk assessment which is the most important among all, and it has more significance than any other aspect of fire safety.

It is clear that sometimes the fire safety regulations have little impact on the safety of the occupants in the workplace because of its inefficiency. Even though, it was among the issues that have been taking care in the building regulations in the earlier time (Visscher et al., 2008). Nevertheless, it is still facing problems more than before.

In Lagos State, Nigeria, building regulations are not well implemented; this is because the National building code is not in the possession of even the professional bodies and cannot be found in any database, either soft or hard copy (Cobin, 2013). Moreover, the building regulations is yet to be endorsed by the National Assembly (Omeife and Windapo 2013) .

Similarly, the Lagos state building code can only be accessed through extra effort and can only be seen in the government offices (Cobin, 2013).

In the same way, Kano State, Nigeria, which is the second largest industrial centre after Lagos State, Nigeria, faces almost the same problem with its counterpart; with a little difference in terms of fire safety privatization, although some factories in Kano State are already in the possession of their own private fire service units. These units are equipped with modern and sophisticated equipment, better than those owned by the state fire service, even though they lacked the trained personnel to steer the fire safety issues effectively. However, the fire safety level of these factories is still questionable because fire incidents continue to occur.

There were no universal building regulations in Nigeria, until recently when the draft was finally submitted to the National assembly for approval in 2006. The main reason for the establishment of the Nigerian National building code was as a result of the environmental problems and potential accident during and after the construction of buildings. The objective of the code is to guarantee the health and safety of the building occupants ("National Building Code, Federal Republic of Nigeria," 2006). Omeife and Windapo (2013) highlighted that the building code in Nigeria was developed to serve as a universal remedy to the following terrible condition of the environment, practice and cities;

a) Lack of good planning of towns and cities.

b) Persistence building collapse, fire disaster and environmental maltreatment.

c) Need of guidelines to standard design for professionals.

d) Abuse of building materials.

e) Intrusion of non-professionals to building industry.

f) Need of building maintenance.

The Nigerian National building code was drafted by a special committee. This committee involved seven professions in the building industry and their respective regulatory bodies: Architecture, Building, Engineering, Estate surveys and valuation, Quantity surveying, Land surveying and urban and regional planning, in addition to other resource persons at various stages of the production of the code (National Building Code, Federal Republic of Nigeria, 2006).

The draft of the Nigerian National Building Code consists of four parts: part I administration, part II Classification and Requirements, Part III Enforcement, Part IV Schedules and References. The part I of the draft explained the administrative aspect, part II refers to the technical (professionals) which consist of pre-design stage, design stage, construction stage and post construction stage. Part III involves mainly enforcement explaining control of building works. The schedule and references are contained in part IV of the drafted code.

The 497-page draft of the Nigerian National Building Code strikes many issues concerning building and its construction and enforcement across Architectural, Engineering and other related professions. However, issues related to fire safety were not compressively discussed; this made the regulations concerning fire safety to be scanty in the National Building Code. In many building regulations a specific part is usually dedicated to fire safety because of its important requirements to comply with throughout the life of the building. For example, the building regulations-Approved Document B (volume II) of England and Wales, purely elucidates requirements for fire safety. Likewise, part VII of the Uniform Building Bylaws Malaysia, is devoted to requirements of fire safety.

Perhaps the National Building Code of Nigeria was compiled and drafted without the input of those few fire safety experts in the country, even though the committee members were drawn from all the professions in the building industry. Although, the draft of the Nigerian National building code was

completed since 2006 however, the bill that was passed for the implementation of the code has been stuck in the National Assembly (the legislative arm of government) waiting for approval. This long expected enactment of the law is the major cause of many problems in the construction industry and the environment (Omeife and Windapo, 2013).

Therefore, suitable fire safety criteria and their attributes most to established to use as yard stick for the evaluation of fire safety in factory buildings in Nigeria. This is because these criteria and attributes suitable for the evaluation of fire safety could not be found any were in the Nigerian Building code or fire safety regulations

2. Methodology

This research employed the use of quantitative method to select the most important criteria and attributes of fire safety in relation to factory buildings and relative weightage through survey questionnaires. The Researcher carried out two different stages of survey questionnaires. Initially the survey was conducted with 21 numbers of experts which include Architects, Mechanical and Electrical Engineers, Quantity Surveyors, Academician, Fire safety engineers and Fire safety officers that have broad knowledge and experience of fire safety. The extracted criteria and attributes of fire safety were presented to the experts in the first stage survey and they were asked to select the must suitable criteria and attributes for the study of fire safety in factory buildings (Chow and Lui, 2002b; Ibrahim, et al., 2011b; Watts and Kaplan, 2001; Zhao, et al, 2004b). The different background of the experts provided a true reflection of the important criteria and attributes. A total of 15 experts' responses out of 21 were received by the researcher. Five-point Likert scale was used in measuring the perception of the experts to elicit the essential criteria and attributes with the scale ranging from 1-5, where 1 represents 'not important and 5 Very important'. The criteria and attributes that are rated '4' and above are those considered in the survey analysis. The experts were also asked to add new attributes where possible.

3. Data Analysis and Result

Four fire safety criteria and their respective attributes were previously identified from the literature and presented to the 21 experts in the form of questionnaire to select the most suitable for this study. However, 15 out of the 21 questionnaires presented to the experts were returned. The analysis of the survey involves the frequency and importance index calculation in order to select the fire safety criteria and attributes that are suitable for the evaluation of fire safety in factory buildings in Nigeria. The analysis was first conducted to determine the collective frequency of the importance of fire safety criteria for all the respondents. The result of the overall analysis of all the four fire safety criteria from all the respondents is as shown in Table 2. The result in Table 2 shows that three out of the four criteria of fire safety obtained objectively high 'important' and 'very important' scores, with the passive fire protection and active fire protection criteria excelling in the table obtaining the added importance frequency percentages (important + very important) of 93.8% and 93.6% respectively. Fire resistant construction received a very low score of cumulative important and very important score of 27.5%.

Table 2: Overall Statistics for frequency of importance (Fire Safety Criteria)

Fire Safety Criteria	Not Important (%)	Less important (%)	Neutral (%)	Important (%)	Very important (%)	Total
Passive Fire Protection	0.00	3.80	2.50	54.8	39.0	100
Active Fire Protection	1.20	0.20	5.00	49.9	43.7	100
Fire Safety Management	0.30	0.20	7.80	43.0	48.7	100
Fire Resistant Const.	26.0	28.1	18.4	16.0	11.5	100

Importance index calculation is used to measure the relative importance of a variable as compared to others. The result achieved from frequency calculation, was used to calculate the important index using the formula as used by Mohammad (2011).

$$\text{Important index} = \frac{5(5n1+n2+n3+n4+n5)}{5(n1+n2+n3+n4+n5)}$$

The result obtained from the importance index calculation indicates the importance for each of the variables (Fire safety criteria and attributes). However, this is not adequate to determine the level of importance of the variables (Fire safety criteria and attributes). Adjei (2009) indicated that the more closely the score of the importance index to 1 the more important is the criteria or attribute nearer. Therefore, the closer the important index score for fire the fire safety criterion, for example (Passive fire protection) is to one the more important is for the fire safety evaluation of factory buildings. This method, still raises a question on how to obviously define 'close' or 'not close' to 1 as there is no pointer to set the borderline for the scores that are considered as 'close' to 1. A question may be asked is 0.5 above, or 0.65 above, or 0.75 above should be considered to be close to 1, so that the criteria could be said to be important. For example, if two criteria scored 0.75 and 0.65 each, it can easily be concluded that the criteria that scored 0.75 is more important than the criteria scored 0.Dixon et al. (2005) conducted a study and came up with the way to determine not only which criterion is more important and but also, are the criteria important. He used the total mean importance index and standard deviations to determine whether the criteria are under the categories of 'very important,' 'important,' 'less important' or least important'. This technique was also utilized previously by Cunningham and Lischeron (1991). Therefore, is possible to determine whether the criteria and attributes of fire safety in this research is 'very important', 'important', 'less important' or 'not important'. The importance index values acquired using the formula provides the importance of each fire safety criteria. Nevertheless, to establish the importance level of each criterion, the importance index acquired from the calculation should be weighed against the standard deviation score of the criteria (Mohammad, 2011). The result of the overall importance index calculation of the fire safety criteria is shown in Table 3.

Table 3: Importance Index for Fire Safety Criteria

Fire Safety Criteria	Importance Index	Mean	Standard Deviation	Level of importance
Passive Fire Protection	0.865	4.05	0.321	Very Important
Active Fire Protection	0.888	4.25	0.678	Very Important
Fire Safety Management	0.866	4.25	0.662	Very Important
Fire Resistant Const.	0.623	4.25	0.786	Not Important

The result from the important index calculation for the fire safety criteria shows that passive fire protection, active fire protection and fire safety management are regarded as very important criteria for the fire safety evaluation of factory buildings. However, fire resistant construction is considered as not important for this study.

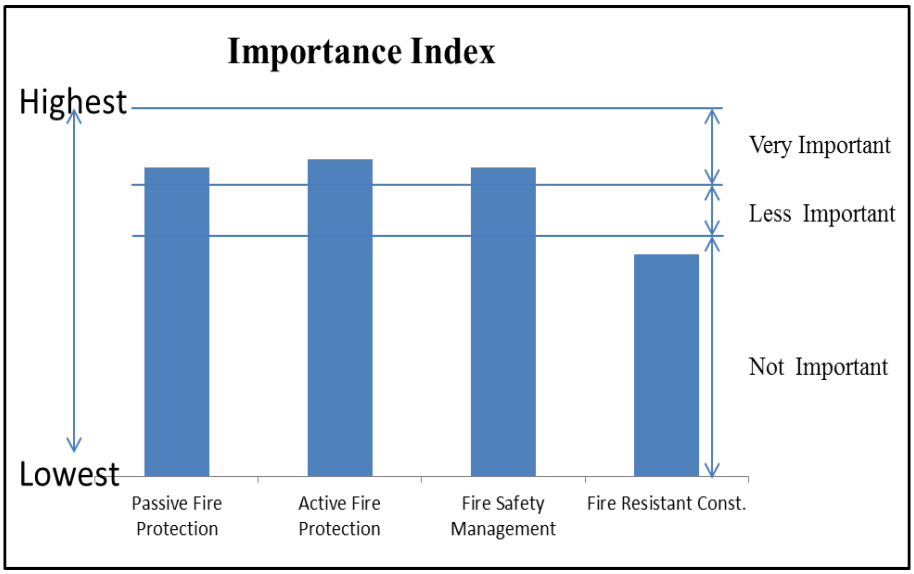

Figure 1: Level of importance of fire safety criteria

The result of the descriptive statistics for the overall frequency from all the respondents for fire safety attributes is represented in Table 4. The frequency calculation from Table 4 shows that all most all the attributes of fire safety received 'important" and "very important' unanimously from all the respondents. However, few attributes received 'not important' and 'less important'. This indicates that the majority of the attributes are regarded as important for the fire safety evaluation of factory buildings. Nevertheless, the result in Table 3 is not enough to establish the level of importance of each attribute. Hence the importance index calculation is required.

The result of the importance index calculation for all the attributes of fire safety criteria from all the respondents is represented in Table 5. The result of the importance index calculation shows that the majority of the attributes of fire safety criteria received 'very important'. This indicates that they are suitable for the fire safety evaluation of factory buildings in Nigeria. However, very few of the attributes

received ‘not important’ indicating that they are not suitable for the evaluation of fire safety in factory buildings in Nigeria.

Table 4: Overall Statistics for frequency of importance (Fire Safety Attributes)

Fire Safety Criteria	Attributes	Not Important (%)	Less important (%)	Neutral (%)	Important (%)	Very important (%)	Total
(Passive Fire Protection)	Occupant load	1.90	1.90	9.20	43.0	44.0	100
	Width of exit route	2.00	1.80	5.8.0	50.9	39.5	100
	Maximum Travel distance	3.00	1.10	12.0	44.9	39.0	100
	Building orientation	20.0	13.2	20.5	29.0	17.3	100
	Exit signage	0.40	1.80	11.0	46.3	40.5	100
	Building height	30.1	20.1	17.7	21.2	10.90	100
	Corridor width	1.50	0.8	10.80	59.5	27.4	100
	Site accessibility	1.00	0.10	5.60	44.3	49.0	100
	Exit door	0.30	0.30	11.0	47.3	41.1	100
	Elevator	29.0	23.0	24.7	14.3	9.0	100
	No. of exit	0.10	0.20	9.60	55.0	35.1	100
(Active Fire Protection)	Fire alarm	1.20	2.20	13.0	46.6	37.0	100
	Fire hydrant	1.20	0.20	5.00	49.9	43.7	100
	Auto. Fire detection system	1.30	2.10	3.60	50.5	42.5	100
	Automatic sprinkler	2.20	1.10	12.9	46.0	37.8	100
	Hose reel	3.20	1.10	2.70	49.0	44.0	100
	Emergency lighting	2.10	1.30	4.10	50.0	42.5	100
	Smoke stop door	25.0	27.0	21.7	17.3	9.00	100
	Portable extinguishers	1.30	1.00	11.4	59.3	27.0	100
(Fire Safety Management)	Fire safety inspection	1.10	0.00	5.00	42.9	51.0	100
	Fire safety plan	0.00	3.60	10.0	45.3	41.1	100
	Fire drill	1.10	1.00	4.00	43.9	50.0	100
	Maint. of exit routes	0.10	0.10	9.10	65.7	25.0	100
	Doors on roof top	28.0	24.0	25.7	13.3	9.00	100
	Smoking	38.0	14.0	15.7	23.0	9.30	100
	Fire safety evacu. plan	1.00	0.10	9.60	50.3	39.0	100
	House keeping	0.30	1.30	21.0	37.3	40.1	100
	Staff training	0.30	0.20	7.80	43.0	48.7	100

Table 5: Importance Index for Fire Safety Attributes

Fire Safety Criteria	Attributes	Importance Index	Mean	Standard Deviation	Level of importance
Passive Fire Protection	Occupant load	0.855	4.04	0.311	Very Important
	Width of exit route	0.878	4.23	0.668	Very Important
	Maximum Travel distance	0.865	4.24	0.672	Very Important
	Building orientation	0.613	4.15	0.788	Not Important
	Exit signage	0.855	4.25	0.311	Very Important
	Building height	0.523	4.23	0.886	Not Important
	Corridor width	0.885	4.15	0.311	Very Important
	Site accessibility	0.887	4.24	0.676	Very Important
	Exit door	0.876	4.15	0.652	Very Important
	Elevator	0.613	4.23	0.886	Not Important
	No. of exit	0.885	4.25	0.311	Very Important
Active Fire Protection	Fire alarm	0.886	4.26	0.668	Very Important
	Fire hydrant	0.876	4.25	0.652	Very Important
	Auto. Fire detection system	0.875	4.25	0.311	Very Important
	Automatic sprinkler	0.877	4.21	0.668	Very Important
	Hose reel	0.878	4.25	0.682	Very Important
	Emergency lighting	0.887	4.22	0.682	Very Important
	Smoke stop door	0.613	4.20	0.886	Not Important
	Portable extinguishers	0.88	4.15	0.668	Very Important
Fire Safety Management	Fire safety inspection	0.876	4.25	0.652	Very Important
	Fire safety plan	0.886	4.22	0.652	Very Important
	Fire drill	0.613	4.15	0.788	Not Important
	Maint. of exit routes	0.887	4.35	0.652	Very Important
	Doors on roof top	0.625	4.25	0.788	Not Important
	Smoking	0.613	4.15	0.788	Not Important
	Fire safety evacu. plan	0.888	4.24	0.688	Very Important
	House keeping	0.868	4.25	0.652	Very Important
	Staff training	0.877	4.24	0.652	Very Important

4. Findings and Conclusion

Identification and selection of the criteria and attributes of fire safety are essential for the assessment of fire safety level in factory buildings. Although many studies have been conducted in different occupancies to determine the level of fire safety. However, the assessment criteria and attributes may differ from one another. Therefore, the findings show that three out of four criteria were selected as the best suited for this study. While 20 attributes out of 28 of the three different criteria were also selected. This suggests the importance of involving experts in the selection of fire safety criteria and attributes as it combines different opinion to achieve one goal. This also indicates that not all the criteria and attributes used in on building occupancy will be suitable for another However, the selection of the criteria and attributes are based on the experts' opinion which may be influenced by their training and background. This is the reason why selection and weightage of fire safety criteria and attributes in one country may differ from another. Table 5 summarises the criteria and attributes selection including their weightage

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A Conceptual Review of Factors Influencing Succession in Construction of Small and Medium-Sized Construction Firms in Nigeria

Aliyu Muhammad Jungudo[1], Nuruddeen Usman[2], Aliyu Ahmad Aliyu[3] and Abdullahi Nafiu Zadawa[4]

Abstract

Several construction companies continue to fail soon after the demise/exit of their founder or owner manager. Founders/owner managers are reluctant to give up control of their business for the next generation and thus, prefer to live with uncertainty. Successfully transferring the control of firm or business to the successor is very vital for sustainable economic growth and knowledge transfer. This is a conceptual review paper aimed at identifying factors influencing succession in construction of small and medium-sized construction firms in Nigeria. A thorough literature exploration was conducted on the existing current available literature. Findings revealed that the major factors that influence succession in construction of small and medium-sized construction firms in Nigeria include; clear company goals/purpose, demarcating personal assets from company assets, having in-place strategy to create leaders, develop and implement a written succession plan, good communication link between stakeholders, mentoring (employee training). Founders/owner and managers of small-sized construction firms should give priority the identified influencing factors to ensure proper succession planning and implementation processes are put in place so as to ensure successful transfer of ownership of the business to the next generation.

Keywords: Nigeria, succession, small and medium-sized construction firms.

1. The Study Background

Majority of Construction Companies are family owned or have small pools of potential successors, which make them more susceptible to the negative impacts that occur with poor planning for succession (Anthony, 2012). A family business is here referred to as an organization in which members of a family (be it monogamous, polygamous or extended households) holds controlling shares and which does not separate ownership from management (Ogundele et al, 2012). Because of its prominent influence on the economic infrastructures of the community, the family business as a household system offers the advantage of sustainable economic growth and dependable wealth creation (Rasoul & Marjan, 2014). Additionally, (Kurato & Hodget, 2004 as cited in Rasoul *et. al*., 2014) maintains that, the family business not only has an inherent potential for creating new employments, but also it plays a dominant role in the

[1&2]Building Technology Department, Faculty of Environmental Technology Abubakar Tafawa Balewa University PMB 0248 Bauchi, Nigeria.
[3]Estate Management and Valuation Department, Faculty of Environmental Technology Abubakar Tafawa Balewa University PMB 0248 Bauchi, Nigeria.
[4]Quantity Surveying Department, School of Environmental Technology Abubakar Tafawa Balewa University PMB 0248 Bauchi, Nigeria; nafiuzadawa@gmail.com nzabdullahi@atbu.edu.ng

gross national product of the countries which have ardently been investing on family-based micro entrepreneurship in recent years. It is interesting to note that, more than 95% of all German companies are family owned and they are generating more than 41% of the German Gross Domestics Product (GDP). Because of its prominent influence on the economic infrastructures of the community, the family business as a household system offers the advantage of a sustainable economic growth and dependable wealth creation (Rasoul and Marjan, 2014). A family business in Nigeria, as in other parts of the world come in virtually all sizes (small, medium and large) and exist in virtually all sectors of the economy (Ogundele et al, 2012). Successfully transferring a businesses to the next generation requires careful management of complex problems psychologically and emotionally. Planning for the transition cannot start too early, and the whole process needs to be very carefully managed. But many entrepreneurs are reluctant to face up to the thought of giving up control, and succession is one of the main causes of divisions and tensions that can damage family life and undermine business performance (Ogundele *et al*, 2012).

2. The Research Problem

As organizations grow and expand and are influenced by the changes in the business environment, the need for strategic direction is very critical for their survival. It therefore becomes imperative to have an in-place strategy to groom and create new leaders. "The factor that empowers the people and ultimately determines which organizations succeed or fail is the leadership of those organizations" (Bennis, 1984). Planning for succession has been recognized for minimizing the impacts that come from leadership transition in companies (Behn *et al*., 2005; Perrenoud, 2012).

Human beings are but mortals and few people find it easy to come to terms with this fact. This is often a particular problem for entrepreneurs, whose success is usually driven by a powerful ego and the firm conviction that they control their own destinies (Peter Leach & Partners, 2008). Nigerian businessmen and entrepreneurs hardly voluntarily retire; they usually die in active service or are forced to retire by a health catastrophe (Ogundele *et.al*., 2012). Majority of construction companies are family owned or have small pool of potential successors which make them more susceptible to the negative impacts that occur with poor planning for succession (Anthony, 2012). The socio-cultural influences of the owner manager together with that of his family creates multidimensional problems for a successful succession of a construction company (Ogundele *et.al*, 2012).

Leadership succession of a company business threatens the initiator with multifaceted set of options. Each option is distinctive and carries its own set of advantage, opportunities and threats. Doing nothing is the least logical, the most costly, and the most destructive of all the options yet; it is by far the most popular (Milan, 2013). While majority of family business owners would like to see their business transferred to the next generation, it is estimated that 70% will not survive into the 2nd generation and 90% will not make it to the 3rd generation (Walsh, 2011).

3. Factors Influencing Succession in Construction firms

The factors influencing succession in construction firms is the main independent variable of the current study. From the existing available literature on succession planning, the following factors as discussed were identified as the major factors influencing succession in construction firms.

3.1 Clear company goals/purpose

The goal of organizational survival underpins all other goals and also argues that, paying attention to this goal contributes to the satisfaction and execution of other organizational goals which suggests that, every organization should see survival as an absolute prerequisite for its serving any interest whatsoever (Gross,

1968; Adewale, 2011). According to Anzilotti (2017), Organizational goals inform employees where the organization is heading, how it plans to get there and when employees need to make difficult decisions, they can refer to the organization's goals for guidance. Anzilotti further argues that goals promote planning to determine how goals will be achieved and employees often set goals in order to satisfy a need; therefore, goals can be motivational and increase performance.

3.2 Demarcating personal assets from company assets

According to Forbes (2017), many successful entrepreneurs, it can be difficult to tell where their business ends and their personal lives begin. As the business of the firm grows and evolves, entrepreneurs become often excited in running the business by investing and re-investing their wealth in the firm without an exit strategy. Most entrepreneurs are fully aware of the need to ensure continuity in running their firms as well as the need for succession plans. For cases in which there will be a change in control for the company after the founder retires, business owners should be clear on how their own family's desires will impact long-term plans for the company (Forbes, 2017). Forbes asserts that, some family members may simply want cash while others may want to stay more closely involved in running the affairs of the firm. Personal estate planning conversations can be the ideal time to review key issues such as how long a successor owner will pay out the founder's heirs; how a planned change of control will be funded; and how the entrepreneur's heirs will handle any resulting tax issues (Forbes, 2017).

3.3 Having in-place strategy to create leaders

Organizations depend upon capable leadership to order to survive through difficult times and unprecedented changes. Yet, there is ample evidence in the news and in recent research reports that even some of the best and most venerable organizations are failing to adapt to change, implement their strategic plans successfully or prepare for a more uncertain future (Pasmore & Lafferty, 2009). Managing change and ambiguity requires strategic leaders who not only provide a sense of direction, but who can also build ownership and alignment within their workgroups to implement change (Fulmer, *et. al*., 2009). As the new economic giants of China and India rise to trump renowned companies, surveys of CEOs show that they believe the one factor that will determine their fate is the quality of their leadership talent (Pasmore, & Lafferty, 2009).

3.4 Develop and implement a written succession plan

A 2004 survey of 711 human resource managers found that although 80 percent of the managers believed that succession planning was critical, less than half of their companies had a succession plan in progress (Taylor & McGraw, 2004; Perrenoud 2012). Hadelman et al (2005) as cited in Perrenoud (2012) stated "Succession Plans are like fingerprints - no two are alike, and they leave an impression on everything they touch. Organizations should have their peculiar succession plan in place and stipulate clearly how such plan will be executed or implemented (Mutunga, 2013).

The level of sophistication of succession planning and management varies, implementation of a succession planning and management program follows four phases: initial, assessment, development and evaluation (Kim, 2006). According to Kim:

(i) Initial phase:

In this phase, organizations review the previous model and procedure for their own succession planning and management programs. If they already have one, they set the policies and procedures for implementing the program. The commitment of CEOs and senior leaders involved in succession planning and management program is one of the key factors for establishing an appropriate program.

(ii) Assessment Phase:

The assessment phase refers to the assessment of individuals who are nominated or selected as a candidate for a succession planning and management program or who are in the talent pool.

(iii) Development phase:

The development phase refers to all developmental activities for candidates in succession planning programs that have been designed to close developmental gaps identified through assessment.

(iv) Evaluation phase:

The evaluation phase refers to the evaluation of succession planning and management. Predictably, the refinement level of evaluation varies along with the sophistication level of the program and its goals in participating organizations. The critical drivers for implementing succession planning include: improving the company's bench strength in key positions, identifying high potentials early and devising strategies to retain talent, difficulty in finding qualified candidates outside the organization and unexpected loss of key leaders (Aberdeen Group, 2006; Krauss, 2007). Organizations that do not take advantage of implementing a well-structured succession plan, will be ill prepared to address complex business challenges and will lack the qualified workforce needed to support growth (Krauss, 2007).

3.5 Good communication link between stakeholders

There are inadequate communication channels available in businesses (Mutunga, 2013). Communication and time are two of the most important elements in a successful succession effort and that you, your successor, your employees and your customers need special attention during the transition period (Medley, 2007). A good communication channel should be put in place to aid in flow of information to avoid conflicts (Mutunga, 2013). Communication plan including messaging to clients and stakeholders will need to be prepared and implemented, to communicate clearly the retirement of the Executive Director and a planned succession process which will help to manage expectations and minimize any negative impact on the organization (Zaret, 2012).

3.6 Mentoring (employee training)

In succession planning, you're targeting individual talent to take on increasingly more responsible positions and eventually assume a major position within your organization **(**Management Mentors, 2015). Mentoring also ensures that the company’s expertise from experienced employees will not be lost once they retire or leave the company but will be retained by having been shared by those who are poised to take their place **(**Management Mentors, 2015). Mentoring therefore becomes and ideal strategy for enriching your succession planning program. When organizations make mentoring and succession planning part of the fabric of their business, they gain confidence. This only comes when a company knows that its next generation of leaders has been identified and is receiving continual development. Here you will find significant opportunities to identify areas of development.

4. Conceptual Framework

Figure 1.0 below presents the conceptual framework of the study showing the independent and the dependent components of the current study. The study scope is limited to one major idependent variables namely; factors influencing succession in construction firms.

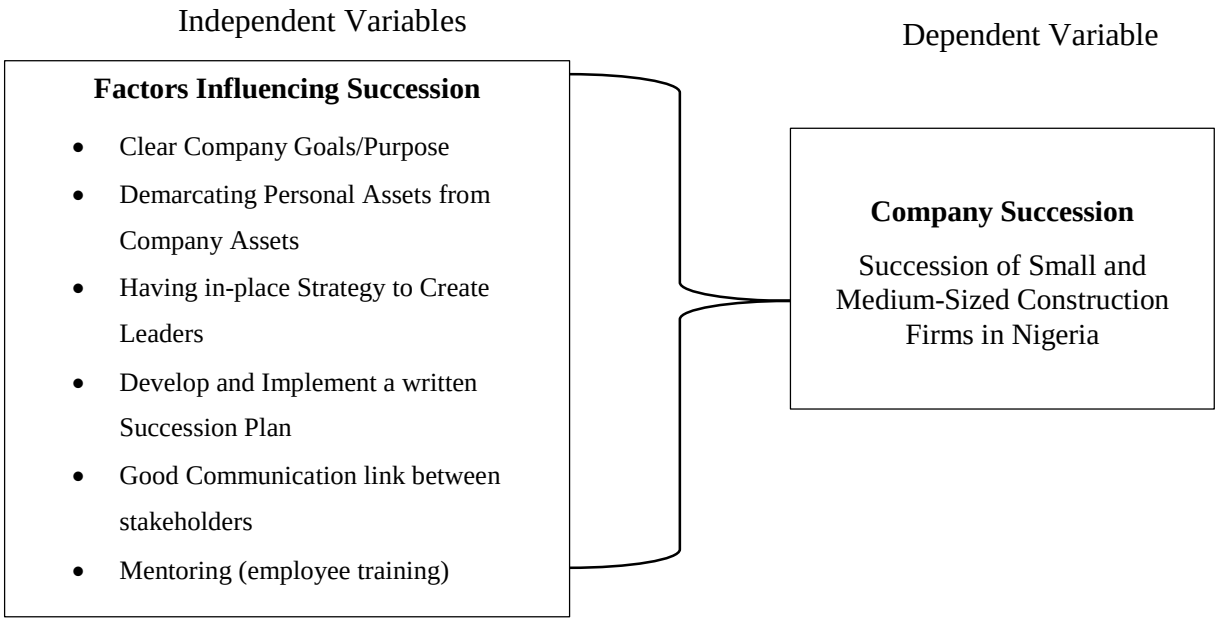

Figure 1: Conceptual Framework of the Study

5. Conclusion & Recommendation

This is a conceptual review paper aimed at identifying factors influencing succession in construction of small and medium-sized construction firms in Nigeria. A thorough literature exploration was conducted on the existing current available literature. Findings revealed that the major factors that influence succession in construction of small and medium-sized construction firms in Nigeria include; clear company goals/purpose, demarcating personal assets from company assets, having in-place strategy to create leaders, develop and implement a written succession plan, good communication link between stakeholders, mentoring (employee training). Founders/owner and managers of small-sized construction firms should give priority the identified influencing factors to ensure proper succession planning and implementation processes are put in place so as to ensure successful transfer of ownership of the business to the next generation.

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Factors Constraining the Utilisation of Risk Management Strategies in the Execution of Public Construction Projects in North-East Nigeria

Mohammad Sani Abubakar[1], Kunya Sani Usman[2], Nuruddeen Usman[2] and Auwalu Sani Shehu[1]

Abstract

Construction projects in Nigeria are characterised with risks emanating from delays and accompanying cost overruns. The aim of the study was to identify and assess factors constraining the utilisation of risk management strategies in the execution of public construction project in North-East Nigeria. Data was collected with the aid of a well-structured questionnaire administered to project parties and stakeholders who participated in three identified projects in the North-East. These selected parties include contractors and professional consultants as the targeted respondents of the research. Data collected were analysed using the severity index. Findings revealed political involvement, selection of inexperienced contractors and lack of coordinated public sector strategy as the most severe factors constraining the utilisation of risk management strategies. The study recommended that: formulation of laws to prevent negative political meddling in construction projects; selection of experienced, risk-informed contractors; and comprehensive risk assessment and planning on all public construction projects.

Keywords: Public projects, risk management, strategies, Nigeria.

1. Introduction

Each project is unique and has its main objectives outlined by the Client and project circumstances. Among the most common objectives of any successful project are deliveries at the right time, within authorized cost and meeting the envisaged quality standards (Bashir, 2012). According to Klemetti (2006), a risk is an uncertain event or condition that results from the network form of work, having an impact that contradicts expectations. Consequently, risk management may be described as "a systematic way of looking at areas of risk and consciously determining how each should be treated. Although risk analysis and management is important to the activities of the construction industry, little is known regarding the industry response, and in particular the techniques employed for risk analysis and management"(Alufohai, 2012). The implementation of risk management techniques in the life cycle of construction projects in Nigeria have always fallen short of required standards. This is evident from frequent delays and cost overruns that characterize each project. In most cases, public projects are not completed within the agreed time frame. Similarly, initial contract sums are sometimes doubled by the end of projects as a result of one risk factor or the other. (Alufohai, 2012). The aim of this paper is to

[1&4]Quantity Surveying Department, Faculty of Environmental Technology Abubakar Tafawa Balewa University PMB 0248 Bauchi, Nigeria. mohdsabubakar@gmail.com
[2&3]Building Technology Department, Faculty of Environmental Technology Abubakar Tafawa Balewa University PMB 0248 Bauchi, Nigeria.

appraise the factors constraining the utilization of risk management strategies in the development of public construction projects in North-East with a view to understanding the level of its application for successful project delivery.

2. Literature Review

Construction projects are characterized as very complex, always unique projects, where risks raise from a number of different sources. These projects are characterized by a continuous decision making due to numerous sources of risk and uncertainty, many of which are not under the direct control of project participants (Baloi and Price, 2003). Construction projects have a bad reputation of failing to meet the deadlines and cost targets (Mills, 2001). That's why identifying risk sources is extremely important, since it is not necessarily possible to identify single risks. Due to the nature of the construction sector, Risk Management is a very important process here. It is most widely used in those projects which include high level of uncertainty. These types of risk investments are characterized by more formal planning, monitor and control processes. The easiest way to identify risk is to analyze and draw a conclusion from projects which failed in the past. To make sure that the project objectives are met, the portfolio of risks associated with all actors across the project life cycle (PLC) should be considered (Cleland and Gareis, 2006). In the early stages of the project where planning and contracting of work together with the preliminary capital budget are being drawn, risk management procedures should be initiated. In later stages, Risk Management applied systemically, helps to control those critical elements which can negatively impact project performance. In other words, to keep track of previously identified threats, will result in early warnings to the project manager if any of the objectives, time, cost or quality, are not being met (Tummala and Burchett, 1999). Quite a number of risks have been identified in the construction industry and which are present in each construction project regardless of its size and scope. Changes in design and scope along with time frames for project completion are the most common risks for the construction sector. The further in the process, changes in scope or design are implemented, the more additional resources, time and cost, those changes require. Project completion ahead of time may be as troublesome as delays in a schedule. Too quick completion may be a result of insufficient planning or design problems which in fact shorten the completion time but on the other hand lead to a low quality of final product and increased overall cost. Being behind schedule generates greater costs for both investors and contractors due to non-compliance with contracted works (Gould and Joyce, 2002). And thus it is important to keep a balance in the concept of time-cost-quality tradeoff, which more widely is becoming an important issue for the construction sector (Zhang and Xing, 2010). Depending on the project scope, types of risks may differ among investments.

Risk classification is a significant step in the risk management process, as it attempts to structure the diverse risks affecting a construction project. In order to manage risks effectively, many approaches have been suggested in the literature for classifying risks. Perry and Hayes (1985) presented a list of factors extracted from several sources which were divided in terms of risks retainable by contractors, consultants and clients. Combining the holistic approach of general systems theory with the discipline of a work breakdown structure as a framework, Chapman (2001) grouped risks into four subsets: environment, industry, client and project. Similarly, Shen (2001) categorized the identified risks into six groups in accordance with the nature of the risks, i.e. financial, legal, management, market, policy and political, as well as technical risks. In essence, many approches can be used to classify the risks associated with construction projects and the rationale for choosing a method must service the purpose of the research. According to Klemetti (2006), Risks are divided into pure risks (e.g. hazards and weather conditions), financial risks (e.g. cash flow or credit risk), business risks (almost anything that can happen in a project) and political risks, which refer to the certain political environment and risks that are caused mostly by extreme conditions, such as, among others, war. Risks in the project network can relate to any one of this

list's categories. Project actors can cause hazards to one another because of inexperience, lateness of their products, delivery failure or unmade payments (bankruptcy) or new government laws either in favour or disfavour of the project.

3. Research Methodology

A quantitative approach was adopted in undertaking this study. Three (3) Public projects in the North-Eastern geo-political zone of Nigeria were taken as case studies The information obtained from the review of existing literature was used to design and develop a well-structured questionnaire which was administered to respondents (clients, constrictors and consultants), so as to obtain refined facts on the research topic. The sample size was determined through statistical methods. Questionnaires was distributed and retrieved personally for each case study.
Data obtained in the questionnaire was analysed using the sererity index (SI). The Sererity Index (SI) as defined by Kaming, et.al (1998) is computer as:

$$SI = \frac{\sum IF}{N}$$

Where I = Importance of Factor
F = Frequency of Occurrence
N = Number of cases

The use of likert scales was employed in analysing the questionnaire, where;
Extremely Severe (ES) = 5, Highly Severe (HS) = 4, Severe (S) = 3, Fairly Sever (FS) = 2 and Not Severe (NS) =1 was used to ascertain factor(s) constraining the utilisation of risk management strategies on construction projects.

4. Results

The questionnaires retrieved from projects A, B and C were analysed with the aid of tables, charts and statistical tools as comprehensively described in the heading above. Respondents were asked to rate a list of identified factors constraining utilization of risk management strategies in terms of severity of each factor the factors are;

- Inadequate knowledge of Risk Management Systems
- Lack of cooperation between stakeholder
- Inadequate project organization structure
- Incompetence of project management team
- Client's decision
- Complex decision making processes
- Inappropriate feasibility study
- Lack of coordinated public sector strategies
- Differences in interests and expectation
- Vested interests
- Selection of inexperienced contractors
- Political involvement
- Forecasting Error
- Absence of clearly defined roles for team member
- Due diligence in supervising risk management activities

4.1 Project A

A total number of fifty (50) questionnaires were distributed for this project. Thirty Eight (38), repenting 68% of the total number were retrieved. Table 1 shows the rating frequency for factors constraining utilization of risk management strategies (Project A).

Table 1: Rating Frequency

S/N	Factors		ES	HS	S	FS	NS
	Knowledge of Risk Management Systems		11	12	6	6	3
	Lack of cooperation between stakeholder		1	15	18	4	-
	Inadequate project organization structure		8	13	12	5	-
	Incompetence of project management team		15	10	8	5	-
	Client's decision		7	18	10	2	1
	Complex decision making processes		5	8	8	12	5
	Inappropriate feasibility study		9	9	12	5	3
	Lack of coordinated public sector strategies		10	9	11	4	4
	Differences in interests and expectation		6	14	13	4	1
	Vested interests		7	10	11	8	2
	Selection of inexperienced contractors		11	17	8	2	-
	Political involvement		16	12	6	4	-
	Forecasting Error		14	10	9	5	-
	Absence of clearly defined roles for team member		12	11	9	6	-
	Due diligence in supervising risk management activities	10	10	10	8	-	

Source: Field survey, 2018

Table 2: Severity Ranking

S/No	Factors	Severity Ranking
1.	Political Involvement	4.053
2.	Selection of inexperienced contract	3.973
3.	Incompetence of project management team	3.922
4.	Forecasting Error	3.869
5.	Absence of clearly defined role for team members	3.762
6.	Client's decision	3.736
7.	Inadequate project organisation structure	3.631
8.	Due diligence in supervising risk management activities	3.579
9.	Inadequate Knowledge of RM Systems	3.576
10.	Differences in interests and expectation	3.526
11.	Lack of coordinated public sector strategies	3.446
12.	Inappropriate feasibility study	3.420
13.	Lack of cooperation between stakeholders	3.343
14.	Vested interests	3.316
15.	Complex decision making processes	2.896

4.2 Project B

A total number of fifty (50) questionnaires were distributed for this project. Thirty seven (37) representing 66% of the total number were re retrieved. Table 3 shows the rating frequency for factors constraining utilization of risk management strategies (Project B). Table 4 shows the Severity ranking for factors constraining utilization of risk management strategies (Project B).

Table 3: Rating Frequency

S/N	Factors	ES	HS	S	FS	NS	
	Inadequate knowledge of Risk Management Systems		9	15	8	5	-
	Lack of cooperation between stakeholder		7	10	12	7	1
	Inadequate project organization structure		10	8	12	7	-
	Incompetence of project management team		10	12	8	7	-
	Client's decision		6	9	10	7	5
	Complex decision making processes		11	9	6	8	3
	Inappropriate feasibility study		8	9	10	6	4
	Lack of coordinated public sector strategies		15	11	-	11	-
	Differences in interests and expectation		-	7	18	12	-
	Vested interests		4	3	14	16	-
	Selection of inexperienced contractors		12	9	8	8	-
	Political involvement		13	10	9	5	-
	Forecasting Error		12	9	9	5	2
	Absence of clearly defined roles for team member		11	10	10	6	-
	Due diligence in supervising risk management activities		12	8	7	9	1

Source: Field survey, 2018

Table 4: Severity Ranking

S/No	Factors	Severity Ranking
	Political involvement	3.838
	Lack of coordinated public sector strategies	3.811
	Inadequate knowledge of Risk Management Systems	3.757
	Absence of clearly defined roles for team member	3.702
	Selection of inexperienced contractors	3.676
	Incompetence of project management team	3.675
	Forecasting Error	3.649
	Due diligence in supervising risk management activities	3.568
	Inadequate project organization structure	3.567
	Complex decision making processes	3.458
	Lack of cooperation between Stakeholder	3.405
	Inappropriate feasibility study	3.297
	Client's decision	3.108
	Differences in interests and expectation	2.865
	Vested interests	2.864

4.3 Project C

A total number of fifty (50) questionnaires were distributed for this project. Twenty eight (28) representing 56% of the total number were re retrieved. The table below shows the rating frequency for factors constraining utilization of risk management strategies (Project C). The Table below shows the Severity ranking for factors constraining utilization of risk management strategies (Project C).

Table 5: Rating Frequency

S/N	Factors	ES	HS	S	FS	NS
	Inadequate knowledge of Risk Management Systems	6	11	7	4	-
	Lack of cooperation between stakeholder	3	9	10	6	-
	Inadequate project organization structure	7	8	7	6	-
	Incompetence of project management team	9	7	8	4	-
	Client's decision	5	7	9	4	3
	Complex decision making processes	7	9	10	2	-
	Inappropriate feasibility study	11	10	7	-	-
	Lack of coordinated public sector strategies	12	9	7	-	-
	Differences in interests and expectation	8	4	14	2	-
	Vested interests	2	5	17	4	-
	Selection of inexperienced contractors	9	8	10	1	-
	Political involvement	11	10	7	-	-
	Forecasting Error	3	9	9	4	3
	Absence of clearly defined roles for team member	8	11	7	1	-
	Due diligence in supervising risk management activities	10	12	4	2	-

Source: Field survey, 2018

Table 6: Severity Ranking

S/No	Factors	Severity Ranking
	Lack of coordinated public sector strategies	4.179
	Political involvement	4.178
	Inappropriate feasibility study	4.143
	Due diligence in supervising risk management activities	4.072
	Selection of inexperienced contractors	3.892
	Absence of clearly defined roles for team member	3.821
	Incompetence of project management team	3.750
	Complex decision making processes	3.750
	Inadequate knowledge of Risk Management Systems	3.678
	Differences in interests and expectation	3.643
	Inadequate project organization structure	3.572
	Lack of cooperation between Stakeholder	3.322
	Client's decision	3.249
	Forecasting Error	3.179
	Vested interests	3.178

4.4 Combined agreement analysis

Responses from the three case studies were compared to ascertain the severity of each factor with a view to achieving the aim of the study. The Rank Agreement Factor (RAF) and the percentage Rank Agreement factor (PRAF) were used to compare the ranking made by stakeholders from each project. This is given as

$$RAF = \sum \frac{ranking\ order\ of\ group}{total\ number\ of\ factors}$$

And

$$\text{PRAF} = \frac{RAF_{max} - RAF_{considered}}{RAF_{max}} \ X\ 100$$

Where:

PRAF = Percentage Rank Agreement Factor

RAF_{max} = Maximum Rank Agreement Factor

$RAF_{considered}$ = Rank Agreement factor, for factor considered

TABLE 7: COMBINED AGREEMENT RANKING FOR FACTORS CONSTRAINING THE UTILIZATION OF RISK MANAGEMENT STRATEGIES IN PUBLIC CONSTRUCTION PROJECTS

S/N	Factors	Project A	Project B	Project C	Sum of Ranking	(RAF)	(PRAF)	Rank
1.	Political involvement	1	1	2	4	00.27	90.78	1
2.	Selection of inexperienced contractor	2	5	5	12	00.80	72.69	2
3.	Lack of coordinated public sector strategy	11	2	1	14	00.93	68.26	3
4.	Absence of clearly defined refers for team members	5	4	6	15	01.00	65.87	4
5.	Incompetence of project management team	3	6	7	36	01.07	63.48	5
6.	Due diligence in supervising risk management activities	8	8	4	20	01.33	54.61	6
7.	Inadequate knowledge of risk management system	9	3	9	21	01.40	52.61	7
8.	Forecasting error	4	7	14	25	01.67	52.22	8
9.	Inadequate project organization structure	7	9	11	27	01.80	43.00	9
10.	Inappropriate feasibility study	12	12	3	27	01.80	38.57	10
11. .	Client's decision	6	13	13	32	02.13	27.30	11
12.	Complex decision making processes	15	10	8	33	02.20	24.91	12
13.	Difference in interest and expectation	10	14	10	34	02.27	22.53	13
14.	Lack of cooperation between stakeholders	13	11	12	36	02.40	18.09	14
15.	Vested interests	14	15	15	44	02.93	00.00	14

5. Discussion of Findings

Analysis of retrieved data from Project A revealed political involvement with 4.053 severity raking as the most severe factor constraining the effective utilization of risks management strategies while complex decision making processes' with 2.896 severity ranking was ranked the least severe factor. Analysis of retrieved data from Project B revealed 'political involvement' with 3.838 severity ranking as the most severe factor constraining the effective utilization of risk management strategies while 'vested interest' with 2.864 severity ranking as the least severe factor. Analysis of retrieved data from Project C revealed 'lack of coordinated public sector strategies' with 4.179 severity ranking as the most severe factor constraining the effective utilization for risk management strategies while 'vested interest' with 3.178 severity ranking as the least severe factor. The Rank Agreement Factor and Percentage Rank Agreement Factor were used to carry out a combined analysis on factors from the three case studies. Political involvement, selection of inexperienced contractors, and lack of coordinated public sector strategy were ranked first, second and third most severe factors constraining utilization of risk management strategies in public construction projects with 90.78%, 72.69% and 68.26% respectively. On the other hand; Differences in interest/expectations, lack of cooperation between stakeholders and vested interests were ranked 13th, 14th and 15th most severe factors with 22.53%, 18.09% and 00.00% respectively.

6. Conclusion and Recommendations

6.1 Conclusion

The study set out to ascertain the factors constraining the effective utilization of risk management strategies, the mitigating strategies employed and the benefits accruable as a result. Political involvement (90.782) selection of inexperienced contractors (72.69%) and lack of coordinated public sector strategy (68.26%) were ranked the 1st, 2nd and 3rd most severe factors constraining the effective utilization of risk management systems. Hence, the study concluded that; The most severe factors constraining the effective utilization of risk management systems in the execution of public construction projects in north-eastern Nigeria are; political involvement, selection of inexperienced contractors and lack of coordinated public sector strategy.

6.2 Recommendation

i. The research revealed that quite a number of project participants are aware of the various risk management strategies but lack the requisite knowledge as to their application. Hence, it is the recommendation of this research that for all capital intensive, risk-prone projects, a training for all project management team and project operatives be carried out to sensitize the workforce on the methods and processes of applying these risk management strategies.
ii. Government should introduce laws that prevent politicians from meddling negatively in the affairs of construction projects. Once a project commences, the professionals engaged to see it through should be given autonomy.
iii. If risks in construction projects are to be minimised, then the selection of experienced, risk-informed contractors is of paramount importance. Contractor selection should be strictly based on merit not affiliations.

iv. The government should set-up a framework via which risk management strategies are adopted at each phase of the project life cycle.

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Ethics of Sustainability: An Exploratory Study

Sambo Zulu[1]

Abstract

The impact of the ethical dimension of sustainability on individual and corporate decisions, especially in the retail and agricultural sectors has been demonstrated. However, the ethical dimension in sustainability decision making in the construction industry has received limited attention. The aim of the study was to evaluate students understanding of the ethics of sustainability and to assess the extent to which the ethical dimension could be taken as a key influencing factor in the consideration of sustainability choices. The paper reports of a pilot study designed to test the application of the ethics focused sustainability framework to explore the impact of ethics on sustainability decisions. The framework was tested on final year students undertaking various built environment subjects at a United Kingdom university. Data was collected using a questionnaire survey. The findings from this data are that ethical contents closely related to the need for compliance to legal and industry norms would take precedence over consideration of sustainability-friendly alternative products and services that would impact on cost and profit. The exploratory study demonstrated application of the framework. However, there is potential for further development and validation of the framework used in the study.

Keywords: Ethics, sustainability education, triple bottom line.

1. Introduction

The construction industry is seen to be a key player in the sustainable development agenda, as its products and processes have a significant impact on the environment. While initiatives have been proposed and continue to be developed to influence sustainability of the industry, there is need to explore further measures that can influence sustainability attitudes and actions. Industries such as the retail, automotive and agriculture sector have demonstrated that ethical considerations can be a significant influencing factor for sustainable-motivated consumer behaviour.

Education and training has also been argued to be an important driver of the sustainability agenda. As such, universities should be considered as key in delivering the sustainability agenda as they are seen to influence perceptions of the leaders of tomorrow (Kalpana *et al.,* 2013). As education influences decision makers of tomorrow, the ethical context of sustainability has been considered as a potential framework for the discussion of sustainability focused decision making in curricula. Ethics education can be seen to be a significant foundation stone for professionals as they embark on their career (Adnand *et al.,* 2012). While there are arguments regarding the significance of the influence of ethics training in influencing behaviour, there is a general agreement that exposure to ethics training can change trainees' perceptions

[1] Leeds Beckett University, School of the Built Environment & Engineering, Leeds, United Kingdom; s.zulu@leedsbeckett.ac.uk

towards ethical dilemmas (Zulu, 2018). It is thus considered, in this paper, that ethics based sustainability training could improve sustainability decision making in the construction industry. This study contributes to this debate and sort to explore the application of an ethics focused sustainability decision framework.

2. Sustainability in Context

Sustainability has become an issue at the forefront of discussion in many sectors of society. This is evident from the extent to which policy initiatives have been developed by governments, sustainability measures have been advocated/developed; and the huge strides in development of sustainability technologies. It can be argued that one of the catalyst for the need to take seriously sustainable development was the World Commission on Environment and development's (or Brudtland's) report which defined sustainable development as 'development that meets the needs of the current generation without compromising the ability of future generations to meet their own needs' (WCED 1987). It is generally accepted that this definition is broad and encompasses three strands, namely environmental, social and economic sustainability (Zwinkle *et al.*, 2014; Zeegers and Clark, 2014). This triple bottom line [TBL] of sustainability: environmental, economic and social (Hall, 2011) is a criteria that organisations can use to measure their sustainability performance. In distinguishing between the three, Hall (2011) considered that environmental sustainability reflect measures of natural resources and potential influences to its viability. Here issues such as air and water quality, energy consumption, waster, land use are considered; economic sustainability focuses on the flow of money. Issues such as income and expenditure, business climate factors, employment and revenue are considered; and that social sustainability reflects community or regional dimensions. Here issues such as education, equality, access to social services, health and safety, labour relations and poverty issues are considered. It is important therefore that any organisation sustainability strategy need to consider the trio. Renukappa *et al.*, (2012) citing Elkington (2001) argues that a more practical definition of sustainability principles focus on the TBL concept where organisations simultaneously consider their environmental, economic and social performance.

MacMahon and Bhamra (2015) suggests that the emphasis on sustainability, in the past, tended to be on environmental and economic sustainability and less on social sustainability as the former, environmental and economic sustainability, are tangible and can be quantified. Perhaps the humanness and difficulty in getting tangible outcomes (Opoku and Ahmed, 2014) or the unquantifiable nature of social sustainability measures such as health, equity, human rights etc. (MacMahon and Bhamra, 2015) makes it complex to apply measurement metrics to social sustainability. A review of literature suggests a number of studies that have examined perceptions and awareness of the TBL of sustainability. For example Osman and Shafiei (2015) examined the level of awareness and implementation of sustainable housing development and measured the level of awareness with respect to the TBL. Govindan *et al.*, (2013), Akadiri *et al.*, (2012), Hatchins and Sutherland (2008), Abduseinab and Arif (2013) and many others all considered the TBL in their studies.

2.1 Ethics of sustainability

Literature is awash with definitions of ethics. The general context however defines ethics in terms of what is right and wrong and also touches on issues of morality. Adnan (2012) viewed ethics as a system of moral principles, which impact on people's judgement of actions, whether such actions are wrong or right. Such a definition is useful to place the context of the ethics of sustainability. Thus, by implication,

ethics of sustainability can be construed as a system of moral principles which impact on peoples judgement when making sustainability related decisions and actions. Meijboom and Brom (2012) argued that the notion of sustainability as a moral ideal is relevant to understand the possible role ethics can play in sustainability discussions.

The roles of ethics in sustainability has therefore been demonstrated. For example, Schults *et al.,* (2005) studied the relationship between values, as ethics construct, and environmental concerns and consumer behaviour. Similarly, studies have looked at impact of consumer ethical behavior as a determinant of consumer behaviour. For example, studies in sectors such as food production, demonstrate that consumer can be active contributors to a sustainability by selecting food choices that are both healthy and produced respecting environmental and socially ethical standards (Ghvanidze *et al.,* 2016). Similarly, this behaviour is seen in consumption in the motor industry (Saleem *et al.,* 2018) and retail sector (Henninger and Singh, 2017). As such companies use ethical marketing to differentiate themselves- (Roy and Banerjee, 2018).

It is no wonder that the ethical context is advocated for in sustainability curriculum. Several studies have examined the importance of teaching ethics of sustsinability. For example, Biedenweg *et al.,* (2013), Tormo-Carbó (2018), El-Zein, *et al.,* (2008) and Byrne, (2012) argued for the need for an ethics-based contextualisation of sustainability curriculum.

2.2 Students sustainability perceptions

The role of the higher education sector in driving the sustainability agenda has been a subject of academic interest. This is particularly the case as universities are seen as training the leaders of tomorrow (Kalpana *et al.,* 2013). Others have argued for the need to incorporate and or develop models for incorporating sustainability in course curriculum (Ramirez, 2006). A review of literature suggests that the context of the universities- sustainability research has been varied. For example, Hanson-Rasmussen *et al.,* (2014) investigated the extent to which business students' perceptions of environmental sustainability had an impact on their job search attitudes. Dagiliute and Niaura (2014) examined the impact of students' undertaking a sustainability course on their sustainability perceptions. They concluded that students who took sustainability courses generally had a relatively high environmental consciousness after taking the course in comparison to pre-course enrolment. Similarly, Clark and Zeegers (2015) examined the impact of sustainability training on students' perception. They compared the pre and post training perceptions of students and concluded that, while the environ-centric perception of sustainability was still a predominant view, there was evidence to suggest that students who took sustainability training, become more holistic taking cognisance of the social, economic and environmental context of sustainability into consideration. Recognition is also made in literature of use of university sustainability programs as case studies in courses or case studies to test students' awareness of sustainability issues. For example Bantanaur *et al.,* (2015) and Emanuel and Adams (2011) used university sustainability initiatives as case studies to evaluate students understanding of sustainability.

An examination of students' knowledge on sustainability issues has also been examined extensively in literature. Most of these studies have tended to be cohort focused, year of study or country specific and. For example Nicolaou and Conlon (2012) examined the level of knowledge and understanding of final year engineering students in three Irish higher education institutions. Tan *et al.,* (2016) focused on perception of quantity surveying students, while Watson *et al.,* (2013) focused on Civil engineering students in the USA; Kagawa, (2011) on students at a UK institution; and Iyer-Ranga *et al.,* (2010)

compared sustainability perception between students Australia and Singapore students on an engineering course. The general view is that in many cases students perceptions tend to be enviro-centric (Dagilite and Niaura (2014; Clark and Zeegers (2015). Studies show, however that education and training can help drive a more holistic students perception of sustainability. For example Clark and Zeegers (2015) examined the pre and post course attendance perceptions. They found that while both the pre-course and post-course perception students' perception of sustainability remained largely environ-centric, there was a noticeable shift towards a more holistic perception of sustainability including social and economic sustainability once students took a sustainability course.

The present study complements these builds on a previous study (Authors, 2017) in which they examined students sustainability priorities, and sustainability influences in procurement decision making. The present study focuses on the ethics context and used Sudbury-Riley and Kohlbacher's (2016) framework of constructs for developing an ethically minded consumer validation scale, in which they grouped measurement factors into 5 constructs as summarised in table 1. Authors (2017) identified a number of factors that can impact on sustainability decision making. These factors are used in this paper and mapped against Sudbury-Riley and Kohlbacher's (2016) constructs. The RECYCLE construct was not included in this research as it is the only factor that relates to a specific activity.

Table 1: Ethics of sustainability framework

Construct	Context	Measurement items used in this study
ECOBUY	The deliberate selection of environ-friendly products or their less enviro-friendly alternatives	The impact on the environment would be a major concern Only suppliers/contractors who have a documented sustainability policy should be involved
RECYCLE	Specific recycling issues	
ECOBOYCOTT	Refuse to purchase a product based on environmental issues	I would be concerned about its impact on future generations I would be concerned about the impact on immediate users
CSRBOYCOTT	Refuse to purchase a product or service based on social issues	Meeting Industry standards on sustainability Meeting minimal legal requirements
PAYMORE	A willingness to pay more for an ethical product or service	Profitability would be a major determining factor Price would be a major determining factor

3. Methodology

The findings reported in this paper was part of a wider study that sort to investigate student perceptions on various issues. It adopted a survey methodology and data was collected using a questionnaire. This is a common approach used in many other studies on student perceptions of ethical issues (Authors, 2017) as it enables the collection of data from a larger sample size. The samples was collected, one at a university in UK and a self-administered questionnaire administered to final year students taking various built environment courses where involved. The sample demography is presented in table 2.

Table 2: Sample Demography

Course	No	Percentage
Building Surveying	32	35%
Construction Management	28	31%
Quantity Surveying	31	34%
Total	91	10%

4. Results and Discussion

The following section explains the results obtained from the questionnaire survey reflecting the ethical perception of sustainability.

4.1 Context of sustainability

In addition to the demographic questions participants were presented with 4 options to indicate their primary view of the context of sustainability. Sustainability as discussed in the literature review section is considered in context of the triple bottom line. However, such does not make the ethical context obvious. As such the fourth option, ethical context, was included. Table 3 presents the findings. As discussed in the literature, the data shows that the primary concern for the students is the economic context effects of sustainability with a mean of 3.82. Of interest is the observation that ethics and social context of sustainability's scores are not significantly different with scores of 3.60 and 3.59 respectively. A comparison of the individual course scores also indicates a similar trend with social context and ethical context as last two contexts.

Table 3: Ethical Context

Construct	***Perception***	***All***	***BS***	***CM***	***QS***
P-Economic	Sustainability in the construction industry should be looked at as an economic problem	3.82	3.65	3.75	4.06
P-Scientific	Sustainability in the construction industry should be looked at as a scientific problem	3.67	3.68	3.53	3.81
P-Ethics	Sustainability in the construction industry should be looked at as an ethical problem	3.60	3.42	3.58	3.77
P-Social	Sustainability in the construction industry should be looked at as a social problem	3.59	3.56	3.45	3.71

4.2 Ethics of sustainability perceptions

Participants were asked to indicate the extent to which they agreed or disagreed with a number of statements. Table 4 presents the findings. Both the aggregate scores and the individual scores are compared. A 5 point Likert scale was used to rate the factors. The two factors related to the PAYMORE construct had their scores reversed to reflect the context of the study. While the statements did not reflect consideration of alternatives as indicated in table 1, the statements related to the extent to which profit and price would be key determining factors in decision making. The interpretation in this study, was that consideration of price and profit would be at the expense of using environmental friendly alternatives. As such it was deemed appropriate to reverse the scores. The data in the table shows that the ranking of the factors is largely similar across the three cohorts, with reversed ranking for the last two factors and factors ranked 3 and 4. From an ethical point of view, the data shows that the students' ethical framework would primarily consider issues that focus on compliance. The top two factors, meeting industry sustainability standards and meeting legal requirements can be both CSR related components and legal requirements. However, it is argued that CSR should go beyond requirements for compliance. The factors that score the least are those related to payment for products and services. As discussed above, the connotation of these two factors, is that cost of alternatives, would be a hindrance to use of sustainable products and services as profit and price would be determinants of whether they would consider to adopt a sustainable product or service. This is consistent with findings in literature such as in Ageron et al's (2011) that quality and cost took precedence over sustainability considerations when making procurement choices. At an aggregate level, factors related to ECOBOYCOTT, fair better than ECOBUY factors. As they rank, 3 and 5 against 4 and 6 respectively.

Table 4: Ethical Context

Construct	Factor	All n=142		BS n=53		CM n=38		QS n=51	
		Mean	Rank	Mean	Rank	Mean	Rank	Mean	Rank
CSRBOYCOTT	Meeting Industry standards on sustainability would be a major concern	4.23	1	4.07	1	4.28	1	4.42	1
CSRBOYCOTT	Meeting minimal legal requirements would be a major concern	4.16	2	4.00	2	4.15	2	4.33	2
ECOBOYCOTT	I would be concerned about the impact on immediate users	3.89	3	3.82	3	3.90	3	3.90	4
ECOBUY	The impact on the environment would be a major concern	3.80	4	3.61	4	3.83	4	4.04	3
ECOBOYCOTT	I would be concerned about its impact on future generations	3.63	5	3.60	5	3.58	5	3.81	5
ECOBUY	Only suppliers/contractors who have a documented sustainability policy should be involved	3.23	6	3.05	6	3.18	6	3.52	6
PAYMORE	Profitability would be a major determining factor	1.93	7	2.12	7	2.00	8	1.73	7
PAYMORE	Price would be a major determining factor	1.83	8	1.82	8	2.08	7	1.63	6

5. Conclusion

The primary focus of the study was to examine the extent to which ethical considerations impact on sustainability choices. The discussion in literature demonstrated that an ethical framework can be essential in addressing sustainability. Studies show that, in some industries, ethical consumer behaviour can influence the sustainability practices of business. While there has been limited on ethics of sustainability in construction industry, there is an argument, that such a framework is essential to frame ethical discussion in sustainability discussion. There is however lack of an agreed framework to measure the ethical dimensions of sustainability for built environment curriculum. The findings in this pilot study showed that the main ethical factors would focus on compliance. Price is also seen to be a key factor to the extent that preference of sustainability-friendly alternatives irrespective of the cost and or effect on profitability is unlikely.

This study adapted a framework from consumer behaviour studies. The framework provided dimension to the understating of sustainability issues by students as it focused on the ethical context. Most of the studies on students perception have adopted frameworks that focus on the triple bottom line of sustainability and in many cases demonstrate that students' perceptions are largely enviro-centric. However, such studies do not provide a contextual understanding of the reasons behind the perceptions. Adopting an ethical framework for sustainability can be a useful way to communicate the need for ethical considerations.

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Infrastructure Project Delivery Systems

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Risk Evaluation and Monitoring Challenges of Public Private Partnership Projects in Zambia: A Recipe for Development Readiness

Peter Mukalula[1] and Mundia Muya[2]

Abstract

Public Private Partnership (PPP) projects are normally high geared projects that must be effectively evaluated and monitored. The introduction of the PPP law in Zambia has not seen an improvement in the approval of schemes particularly with respects to quantification of risks embedded in proposals submitted for development. As PPPs are part of the New Public Management (NPM), their successful implementation should be tailored to address they face. However, construction professionals are ill equipped to evaluate as well as monitor PPP risks before projects are developed. The consequence is that negotiated concession periods could exceed those that are acceptable around the world. Evaluation of risk factors and effective application of remedial measures is what inevitably renders projects successful. This paper contributes to the debate of appropriate risk evaluation and monitoring tools that need to be used in a developing world context. The methodologies used in obtaining primary data from the industry were focus group interviews and questionnaires. These were analysed using Rotated Component Matrix from the Statistical Packages for Social Sciences (SPSS). A list of commonly used risk evaluation and monitoring tools were analysed using Spearman's rho. Findings suggested that professionals are using methods that are ineffectively evaluating risks and monitoring PPP. It is recommended that Zambian professionals be trained in financial and risk monitoring skills.

Keywords: Risk evaluation, project monitoring, new public management, public private partnership**.**

1. Introduction

Over 90% of PPPs projects on the African continent are externally funded. This indicates the necessity of evaluation and monitoring procedures for projects. In 2009, the Zambian government enacted the PPP law. However, the process of implementing this law has had challenges regarding the assessment of proposals. PPPs signify greater private sector involvement in the delivery of public services. Private sector participation brings with it risk complexities regarding the nature of funding and availability of expertise (Hardcastle and Boothroyd, 2003). Finance lenders assume about 70 – 75% of the risk on capital costs required for development of large scale infrastructure projects. Evaluation must therefore, be

[1]PhD student; Civil and Environmental Engineering; University of Zambia; P O Box 32375; musomuko@yahoo.com.
[2]Associate Professor of Construction Management; Civil and Environmental Engineering; University of Zambia; P O Box 32375; mmuya@unza.zm.

effective. This raises the confidence of multilateral lending agencies in providing investment funds. It also deepens the developer's desire to readily own risk (Amundurud and Aven, 2015).

This research is part of a doctoral thesis that seeks to highlight evaluation and monitoring challenges on PPP projects in Zambia.

2. Literature Review

Evaluation of the project's viability is a result of the PPPs agreed concession period. This comes after risks exposed to the project are analysed using risk profiles. The risk profile considers changes occurring in the (Knutson and Huettel, 2018):

- the political situation;
- bank loan guarantees;
- stability and enforcement of institutions overseeing PPPs;
- instability of the local currency and credit support for loans;
- availability of public and private information; and
- how adequately developed financial markets are.

Financial resources loaned are usually equated to the risks posed to the phases of the project based on a risk/reward categorisation (Balog et al, 2017). Projects bear four main phases consisting of the pre-construction, construction, commissioning and hand-over of the project. PPP schemes are faced with various risks at different phases of execution. These include currency, expropriation, legislative changes, political violence, government approval, loan security and law enforcement that affect financial management. With PPP project finance, repayment of loans for capital costs is generated through the cash flows from the operation of the project. Finance debt lenders, therefore, analyse a project's ability to produce revenues. These must be able to service the project's debt obligations. PPP financial arrangements must address project-specific risks (Smith et al, 2014). Certain project risks are insured as a way of avoiding disruptions at the time the project is implemented. These would need to be evaluated so that developer could repay loans borrowed from multinational lending institutions (Bull and McNeill, 2008).

Identified risks on a project are mitigated in different ways. This is done in order to have sufficient funds for development or involvement of third parties (Merna and Njiru, 2002). Insurance companies and bank guarantees are used as third parties to help developers successfully implement their projects (Cui et al, 2018). Wang et al (1999 and 2000) was able to show how various mitigatory methods were utilised for risks associated with the political situation, foreign exchange and revenue on China's PPP projects. Evaluation of projects requires competences in a number of technical fields. These include accounting, quantity surveying and general business management. The evaluation process combines financial and other technical information regarding the developer. Project evaluation methods consist of the following (Zhang, 2004):

- the simple scoring method that utilises the maximum possible scores from a prescribed criterion for bidders adherence;
- the net present value method that chooses a bidder with the lowest NPV for the concession period proposed;

- a multi-attribute analysis that uses the simple scoring method together with assigned weights for their relative importance with selection based on the highest maximum product of these factors;
- the Kepner-Tregoe decision analysis technique that segregates 'musts' and 'wants', with bidders categorical satisfaction of the latter which is then evaluated using either a simple scoring system or multi-attribute scoring method;
- the two envelope method that allows bidders to submit technical and cost information that evaluated in this order with cost being considered when it is within acceptable ranges;
- the NPV and scoring method that has a double evaluation undertaken for financial and unquantifiable information; and
- a combination of the binary and NPV method that qualifies bidders achieving 'musts' for the project before their NPVs are considered.

3. Research Gaps

The following research gaps were identified in the literature reviewed:

- the assertion that allocated risk structures vary according to the contract types that place risks between the contractual parties concerned. For instance, Build-Operate-Transfer contracts allocate a lot of risk to the private sector as opposed to service and management ones;
- economic factors existing in countries such as exchange rates and interest rates are primal considerations for investor's evaluation hoping to utilise the PPP mode of procurement;
- that private firms using the PPP method of procurement are exposed to various risks as they execute projects in other continents than their own;
- the contractual party able to handle a particular risk should have the capacity to manage it; and
- project monitoring is a technicality that must be exercised from the inception to the running of the scheme.

This paper discusses the second and fifth points listed above.

4. Methodology

Primary data was collected using structured interviews as well as distribution of 150 detailed questionnaires. Interviews conducted lasted between 30 and 40 minutes with extensive notes were taken during the process. Distribution of the questionnaire utilised registers from the National Council for Construction, Surveyors Institute of Zambia and Engineering Institution of Zambia. For the interviews as well as the questionnaire distribution, dates and venues were arranged. The detailed questionnaire was given to professionals who had interacted with the PPP law in Zambia and results were analysed using excel and SPSS package.

4.1 Analysis of interview results

Owing to the fact that PPPs were novel in Zambia at the time of the study, a purposive sample of 11 stakeholder interviewees were selected based on their knowledge of the PPP procurement mode. Two main areas were the focus of the interviews which included what established evaluation and monitoring methods construction professionals used for PPPs. Descriptive analysis was used on the qualitative data

collected (Silverman, 2010). Responses on the monitoring methods were further analysed using Spearman's rho.

4.1.1 Background information on interview respondents

Respondents interviewed held high and middle management positions in their organisations. All the respondents had a minimum of a bachelor's degree. However, three had post graduate master's degrees. 72.72% of the respondents had PPP experience while 27.28% had not (Figure 2). 8 of the respondents had well over 15 years of experience in the construction industry while 3 had only served for 10 years.

Table 1: Professionals interviewed

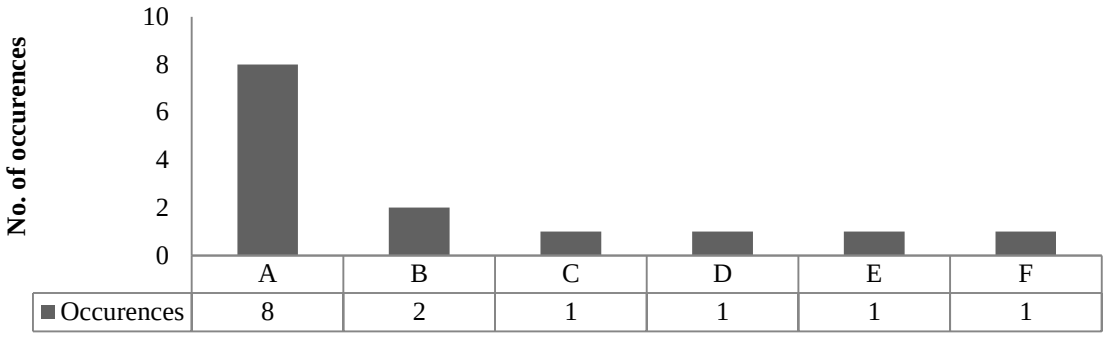
	Category	Focus group interviews (Composition)	Handled PPPs	% response
1	Quantity Surveyors	3	2	66.67
2	Valuation Surveyors	2	2	100
3	Architects	3	2	66.67
4	Civil Engineers	2	2	100
5	Contractors	1	0	0
6	Totals	11	8	72.72
	% response	100	72.72%	27.28

However, respondent's experience was limited to responding to requests for proposals and submission of the same to client organisations. Only one chief executive had gone beyond submission in terms of advising clients over implementation procedures. This was a response of less than 10% (9.09%).

4.1.2 Financial evaluation tools

A total number of 6 tools were identified as shown in **Figure 1** below. These were:

- financial appraisals
- cash flow analysis;
- profit and loss analysis;
- development concept;
- cost benefit analysis; and
- life cycle costing.



A – Financial appraisals

B – Cash flow analysis

C – Profit and loss analysis

D – Development concept

E – Cost benefit analysis

F – Life cycle costing

Figure 1: Financial evaluation tools

Financial appraisals were the preferred evaluation tool by financial institutions as noted by eight respondents (giving a response of 80%). This was followed by cash flow analysis that had two (20%) occurrences from respondents. It was observed that projects applied a combination of decision-making tools. Hence a combination of the use of financial appraisals and cash flow analysis was noted twice (for A and B). The other evaluation tools used were profit and loss analysis, development concept, cost/benefit analysis and life cycle costing which had a single response each, as listed above. However, such tools are very basic in examining the financial worthiness of PPP projects. Such tools are vague in assisting proper risk assessment of projects.

4.1.3 Spearman's rho – financial method accuracy

Spearman's rho calculations were used to determine the accuracy of use for project evaluation of five of the financial evaluation tools recommended by the focus group. The five financial evaluation tools were the payback period of the project, internal rate of return, life cycle costing, discounted cash flow and net present value. Typically, these are the tools used for evaluating the financial management of projects. Spearman's rho gives the relative strength of a relationship. The resultant assessment between 0 + 1 indicates no direct construal. However, when the rho value is squared, a proportional reduction in error (PRE) in the tools is conceivable. The given equation for obtaining the desired rho value was (Healey, 2009):

$$r_s = 1 - \frac{6\sum D^2}{N(N^2-1)} \quad (1)$$

Using the means and accompanying field mean ranking of the focus group, a Spearman's rho value of 0.15 was obtained. By squaring 0.15, the value of 0.0225 was obtained meaning the use of the financial evaluation tools with risk assessment imbedded in them, would have a predictable reduction in error of 2.25%. This means errors in the evaluation process would be minimised by using financial tools that are able to analyse a compendium time-related risk factors such as inflation, political threats and global influences. The challenge of having accurate financial projections is an assurance to both developers as well as recipients of the scheme. With risks accommodated in the cash flow projections, use of appropriate financial evaluation tools guarantees their successful completion.

Table 2: Spearman's rho calculation for financial evaluation tools

Financial decision-making tools	Mean	Field mean ranking	Focus group rating	Focus group ranking	D	D^2
Payback period of project	4.30	1	5	1.5	-0.5	0.25
Internal rate of return	3.98	2.5	4	3	-0.5	0.25
Life cycle costing	3.98	2.5	3	4.5	-2	4
Discounted cash flow	3.74	4	3	4.5	-0.5	0.25
Net present value	3.62	5	5	1.5	3.5	12.25
					$\sum D^2 = 0$	$\sum D^2 = 17$

Spearman's rho value=0.15

4.2 Analysis of the detailed questionnaire

An industry-wide questionnaire survey was later conducted. Major issues brought out of the structured interviews formed the main data that was collected for the research. Again, the draft questionnaire was pre-tested so as to improve response clarity as well as the removal of ambiguities.

4.2.1 Survey composition

It was necessary to investigate factors that warranted good project evaluation before, during and after implementation of a scheme. A key component of this was to ascertain whether the construction industry was ready to accept the PPP mode of development. PPP contracts can be complex and that industry professionals may not be able to handle certain technical difficulties. The field study included distributing 120 questionnaires but obtained 53 of which 5 were not properly answered. 47 responses were finally obtained giving a response rate of 46%.

Table 3: Questionnaire distribution and response

	Category	Questionnaires (Distribution composition)	Questionnaires (Response composition)
1	Quantity Surveyors	33	12
2	Valuation Surveyors	13	12
3	Architects	25	10
4	Civil Engineers	28	11
5	Contractors	21	8
6	Totals	120	53

This response consisted of 12 quantity surveyors; 12 valuation surveyors; 10 architects; 11 civil engineers and 8 contracting firms. All the respondents were in management positions and were well advanced in careers. The average age obtained for the final 47 respondents was 47 years. In terms of education, all stated to have a minimum of a basic degree with at least 14 years' experience while five had a post graduate masters' degree. The survey response was therefore 46%. Researches of a similar nature done

by Jang (2011) and Awodele (2012), gave responses of 53% and 32%, respectively. Results from the questionnaires were analysed qualitatively as well as using Spearman's rho.

4.2.2 Respondent's PPP experience

Respondents were asked to indicate their industrial experience as well as the period they have dealt with PPPs. There was a huge disparity in terms of the year's worked, industrial experience and PPP proficiency. Noted among the respondents was the low PPP experience. Although 66% (representing 31 respondents) indicated that their organisations had done PPPs, actual working experience on these types of contracts was negligible. 34% (i.e. 16 respondents) indicated that they had never participated in PPP projects as shown in Table 4. The respondent with the highest years of working construction experience had 14 years while the lowest only had a year.

Table 4: PPP experience

	Have done PPPs	Have not done PPPs	Totals
Respondents	31	16	47
% response	66	34	100

4.2.3 PPP monitoring methods

From Table 4, only 31 respondents had participated in PPP contracts. These were asked to indicate what monitoring methods had been used on PPP projects. Table 5 gives the respondent's frequencies and means of their preferred monitoring methods that were listed using a Likert scale of 1 to 5; one indicated 'less preferred' while 5 was the 'most preferred'.

Table 5: Preferred monitoring methods

	Type of monitoring method	Frequency	Mean	% Response
1	Budgeting	25	4.45	81
2	Cash flows	21	4.36	68
3	Profit and loss analysis	17	4.32	55
4	Return on investment analysis	14	4.26	45
5	Life cycle costing	11	4.02	34
6	Sensitivity analysis	9	3.77	29

4.2.4 Discussion of questionnaire results

From Table 5, 81% of the respondents indicated that 'budgeting' was the most preferred method for monitoring PPP projects. This was followed by cash flows (68%); profit and loss analysis (68%); return on investments analysis (45%); life cycle costing (34%); and sensitivity analysis (29%). However, such tools are very basic in monitoring the financial worthiness of PPP projects. For instance, most budgets are done for a limited period of time of one to five years. PPP projects on the other hand exceed 25 years. Budgets were preferred by developers because they showed the profitability of project (Ronnie, 2018). Inevitably, this means that methods of monitoring must be focused on the phases of the projects. Responses from the respondents, however, preferred short term methods (1 to 3) than ones that gave a long term perspective (4 to 6).

4.2.5 Monitoring methods accuracy

Spearman's rho calculations were used to determine the accuracy of use for project monitoring of the six monitoring tools. The obtained values from formula (1) yielded 0.58 which when squared gave a proportional reduction in error (PRE) of 3.4%.

Table 6: Monitoring methods

Monitoring tools	Mean	Mean ranking	Group rating	Ranking	D	D^2
Budgeting	4.45	1	5	1.5	-0.5	0.25
Cash flows	4.36	2	5	1.5	0.5	0.25
Profit and loss analysis	4.32	3	1	6	-3	9
Return on investment analysis	4.26	4	4	3	1	1
Life cycle costing	4.02	5	2	5	0	0
Sensitivity analysis	3.77	6	3	4	2	4
					$\sum D^2 = 0$	$\sum D^2 = 14.5$

Spearman's rho value = 0.58

As the computation suggests, these monitoring methods can achieve an accuracy of 96.6%. This verifies use of these tools with the proviso that project risks are carefully monitored during the negotiation, construction and operation phases. The advantage of the methods is that risk is gauged over the time period of the project.

5. Conclusion

The following conclusions were drawn from the findings of the study:

(1) respondents were well able to articulate issues on PPP evaluation in spite of the fact that PPPs have been recently introduced in Zambia;
(2) respondents preferred a combination of financial tools in evaluating PPP projects;
(3) financial evaluation methods were better able to analyse long term risks in projects;
(4) respondents used financial monitoring tools for PPP projects; and
(5) financial monitoring tools have a high accuracy rate in monitoring projects.

6. Recommendations

The following recommendations have been made:

- that construction industry professionals be trained in risk related financial disciplines to assist them in evaluation processes; and
- that short and long term monitoring methods be adopted during implementation.

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Replacing the Construction Contract with the Total Cost of Ownership (TCO) Contract

Sitwala Simushi[1]

Abstract

The importance of considering all the costs of a product or project is well-understood by professionals, practitioners and researchers alike. It is known by many that the acquisition costs of a product or project include more than the purchase price. In Zambia and in many sub-Saharan countries, however, the concept has not been actualised in infrastructure contract delivery systems. There has been little change in the procurement of infrastructure to align with the total cost of ownership (TCO) concept, which provides for evaluation of all costs associated with ownership when selecting projects. Most projects are still procured on the basis of the construction contract leaving out the operating and management phase. The purpose of this study was to identify the problems of the current infrastructure contract and the possible benefits of replacing it with the TCO contract. Using secondary data review, it was found that the current infrastructure contract does not enable procurement entities to have a strategic evaluation and implementation of projects on long-term basis. In addition, it does not cover the entire life of the project and thus depriving clients the ability to manage project life cycle costs evaluated at project initiation stage. The paper is intended to add knowledge to "sustainability in infrastructure" in the procurement and management of physical assets in sub-Saharan Africa. The paper presents the TCO contract as a replacement to the construction contract to improve procurement of physical assets, which would potentially lead to sustainable development of infrastructure and creation of employment across the entire asset life cycle of projects and thus improve asset operation and management.

Keywords: Infrastructure, procurement, sustainability, total cost of ownership

1. Introduction

The total cost of ownership (TCO) is well understood and applied in many industries (Bacchetti et al, 2018). Many know that the cost of a product, good or service is more than the purchase price or the initial price (Baily et al, 2008). Tibben-Lembke (1998) says that the idea of all-in-costs is not new. Humans have been aware that the purchase price of a product was not the only cost involved in buying a product. All the costs associated with the acquisition, use and maintenance of the good or service need to be taken into consideration. Following this, an infrastructural contract must cover more than the cost of construction. It should comprise all the costs associated with the acquisition of the installation which are costs of construction, operation and maintenance. This means that our procurement contracts need to

[1]Lecturer; School of Graduate Studies, School of Built Environment, Copperbelt University, P O Box 21692, Kitwe, Zambia. simushis@yahoo.com.

embrace the tenets of TCO. In Zambia, as in many sub-Saharan countries, we have paid lip service to it and never changed our procurement systems to be in line with TCO concept.

This article discusses results from a literature review-based study on the concept of total cost of ownership. It presents the relationship with life cycle costing or whole life costing and the benefits of embracing infrastructure contracts using TCO principles.

2. Establishment of a Clear Project Execution Strategy

The establishment of a clear project execution strategy is important (Ashworth, 2004). The strategy becomes the tool to guide in the planning as well as implementation during construction and operation. It will help the team at the planning stage to determine the factors and resources they need to consider before and after they launch the business case. The strategy will consider the total life cycle of the project from inception up to the eventual decommissioning or salvage stage of the project. This means that the strategy will have a life as long as the life of the project from start to decommissioning calling for a long range or strategic focus as opposed to a short term or tactical focus.

The TCO concept is related to the concept of whole life cycle costs (WLCC) or life cycle costs (LCC) (Ferrin and Plank, 2002). The concept of whole life cycle costs or life cycle costs is well-understood in construction, but less the concept of total cost of ownership. All these concepts suggest that it is important in procurement to have a long term view rather than a short term one in regard to costs of a product or service. Their main idea is that when making a decision to purchase or procure a product, accurate valuation of the prospect should not only rely on the initial price perspective, but rather on the costs of all the associated activities to improve sourcing decisions (Wouters et al, 2005). TCO quantifies all direct and indirect costs associated with the purchase including net price costs related to service, quality and delivery (Kanagaraj et al, 2016).

From the construction point of view, the concept of life cycle costing or whole life cycle costing has been established over many years to guide in the procurement of infrastructure (Jaggar et al, 2002; Ashworth, 2004). The aim is to ensure that a client gets value for money by considering not only the initial costs of construction, but also the costs in use during occupancy. Sherif et al (1981) say that the life cycle costing refers to a technique that considers the costs associated with a product or service one wishes to purchase from inception to disposal. It is a method of evaluating all the costs of the asset or services over the whole life cycle (SIGMA, 2016).

3. The Problem of the Current Infrastructure Contract

In the modern construction project, there are two contracts; the contract to design the facility and the contract to or construct the facility which is then handed over to the client to manage (Briceño-Garmendia, 2009). This provides an incomplete contract from the total cost of ownership point of view as it leaves out the operation and maintenance phases of the project whose costs were included in the evaluation at project selection stage. It is even made worse by the inefficiencies often found in the SOEs and local municipalities which are often left to manage the operation and maintenance phases of public projects.

The consideration of life cycle costs represents all costs that come from using goods, services or works during their entire life span. For a public entity intending to invest in infrastructure, it means considering all the costs associated with the acquisition up to salvage or decommissioning of the asset. TCO model then, will be used to determine all these costs over time to be able to select the best option, from design to the ultimate decommissioning of the facility. Essentially, having made these considerations at inception stage, they need to be implemented in the contract at design, construction and especially, at operation and maintenance phase.

The infrastructure contract is centred on the construction contract which is between the client and the contractor. This contract would be for a period lasting a few years including the warranty period or the defects liability period. This contract is preceded by the design contract which is entered on a tri-lateral basis between the client and the consultant with little bearing on the main contract, the construction contract. This contract, too, lasts a few years. After the main contract, the period that follows is that of operation and maintenance which lasts for several years. This is a longer period than any that preceded it. Yet, surprisingly, there is no contract that is entered to manage this period.

This, therefore, means that the infrastructure contract does not cover the entire life cycle of the project. It is a partial contract that only covers the construction phase leaving out most of the period of the asset life cycle. Following this logic, the question is, at what point is the TCO concept applied? Or when do we apply the life cycle costs? At what point are these costs managed or reviewed to evaluate how the project fared with what was planned at inception stage? If we say, during construction, we will not be near the truth as we have not yet come to costs-in-use.

The argument, however, is that the TCO concept is understood but not wholly implemented. We procure our projects on the basis of the construction contract leaving out the operation and maintenance period. Thus, the potential benefits that could be realised from TCO or LCC are not wholly realised.

Benefits from a typical TCO concept include selection, assurance of the knowledge of entire life costs and ability to select the best supplier or contract since more than the initial costs are considered. Ellram (1995) discussed various benefits of TCO. (1) provides a consistent supplier evaluation tool, (2) helps clarify and define supplier performance expectation, (3) improves purchaser's understanding of supplier performance issues and cost structure, (4) provides excellent data for negotiations, (5) provides an opportunity to justify higher initial prices based on better/lower total costs in the long run and, (6) provides a long term purchasing orientation by emphasizing TCO rather than just price.

Roda and Garetti (2014) discuss benefits of using TCO approach at three stages of the project life cycle. (1) TCO evaluation enables economic evaluation of different scenarios at pre-design stage, (2) helps in determining the most cost efficient design amongst a set of alternatives, (3) helps identify cost drivers for design changes and optimization and determination costs for budgeting purposes, (4) TCO is a procurement and, sales and marketing tool to assist both procuring entities and suppliers and, (5) TCO provides the basis for supplier evaluation and selection.

The TCO approach, which is in all respects similar to WLCC or LCC, is a methodology that encourages sustainable construction in that decision-making at investment level takes account of durability, future running costs and maintenance requirements (Akbiyikli and Eaton, 2006a). It forces the planners at the business case stage to consider all the possible costs and also provides a platform to include value engineering, risk management and other useful strategies in optimising the selection of the project or solution being considered at this stage.

Another benefit is that the long range outlook, where the total project life cycle duration is considered, enables them to view the potential pitfalls and implementation hurdles of the procurement, construction and operation phases. Thus, it provides an opportunity for long range or strategic procurement and contract management planning to be carried out, completely moving procurement from a buying function to long view planning for the infrastructure projects. This means that, not only is there a project-length evaluation of alternatives of materials and methods of construction, but also long-range planning of partnerships along the entire project and asset life cycle. This spawns better integration and innovation along the project life cycle supply chain.

This planning could be for an infrastructure project for a duration of 30 years where an integrated approach to TCO is taken. Design, construction, operation and maintenance, all get input from all professionals who, in this case, not only include designers but also builders and operators as well.

Unfortunately, TCO is not wholly implemented especially that the project life cycle is managed in a fragmented manner with different players along the various stages of the project supply chain. From the European Union Commission research on use of the LCC, it was found that even within the public sector, LCC was undertaken in a very fragmented manner without any underlying methodology or standards (Davis Langdon, 2007). From their review of literature in USA, Canada, Australia and Europe, they found that LCC was mostly discussed in concept nature with little evidence of its application in construction. They found that most literature paid attention to potential benefits of LCC and its technical issues relating to its application and ended there.

Furthermore, the last phase, the operations and management stage in public projects, is left to a team that did not participate in the initiation of the project, the state owned enterprise (SOE). This leaves this stage with less attention and mostly, least financed.

In sub-Saharan economies and in most developing countries, the financing provided for maintenance is often less compared to other economies. The sub-Saharan region also has higher ratios of road asset values to gross domestic product (GDP) compared to other regions showing that they have higher costs of maintenance or depreciation (Brushett, 2005). Table 1 shows some of the typical examples. Ghana shows a higher ratio compared to countries in other regions. The ratio is about six times that of Chile. South Africa has a lower ratio compared to Ghana.

Table 4: Ratio of road asset to Country GDP

Country	Ratio of road asset value to GDP
Ghana	33%
South Africa	16%
Chile	5%
Thailand	8%
Jordan	10%

Source: Brushett, 2005

Quoting Fay and Yepes (2003), Brushett (2005) says in developing countries around USD233bn is required to be spent on new infrastructure and a similar amount on maintenance which represents 5.5% of GDP. Roads alone constitute about 1.1% of GDP on average without considering maintenance costs. Sub-Saharan countries have higher values. In Zambia, it is about 1.9% of GDP. Following the argument of Fay and Yepes (2003), a similar amount of 1.9% of GDP or higher is spent on maintenance of roads.

There is poor maintenance of infrastructure in these economies. Close to 30% of all assets are in need of rehabilitation with higher figures of railways and rural roads. For Zambia, the figure is about 35%. Most countries have shortfalls of 40% on annual maintenance (Briceño-Garmendia (2009). Heggie and Vickers (1998) report that most roads are poorly managed and badly maintained. Often there is a backlog of rehabilitation of infrastructure. This increases costs of maintenance tremendously. Heggie and Vickers (1998) said that maintaining a paved road costs USD 60, 000/Km. If the road is allowed to deteriorate over 15 years, costs increase to USD 200, 000/Km to rehabilitate making it more expensive to maintain. This is compounded by three issues: (1) lack of will to provide for or invest in maintenance of assets, (2) bias toward capital spending at the expense of maintenance and, (3) inefficiencies in SOEs mandated to manage infrastructure. Two-thirds of spending on infrastructure goes to capital expenditure leaving one third on maintenance, thus creating huge backlogs and increasing costs on maintenance (Briceño-Garmendia, 2009).

The construction contract supports capital expenditure which in a large measure may be responsible for institutions paying less attention to maintenance. Replacing the construction contract with the TCO contract may be a solution to reducing poor performance of asset management in developing countries.

4. Asset Management of Infrastructure, The Proposal

In considering the costs of acquisition of assets, the purchase price and all the other costs need to be accounted for in the economic evaluation. For a product, the price/iceberg principle shows that the price is merely a tenth of the cost of acquisition with other costs such as delivery and inspection hidden from view (Baily et al, 2008). The total cost of ownership is to be considered for all procurement (Carter and Kirby, 2006). This is to include design, specification, acquisition, commissioning, use, maintenance and disposal. Clearly, for capital projects such as infrastructure, this means, in procurement of these assets, there is need to not only consider the purchase price but also the long range costs of the subsequent activities. A strategic view of procurement is called for which will include, not only the construction contract, but also the design and operations contract. In other words, the investment analysis should not end at commissioning of the project but also include operation and management costs of the facility.

In this paper, a two stage process is proposed:

- Investment appraisal stage with strategic procurement
- Implementation stage commencing with the design contract, the construction contract and the operations and management contract

Stage 1 is the typical TCO where the life-cycle costing procedure is carried out. Ellram (1993) discussed the major components of TCO from the purchasing point of view as, pre-transaction costs, transaction costs and post transaction costs. Pre-transaction costs are those that occur prior to receiving the item or placing the order. These are costs associated with identifying the need and the follow-up costs of market analysis in search of alternative sources of the product or service. The transaction costs relate to costs

associated with placing and receiving the order which will include, construction and installation costs. The post transaction costs occur after the product has been received. At this point, the product is owned by the organisation or the project has been handed over to the client. Typical costs include repair, operation and maintenance. Figure 1 shows the relationship of TCO with infrastructure development.

At Stage 1, the total sum of all costs to be incurred from inception to the end of the product's useful life are evaluated. This will include evaluation of the possible contract permutations and all risk implications. Harvey's Cycle of costing procedure discussed by Woodward (1997) could be followed which involves:

- Defining the cost elements – all the elements from inception up to use
- Defining the cost structure to be used – here the costs are grouped to identify potential trade-offs. One way of grouping the costs is (1) engineering and development (design development), (2) production and implementation (construction) and, (3) operation and maintenance (use and management)
- Establishing the cost estimating relationships – here the work is to establish the methods of estimating related to different items or categories such as cost per unit.
- Establishing the method of life cycle costing – determine how the total costs will be itemised and evaluated such as initial acquisition costs, operating costs, maintenance costs and repair costs which will then be summed up to come up with the TCO. For operating costs, the life of the asset, considering functional, physical, technology and economic life of the assets will have to be determined.

In Stage 2, administration of the project will have to be determined in line with the various stages identified earlier. Thus, pre-transaction, transaction and post-transaction. This will be the point of departure with the general approach to TCO/WLCC concept where it is used as a model for investment decision and end there. This integrates the determination of all the cost factors of the entire life of the infrastructure with that of the management of the process to realise/minimise the costs earlier visualised.

The management of the three phases is determined and all the associated risks considered. The evaluated costs are kept and transmitted to each phase as it is carried out. The paper ignores the discussion of outsourcing or using in-house skills for each stage. The emphasis is on having an entire management framework for the total life of the asset.

The following are proposed permutations of contract management:

- One contract for the entire life of the asset
- Separate contracts for each phase
- Phase contract combinations

The emphasis of the proposal is that the post-transaction phase should be managed on a contract basis and so planned at pre-transaction stage. This will have the effect of forcing the planners to lay aside funds or put in methods of raising funds for this crucial stage of the physical asset and move away from the adhoc method of financing or preparing for the maintenance phase.

One of the potential ways of replacing the construction contract with the TCO contract is to use the Private Finance Initiative (PFI) or other concession arrangements. The major difference with the PFI concept is that in PFI, as in other concession arrangements, the private sector finance the project and operate for an agreed term called concession period (Akbiyikli and Eaton, 2006a). When the period is over, the asset is handed over to the public entity to run for the rest of its useful life. What is being

proposed is that the partner to the public entity runs the facility up to the end of its useful life. If this is not done, then TCO is not fully performed. Useful life has been left for which there is no contract for management and maintenance of the physical asset.

Is the TCO contract being proposed, design and build? No. Design and build ends at the warranty period when the building is handed over. The concession contract ends when the facility or project is handed over to the user department or public entity. There still remains a period where the facility is managed and maintained by the public entity. The design and construction contracts account only for the period concerned. Design and construction periods in this case. Figure 2 shows graphically, how these arrangements relate with the duration.

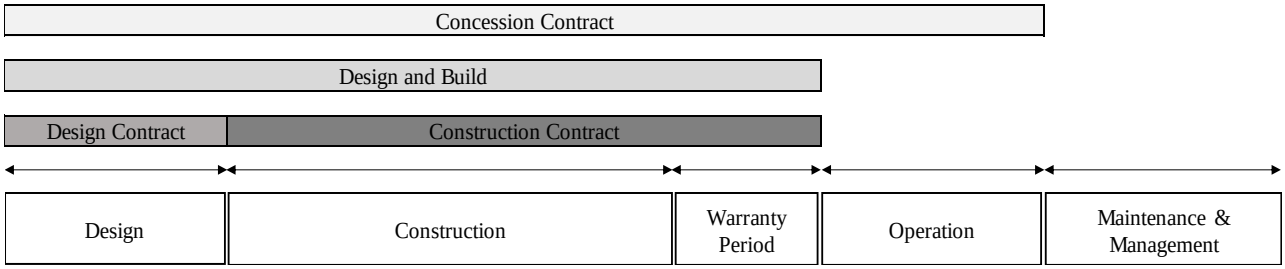

Figure 2 Existing contractual arrangements

The TCO contract being proposed, however, is to cover the entire life of the product or facility. The whole period of ownership of the product or facility. This will include design, construction, the warranty period, operation and maintenance periods as shown in Figure 3.

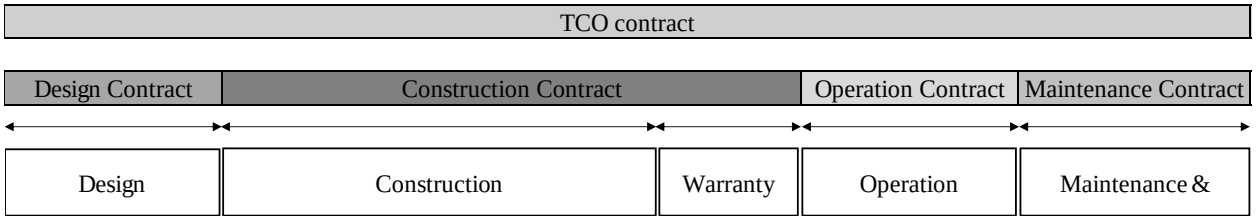

Figure 3 Proposed TCO contract arrangement

Setting up a contract administration system on TCO basis, for a period of 30 years, for instance, will bring about many benefits to the management of infrastructure. (1) ensure the costs of the entire process are evaluated and thus providing a basis for selection of sustainable projects, designs, materials and construction methods, (2) creation of employment for various professionals in the construction industry (Westcott, 2004) to carry out TCO evaluations and management of contracts for that length of time and thus enhancing their competence, (3) creation of employment for personnel in government and other public entities for the entire TCO period, (4) creation and assurance of employment for construction team members not only in capital projects but also in operation and maintenance projects, (5) creation of opportunities for many other players such as small and medium scale contractors and suppliers of materials, labour and equipment, (6) improvement in the economy due to increased scope of infrastructure contract work in construction as this sector is a driver for development in many other sectors of a national economy (Dakhil, 2013; Khan, 2008; Mabuku, 2000), (7) alleviation of poverty due

to the long range contracts and long-term effect of construction work on the economy as related in item (6) above.

5. Conclusion

The TCO concept is well understood in Many industries with the concepts of whole life cycle costing and life cycle costing being more familiar in the construction industry. These concepts all aim to help investors in deciding which product or service offers a more sustainable approach to costs by considering all the costs associated with the acquisition from inception up to closure. Unfortunately, however, in the procurement process, this goes as far as the project evaluation stage only. In infrastructure procurement, a contract is provided that only carters for design and construction leaving out operation and maintenance whose costs had been included during project evaluation at inception. This approach to infrastructure procurement is at variance with the concept of TCO or WLCC as it provides an incomplete contract since it does not carter for the entire life of the physical asset.

It is, therefore, recommended that the infrastructure construction contract be replaced with the TCO contract. Embracing the TCO contract will lead to improvements in physical asset procurement since TCO provides a consistent supplier evaluation tool that accounts for durability, future running costs, maintenance and operating costs. Its inherent long-range outlook will enable planners at both evaluation and implementation stage to view potential hurdles and risks, project-length evaluation of materials, construction methods and options as well as long-range planning of partnerships along the entire project and asset life-cycle. This will provide a platform for innovation along the whole project and asset supply chain.

For sub-Saharan countries with huge infrastructure rehabilitation backlogs coupled with poor maintenance of assets and inefficiencies in public agencies, the TCO contract, which provides an efficient solution, needs urgent consideration. The TCO contract will enable these economies to create employment for personnel in both public and private enterprises over the entire physical asset life cycle.

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Assessing the Utility of the Retention Bond as an Alternative to Cash Retention for Small-Scale Contractors in Zambia

Chipozya Tembo-Silungwe[1], Danstan Bwalya Chiponde[2] and Nomsa Shankaya[3]

Abstract

Small-scale contractors, especially in developing countries face cash flow challenges due to limited financial resources meant to meet operational expenses. The construction client does not help matters, as they normally require the cash retention in order to protect their interests in case of default by the contractor. This study investigated the use of retention bond with a focus of establishing whether it allows the contractor to improve their cash flow. The methodology used consisted of literature review, self-administered questionnaires to contractors and semi-structured interviews to clients. The respondents were contractors in grades 4 and 5 though small scale contractors go up to grade 6, as these are more likely to require a retention bond on the projects they are engaged in. The study focused on small-scale contractors' cash flow only in relation to the use of retention bonds. The study established that retention bond offers more benefits to both contractors and clients by enhancing project cash flow, whilst providing the same security as cash retention. Contractor's ability to meet day-to-day expenses is critical to successful completion of projects. The study has established that financial institutions offer the retention bond, which is cheaper for the contractor compared to cash retention therefore contractors can utilise the bond to enhance their cash flow thereby increasing contractors' ability to meet project cash flow requirements.

Keywords: Cash flow, cash retention, retention bond, Zambia.

1. Introduction

The lifeline of any business relies in its ability to be able to meet the daily expenses in order to run the business. The construction industry is no exception to this state of being particularly small and medium sized construction companies who need to expand, create jobs, innovate and improve efficiency (Innovation for Poverty Action, 2019). For small scale contractors, like all small businesses, the main problem is lack of access to and difficulty in obtaining credit (Ackah & Vuvor, 2011). In comparison to other small businesses, small construction companies have a high financial turnover and hence a larger need for short term working capital (Simpemba, 2002). The meeting of daily expenses especially on projects is cardinal to the survival of small and medium enterprises. The construction client normally

[1] Lecturer, Construction Economics and Management, Copperbelt University,chipozya@yahoo.co.uk
[2] Postgraduate Student, Northumbria University, England.
[3] Quantity Surveyor, Mopani Copper Mines; Central street, Kitwe, Zambia.

opts for cash retention to safeguard against defects that later occur. Retention bonds can also be used to safe guard against defects but are rare in the construction industry as pointed out by Mason (2016). Cash retention is normally withheld by the client and handed over at the end of the defect liability period, this restrains the cash flow for such projects (NASSC, 2012). Retention apart from safeguarding against defects is a common means of protecting an employer from a contractor's insolvency as well as ensuring that contractor finishes the work that they start . Additionally, retention secures contractor's contractual duty to repair all defects within the defects period (Klee, 2018). Nevertheless, not all subsectors all over the world use retention for instance guarantees are used e.g. in lift sector (BEIS research paper, 2017). Larger contracts tend to be subjected to smaller rates of retention; however, by calculating the cost of retention as an amount per year of a contract, cash retention is far more expensive on the small-scale contractor's part. The extra cost is multiplied when the final payment is delayed (Pace, 2012; BEIS research paper, 2017). This paper explores the viability of using of retention bond in the Zambian construction Industry as a means of improving the contractors' cash flow. The objectives of the research were to:

- To explore generally the nature of bonds used in the construction industry
- To identify the challenges and opportunities associated with cash retention
- To outline the perceptions of small scale contractors on the use of retention bond

1.1 Bonds generally

Bonds are just one of the means of protecting the client. Alternatives to bonds include project bank accounts, Esccrow stakeholder accounts, parent company guarantees and retentions held in trust funds (Mason, 2016)**.** Boswall (2010) defines a construction bond as a written agreement in which one party (the surety) guarantees that a second party (the principal) will fulfil its obligations to a third party (the obligee). Hosie (2010) clarifies by defining a guarantee as a promise to answer for the debt, default or miscarriage of another. If the principal defaults on its obligations, the surety must complete them or pay the completion costs to the obligee. Various types of bonds exist.

1.2 Types of bonds for construction

Brodies (2012) identifies two classifications of bonds namely, conditional or default and on demand bond. The on demand bond allows the client to demand payment under the bond without having to prove that a defect is present or that the contractor is unable or unwilling to correct it (Ibid). The conditional or default bond however would have to have some proof of "default" before they can be paid for by the bondsman. Various bonds are used in the construction industry and the most common are, bid bonds, performance bonds, prompt payment bonds, labour and material bonds, and retention bond (Hosie, 2010, Mason, 2016). A bid bond guarantees that, if a bidding contractor is awarded a contract in response to a tender and then refuses to enter into the contract in accordance with the terms of the tender, the surety will pay the owner the price difference between the dishonoured bid and the next lowest bid upto the penalty limit of the bond (Boswall, 2010). Klee (2018) further indicates that, a bid (or tender) bond may be required when a client releases an open request for tenders for the supply of goods or the performance of services on construction projects in anticipation of receiving a number of responses and not wanting to waste time choosing a winning bidder, only to have the lucky contractor refuse to take the contract (or to be unable to perform it). The construction client will ask possible contractors to provide a bid bond

for a small percentage of their bid price (Klee, 2018). It is generally a condition of the bid bond that the tender must be accepted within some specified period (generally 30, 60 or even 90 days) from the closing date of the tender. If this is not done, the contractor, the owner and the surety must execute an agreement to any extension, or the bid bond will simply expire and become unenforceable (Boswall, 2010). In Zambia the bid bond is normally 2% of the contract sum.

Performance bonds guarantes that the contractor that has entered into a construction contract will perform all of its obligations under the contract (Boswall,2010). If the contractor fails to perform the contract, the bondsman assumes the responsibility to indemnify the employer up to the maximum amount of the bond. The Bondsman's obligation to pay arises when called upon to do so by the employer (Murdoch and Hughes, 2007). Performance bonds are usually at a cost of 10% of the contract sum as a condition precedent to the commencement of work (Mason 2016). The contractor is normally not permitted to carry out any work under the contract unless the performance bond is secured (Klee 2018). Performance bonds are said to be triggered by the principle's default in the performance of the bonded contract. The default may be determined simply by the principle's failure to meet the contractual obligation or by evidence that the principle will be unable to meet the obligations (Mason , 2016). Murdoch and Hughes (2007) pointed out instances when call of performance bond can be made examples include: failure to meet financial obligations such as paying contractors, insolvency, refusal to remedy construction deficiencies and failure to meet the project schedule by the contractor. Labour and material payment bonds provide for payment of the bonded principal's subcontractors and material suppliers should the principal not make payments as required (Boswall, 2010). This is to ensure that payment is made on labour and materials. The Payment bond enables the contractor to call for action against the client if the client fails to pay on time (Gebre, 2006).

Advance payment bonds manage the risk of the contractor's failure to earn the whole of any advance payment from the employer by failing to provide goods and services to an equivalent value (Gebre, 2006). The failure may result from the contractor's insolvency, fraud or default through using the advance payment for another purpose. Such bonds usually contain a reduction clause, whereby the amount of the bond reduces in accordance with monthly certificates until the certified value of work done exceeds the advance payment (Fong, 2004).

1.3 Retention bond

A retention bond is where the client agrees for the contractor to take out a bond to ensure that the works under the contract are properly completed (Klee, 2018). The current regulatory framework provides for a maximum of up to 3% of the contract sum. With cash retention, the value of the bond will usually reduce after practical completion has been certified. The cash retention is normally not expected to be more than 5% of the contract sum though 10% of the money claimed can be the retention threshold held in each progress claim.

In comparison to cash retention the retention bond has many merits such as , no need to chase outstanding retentions, pre-approved so you can offer your client a bond without waiting, bond limit is set annually, simplified application procedure, payment can be made in instalments to spread the cost and to offer security for the client (Cobra Insurance Broker, 2013). Offering a retention bond in place of cash retention can result in substantial cost savings for the small scale contractor in that the money that would have been held in cash retention remains in the cash flow of the contractor improving its financial position (Underwriting Austria, 2013). In addition, the retention bond normally contains a fixed expiry date , thus, there is no confusion about when the contractor has been released from its obligations. There is also no chasing for the release of cash at the end of the works (Klee, 2018). The next sections outlines the documentation needed for obtaining a bond.

1.4 Requirement for a valid issue of a construction bond

For a construction bond to be valid for issue, there are conditions required by the surety provider, the following are the general conditions (Daka, 2019; Goldman insurance, 2019; Sodala, 2019).

- ***Corporate Profile:*** outlines the company structure its organisation and operations. It further shows company competitive intelligence toolkit
- ***Signing Of Counter Indemnity Form:*** A counter indemnity is a legal agreement, which entitles the surety company to be reimbursed by the contractor on whose behalf the bond has been issued in the event that a bond is called and paid. A counter indemnity reinforces the surety's legal rights of recourse
- ***Bank statement:*** Bank statement for the past six months and verified by the manager
- ***Sufficient Collateral:*** collateral is a security held by the bonding company for reimbursement against a surety loss for the duration of the bond. Collateral can take various forms such as cash, equipment, property etc.
- ***Irrevocable letter of credit (ILOC) and real estate equity***
- ***Current Valuation Report:*** giving the detail valuation of previously finished works by the contractor
- ***Premium Rate:*** For a bond to be issued a certain amount of money known as premuim is required to be paid. The premuim varies, but may range between 1% to 3%.
- ***About 10% to 20% Financial Deposit in Respect:*** This will be refunded upon return of the bond.

2. Methodology

The research adopted a mixed method approach using structured questionnaire and semi-structured interviews. The target group comprised of contractors (grade 4-5), surety providers and clients' consultants (specifically quantity surveyors) all based both on the Copperbelt and Lusaka provinces. The two provinces currently account for over 85% of the contractor population and over 90% of surety companies and consultancy firms. The sampling for questionnairee survey was randon while purposive sampling was used for interview respondents. The sample from the Copperbelt and Lusaka provinces was divided proportionally between the two provinces. The formula used to arrive at the sample size was adopted from Schaeffer (1979) as shown below resulting in a sample of 60 for Lusaka out of 371 and sample of 24 for the Copperbelt out of 142 possible respondents.

$$n = \frac{Npq}{(N-1)D+pq}$$

Where, q=1-p and $D=B^2/4$, n = population sample size,N= population of interest,P = probability of p (p=0.5 since there was no previous study) , q = compliment of P ,B = marginal/ bound error which must be smaller than the value of p

The interview had open-ended questions and the questionnaire had closed ended questions. Leedy and Ormorod (2014) posit that open-ended questions allow the respondent to express their attitudes or opinions without the bias associated with restricting responses to predefined alternatives On the other hand closed questions allows for collecting structured results that are easy to analyse (Ibid). Descriptive statistics were employed as an analysis technique and subsequently used in ascertaining the cashflow difficulties that small scale contractors face when cash retention is employed. The descriptive statistics method was used because it is the simplest method of analysis which provides a general overview of the results (Kombo and Tromp, 2006). Given the limited sample, software packages such as Ms Excel 2010 was used to give meaning to the data. It included measurement of central tendency and the frequency distribution. Aided by the tabulation of data extracted from a closed–ended questions surveyed, it was easier to understand the issues identified by the respondents. The qualitative data was analysed using content analysis. To attain validity data from the interview and questionnaire was triangulated using the different instruments and the different respondents.

3. Discussion

3.1 Response rate and characteristics of respondents

A total number of 106 questionnaires and 14 interviews were administered and the overall response rate was rate was 71% of the total sample size as 75 useable questionnaires were collected. From the contractors questionnaire respondents 44% were sole proprietors while 42% constituted limited companies, 12% was taken by co-operatives and 2% taken by partnership. The most common form of business organisation was the sole trader.

The Small and medium business were asked their source of business start-up or working capital and it was found that 61% had funding from the contractors own savings, 9% and 7% from overdraft and suppliers credit respectively. Bank loans was the smallest percentile of 4% whilst advance payment at 14% and others at 5%. From the findings, it can be deduced that contractors mostly depend on their own profit that is their profit from the previous project as their working capital. It was evident from the interviews that SMEs hardly access financial help from financial institutions who view them as a financial risk.

3.2 Types of Bonds used in the ZCI

Various types of bonds are used in the ZCI. All the of respondents had utilised one or more different types of construction bonds in particular bid bond (57%), performance bond (57%) and advance payment bond (57%), but none of the contractor respondents had used labour and material payment bond. The quantity surveyors indicated a few cases were the payment bond had been used presumably for large-scale contractors on private sector projects. There is scanty evidence of the use of retention bond though

some insurance firms contacted have had 1 or 2 contractors use it on private sector projects in the past 5 years as of February 2019 specifically on large scale projects.

3.3 Requirements needed for retention bond

The insurance houses contacted indicated the following as documentation that is needed at application for a retention bond: a completed proposal form, company profile, copy of company registration certificate, audited account, bank statement (3 consecutive months). Original certificate of title for unencumbered property, latest valuation property, signed directors counter indemnity forms and insurance as supportive business. Clearly, from what is needed a firm needs to be well organisation to keep such documents in place considering that the businesses considered in this study are small scale, the preparation comes at an expense not negligible to the small scale contractor.

Almost all respondents gave the following as requirements (collateral) for obtaining loan facilities; landed property, machinery, chattels, and guarantor. These are usually difficult to acquire for SMEs. This was affirmed by surety providers who indicated that SMEs are on occasion not given bonds because of lack of proper financial statements required by the surety providers and lack of collateral demanded by the surety providers.

3.4 Challenges and opportunities of cash retention

Contractors in grades four to five have limited works of up to 30 Million Kwacha depending on the category of registration (civil, building mechanical etc.) hence the projects though not that big in nature but are big enough to pose financial challenges for the contractors. The maximum limits and lower limits by category in Grade 4 and 5 for building works are Building K13M-K9M and K4M-9M respectively. With such sums of money, clients often protect themselves from contractors' failure to do satisfactory works by using traditional "cash retention" method which was indicated as being used by all the contractors (100%). However, the contractors view the of the cash retention negatively as this reduces their cash flow as indicated by the majority of the respondents (82%). The quantity surveyors in contrast view the cash retention positively as indicated in the interviews. The positive view is that the retention offers financial protection for the owner and ensures performance while imposing minimal financial hardship on contractors. Contractors stated that cash retention held mostly ranges from 5 to 10 %. and it decimates cashflow – approximately 2.5% to 5% of the turnover of a project is held by the client for a year or more post completion of the project. Additionally, contractors indicated that one third of retentions held were overdue for release. Additional reasons advanced for the negative view of the cash retention emerging from the interviews include:

1. it increases the likelihood of retentions being lost as a result of the clients insolvency;

2. it is an administrative nightmare – problems include keeping records on outstanding retention, chasing release of retention at the end of the defects liability period and trying to find out who is responsible or who has the authority to release retention a year or more after a project is completed is perceived as cumbersome.

Among the surety providers, 50% offer loan services to small-scale contractors while the remaining 50% are specialised in insurance services and others do not offer loans services to SMEs. When asked to rate likeliness of either large contractors (1-3) or small-scale contractors (4-6) to pay back loans, the

respondents rated 70% large contractors on average of being likely to payback and 30% of the respondents rated small-scale contractors to pay up. This shows that small-scale contractors do not have easy access to finance.

3.5 Perception on the feasibility of using Retention bond

Contractors were asked if they were familiar with retention bond and cash retention. The findings revealed that 40% were familiar with the retention bond nonetheless, 91% were willing to adopt the use of a retention bond despite not being familiar with the retention bond. This was done from a background that they felt it would improve their cash flow and being held by a third, party would speedy its release. There seem to be willingness on the part of contractors to use the retention bond and it is a product that is on the market in most financial institutions. Therefore, the use of the retention bond is feasible only if the clients are willing to implement its use.

Table 1 Cost Comparison between Cash Retention and Retention Bond at lowest and highest rate

Case A Cash retention **Project cost – K 600,000.00**	**Case B Retention bond (1% premium)**	**Case B Retention bond (3% premium)**
Project duration – 3 months Payments – thrice K 200,000.00 respectively Maximum value of retention fund-60,000 1st month Retention 15% of K 200,000.00 =K 30,000,.00 2nd month Retention 10% of K 200,000.00 =K 30,000.00 Total cash retention to be withheld for a period 60,000 Total Money paid out at practical completion assuming 50% of retention is released 600,000-30,000 = 570,000	Project cost – K 600,000.00 Project duration – 3 months Premuim of 1% of the contract sum Money to be bonded = K 6,000.00 Total money paid out at practical completion assuming 50% oof retention is released 600,000-6,000 = K594,000	Project cost – K 600,000.00 Project duration – 3 months Premuim of 3% of the contract sum Money to be bonded = K 18,000.00 Total Money paid out at practical completion assuming 50% oof retention is released 600,000-18,000 = K582,000

The computations in Table 1 show that the cash flow is improved when the retention bond is used. However, nine percent of the respondents chose cash retention, they gave the following reasons for opting for cash retention;

1. the procedure is not complicated and limited requirement
2. no need to pay the surety providers to obtain a bond
3. money tend to be wasted as the project progresses but with the money retained, it acts as a form of saving.
4. it enables the contractor to adhere to contract specifications in terms of quality and time

91% of the respondents chose to adopt retention bond due to the following reasons;

- Respondents would lower their bid prices thus giving them chance to tender competitively
- To avoid the problem of delay of payments provided the client goes into insolvency during a project and it becomes difficult very difficult for contractors to obtain the funds held by the client as retention, unless special arrangements have been made.
- Retention bond increases/ improves working capital and cash flow.
- The bond could help avoid the need to borrow money which attracts high interest rates.
- Retention bond will normally contain a fixed expiry date so there is no confusion about when the contractor has been released from his obligations.
- The same money obtained today will have less value tomorrow; hence retention bond enables to have the value of money as calculated.
- Retention bond does not affect working capital as much as cash retention does

- The caption below shows a comparison between cash retention and bond retention using the current bond requirements using Surety Ideal Insurance (pseudo name) in February 2019.

Some respondents gave an illustration on how retention bond is charged (see illustration above) and it can be analysed that if cash retention is applied more money is kept for a long period. However, if a retention bond is used only collateral would be required and charge of about 1% of the money to be bonded. This justifies that retention bond yields better results protecting both parties interests. However, the contractors as indicated need to provide the needed collateral. The field research showed that most contractors would prefer to use retention bond rather than cash retention. It has been demonstrated that the cash flow would be improved.

4. Conclusion

Medium and small-scale contractors often face financial difficulties. The literature and field research shows that this could be minimised by use of non-cash systems to guarantee performance. The retention bond is one such measure. The Small and medium scale contractor might benefit from the introduction of the retention bond as a means of improving cash flow assuming that they can provide the needed collateral. Use of the retention bond might additionally reduce the uncertain release payment that results from cash retention. It is also envisioned that the same benefits would accrue to large-scale contractors. Therefore, future research should focus on how the use of retention bond could affect the largescale contractor given that the sums the engage in contractually are usually huge. This might entail that the collateral provided must be of high value.

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Issues of Corruption in Construction Projects and Infrastructure Development in Nigeria: An Empirical Approach

Chinedu Adindu[1], Ikechukwu Diugwu[2], Saheed Yusuf[3] and Musa Musa[4]

Abstract

Corruption is a major problem that ravages many construction and infrastructure development projects in Africa and the world over. In Nigeria, this social menace has severely crept into the activities of the construction industry and is currently affecting the quality of project performance negatively. This paper identified project milestones and their susceptibility to corrupt tendencies at both pre-contract and post-contact stages. It further examined the frequency of occurrence of identified construction corruption sources and assessed the severity of impact of identified construction corruption sources. The methodology used involved descriptive survey and a structured questionnaire was administered to a study population involving major construction industry stakeholders with operations in North Central geopolitical zone of Nigeria. A total of 120 questionnaires were judgmentally distributed, out of which 100 returned, thus representing 83.33% response rate. Findings of the study revealed that bidding and construction stages ranked highest with 65 and 70 points respectively with regard to corruption susceptibility of project milestones at pre-contract and post-contract stages; while contract fraud and bribery recorded the highest frequency of occurrence of 70 and 65 points respectively among eleven identified construction corruption sources studied. The findings also revealed that contract embezzlement, fraud and cost-cutting ranked most in severity of impact on project performance with 85, 80 and 78 points respectively among other identified sources corruption in Nigeria. The study concluded that corrupt activities in construction project delivery in Nigeria remain a cankerworm that severely affects project performance. The study recommended the institutionalisation of the culture of transparency, good practice, ethical conduct and accountability at all phases of construction project and infrastructure development in Nigeria.

Keywords: Construction, corruption, development, infrastructure, projects

[1&2]Senior Lecturer; Department of Project Management Technology; Federal University of Technology, Minna; PMB 65, Minna, Niger State, Nigeria; chinedu.adindu@futminna.edu.ng; i.diugwu@futminna.edu.ng.
[3]Graduate Assistant; Department of Project Management Technology; Federal University of Technology, Minna; PMB 65, Minna, Niger State, Nigeria; so.yusuf@futminna.edu.ng.
[4]Assistant Lecturer; Department of Project Management Technology; Federal University of Technology, Minna; PMB 65, Minna, Niger State, Nigeria; musa.adamu2437@futminna.edu.ng.

1. Introduction

The Nigerian construction industry is highly vulnerable to corruption due to its characteristic nature. It is comparatively disorganized, uncontrolled and often difficult to clearly understand the actual interest of her stakeholders as many are there solely for the profit. Also, the industry is characterized by somewhat complex contract procurement processes, variegated interests and objectives of construction stakeholders, diversity of personnel skills, different project phases, varying size of projects, locational and geological differences, and many others, thus making the industry prone to corruption. Corruption has been defined by many researchers and organizations. Ernest et al. (2017) adopted the UN definition for corruption as giving, receiving, offering or soliciting directly or indirectly anything of value to influence the action of an official in the procurement or selection process or in contract execution. Olatunji and Muhammed (2013) noted that the definition of corruption is dependent on so many factors such as cultural, political and civilization as it varies from one society to the other. For instance, giving gift to a government official in appreciation for good performance is regarded as a means of motivation in Nigeria but this gesture may be seen as an act of corruption in the western world. Kayode et al (2013) defined corruption as a selfish interest that affects the ability of the agent (government) in providing basic services to the consumers (public), in the right place, right quantity and right quality.

According to Uwak (2016), corruption ranges from embezzlement of public funds, diversion of public fund and giving of bribes for contract in public offices. Corruption leads to backward development of a country as people occupying influential positions often misuse it for selfish purposes and wealth accumulation, rather than a call to service. There is no generally accepted justification for corruption but majority of studies relate it to poverty and greed. Ayodele et al. (2011) concludes that greed, poverty, god-fatherism in contract award, unethical behavior of professionals and profit maximization by contractors are the major causes of corruption in the construction industry.

1.1 Problem of study

All over the world, the construction industry is continually growing due to its dynamic nature and high socio-economic impact on the economy of nations. Unfortunately, the industry in Nigeria is plagued with a variety of challenges, of which corruption is key. Corrupt tendencies in Nigeria construction projects arise from multifarious sources and pervade various milestones of project execution covering both the precontract and post contract stages. Corrupt activities in construction project delivery in Nigeria, severely impacts project performance and this cankerworm, constitutes a major obstacle to the optimal realization of the nation's mass infrastructure projects considering Governments huge capital budgeting and expenditure towards their realization.

1.2 Research objectives

1) To identify the project delivery milestones at precontract and post contract stages and their susceptibility to corrupt tendencies in construction projects in Nigeria
2) To examine the frequency of occurrence of identified construction corruption sources in construction projects in Nigeria
3) To assess the severity of impact of identified construction corruption sources in construction projects in Nigeria

2. Literature Review

2.1 Overview of Nigeria construction industry and its socio-economic significance

Globally, the construction industry is one of the major drivers of an economy. According to Afzal et al. (2017), the industry contributes immensely to the GDP and employment of any country. The construction industry is a critical and pivotal sector in the European Union (EU) as all other sectors of the economy are dependent on it. In the EU, it contributes about 10% and 7% to the GDP and workforce respectively (EISC, 2012). It is also a major sector in the economy of China, as its contribution to the growth of the economy is about 7% in GDP and also creates over 30 million job opportunities (NBSC, 2015).

The Nigeria construction industry has since independence played a dominant role in the economic advancement of the country. Isa et al (2013) revealed that the construction sector had an impact of 3.76%, 3.16%, 2.86%, and 3.22% on the national GDP in 2008, 2009, 2010, and 2011 respectively. Adeagbo (2014) posited that combined efforts of both the construction and real estate sector contributed no less than 3.41% in 2012, and 3.59% in 2013. Furthermore, Andawei (2018) avers that the construction sector contributed 4.34% and 4.13% in 2015 and 2016 respectively.

2.2 The concept of corruption and its impact on Nigeria construction industry

Oluwakiyesi (2011), Mbamali and Okotie (2012), Adeagbo (2014), and Atomen et al (2015) states that although the Nigeria construction industry is significant to the socio-economic emancipation of the nation, it is unfortunately plagued with a variety of challenges, of which corruption is key. Corruption constitutes a major drawback for the operation of the construction industry in Nigeria (Olusegun et al, 2011). Transparency international defines corruption as the abuse of entrusted power for personal gain. Nigeria has a very high potential to build a stable economy, reduce poverty, provide basic services like education, health and infrastructure but clear evidence indicates that the Nigerian resources have not been judiciously used to meet the need of the populace in terms of human capital development due to high level of corruption (Nwankwo, 2014). In 2017, Transparency International ranked Nigeria 148th out of 180 countries in its corruption perception index with 27 points on a scale from 0 (most corrupt) to 100 (least corrupt) as compared to other countries.

The menace of corruption cuts across all sectors in Nigeria, with the construction industry also not left out (Olufemi and Omolayo, 2013). In appraising the impact of corruption on sustainable development of the Nigerian construction industry, Kasimu and Kolawole (2015) argue that majority of failures in the nations infrastructural project is as a result of corruption within project stakeholders stating that contractors sometimes give bribe to rig the outcome of a tender, delay project execution for personal gains, compromise quality of project and reduce quality supervision and monitoring. Corruption in the industry takes many forms like the allocation of lucrative monopolies, bribery, fraud and poor construction due to use of inferior or substandard materials (Sohail and Cavill, 2008; Olufemi and Omolayo, 2013). Faith (2016) study on appraisal of the factors influencing delays and cost overruns on construction projects in Nigeria, found among others - that high level of corruption within the government and the industry is a major causative agent. Similar studies by Sohail and Cavill, 2006; Ayodele et al, 2011; Ijewereme, 2015; Locatelli et al, 2016; Ernest et al, 2017, asserts that corruption exists in the form of bribery, fraud, favoritism, embezzlement, conflict of interest, nepotism, kickbacks, collision tendering

and bid rigging in the industry. Corruption constitutes a major drawback for the operation of the construction industry in Nigeria (Olusegun et al, 2011). This has led to the Nigeria's poor project performance leading to gross underdevelopment and large absence of basic infrastructure, unstable economic outlook, and mass poverty.

2.3 Project management perspectives in construction project performance

A project life cycle consists of different stages during which deliverables are created and end with approval of the deliverables (Rashmi, 2008). These stages include: initiation, planning, execution, monitoring and control, and closing. The concept of project delivery involves customer satisfaction especially in meeting/exceeding clients' expectations which is a way of actualizing set goals and objectives on any given project. Successful outcome in project management is usually achieved through a carefully structured process involving all the stages associated with project delivery. This process enables projects to be planned within the scope, quality, schedule, risk, resources as well as budget. The ability of a project manager to meet these requirements ensures project success. However, the success of this process can be marred by corruption through each and every stage of project delivery. The way and manner corruption take its shape or form is different through the project stages, and also dependent upon the stage a particular project is at a particular point in time. Sohail and Cavil (2008) noted that corruption occur in construction projects at both precontract and post contract stages. The corrupt tendencies cut across the planning and design stages and extends to pre-qualification and tendering, project execution, inspection, maintenance and management stages.

3. Research Methodology

The study is a descriptive survey and the research design involved use of a structured questionnaire. The questionnaire fundamentally sought responses on the sources of corruption, and their severity of impact on project performance. The study's population of interest included several construction industry practitioners including engineers, quantity surveyors, architects, builders, and project managers. These professionals work in construction companies, professional consultancy firms, client organizations, building materials manufacturing firms, etc. located in North Central Geopolitical Zone of Nigeria. A total of 120 questionnaires were judgmentally distributed, out of which 100 returned, thus representing 83.33% response rate. This return rate was considered adequate for a zonal study of this magnitude. Consequently, a total of 100 valid responses formed basis for data presentation, analysis, conclusion and recommendation of study.

4. Study Results

4.1 Demographic features of respondents surveyed

Respondents were made up of 63% male and 37% female (Table 1), with most respondents between 25-29 years of age with 38% (Table 2), and qualification of BSc/BEng/BTech (39%) (Tabe 3). The respondents comprised Civil Engineers (33%), Project Managers (26%), Quantity Surveyors (18%), Architects (14%) and Builders (6%) (Table 4). Most of the respondents have professional experience of between 1-5 years (31%) and 24% had between 5-10 years.

Table 5: Analysis of respondents by gender

Gender	Frequency	Percentage	Cumulative percentage
Male	63	63	63
Female	37	37	100
Total	100	100	

Source: Authors Field Survey, 2018

Table 6: Analysis of respondents by age

Age Range	Frequency	Percentage	Cumulative percentage
20 – 24	9	9	9
25 -29	38	38	47
30 - 34	11	11	58
35 - 39	29	29	71
40 – above	13	13	100
Total	100	100	

Source: Authors Field Survey, 2018

Table 7: Analysis of respondents by level of education

Qualification	Frequency	Percentage	Cumulative percentage
HND	19	19	19
BSc/BEng/BTech	39	39	58
MSc/MEng/MTech	28	28	86
PhD	14	14	100
Total	100	100	

Source: Authors Field Survey, 2018

Table 8: Analysis of respondents by level of education

Discipline	Frequency	Percentage	Cumulative percentage
Civil Engineer	33	33	33
Quantity Surveyor	18	18	51
Architect	14	14	65
Project Manager	26	26	91
Builder	9	9	100
Total	100	100	

Source: Authors Field Survey, 2018

Table 9: Analysis of respondents by professional experience

	Frequency	Percentage	Cumulative percentage
1 – 5	31	31	31
5 – 10	24	24	55
10 – 15	18	18	73
15 – 20	16	16	89
Over 20	11	11	100
Total	100	100	

Source: Authors Field Survey, 2018

4.2 Responses on issues of corruption in Nigeria construction project delivery

Figure 1 presents results of the issues of corruption. The respondents were mostly in agreement on the issues of corruption at the pre-contract stages of bidding, followed by project selection, tender opening/adjudication and contract documentation. On the contrary, in the post contract stage of project delivery, the construction stage is most susceptible to corruption (Figure 2). The identified sources of corruption were mostly embezzlement and fraud, as well as bribery, over-design and over-evaluation (Figure 3). Figure 4 identified the severity and impact of the corruption issues on construction performance in the Nigerian construction industry.

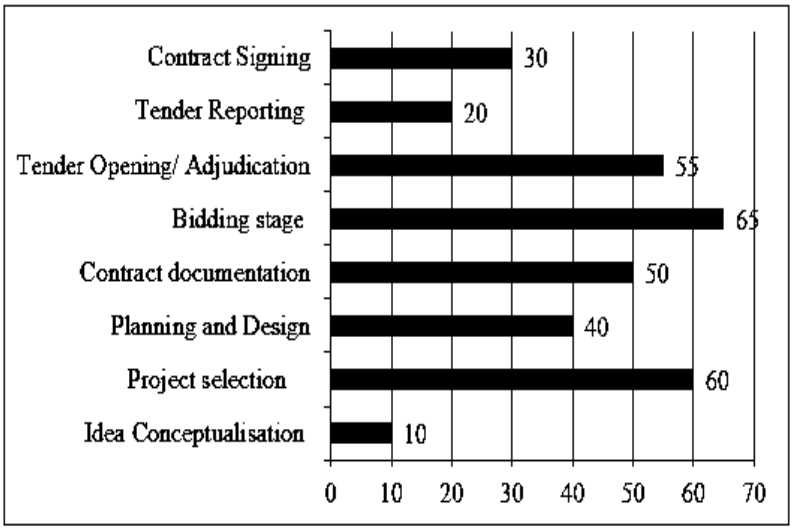

Figure 4: Susceptibility of pre-contract project delivery milestones to corrupt tendencies in Nigeria (Source: Authors Field Survey, 2018)

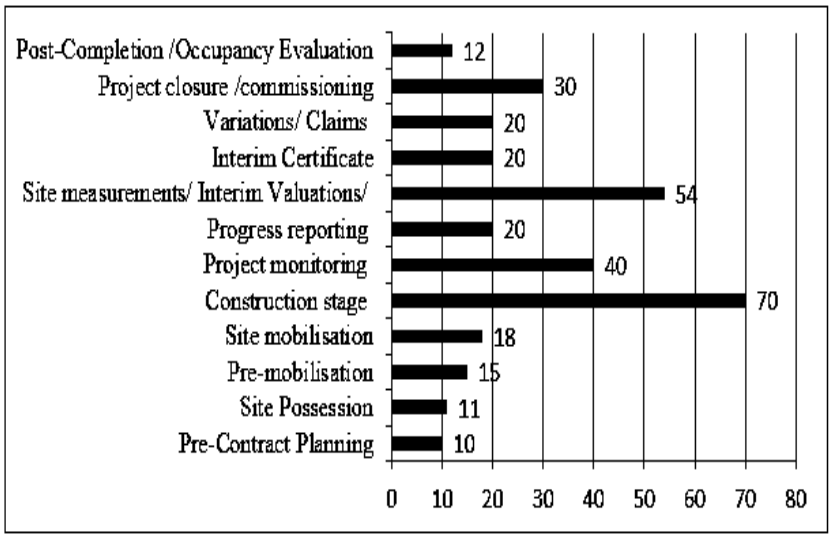

Figure 5: Susceptibility of post-contract project delivery milestones to corrupt tendencies in Nigeria (Source: Authors Field Survey, 2018)

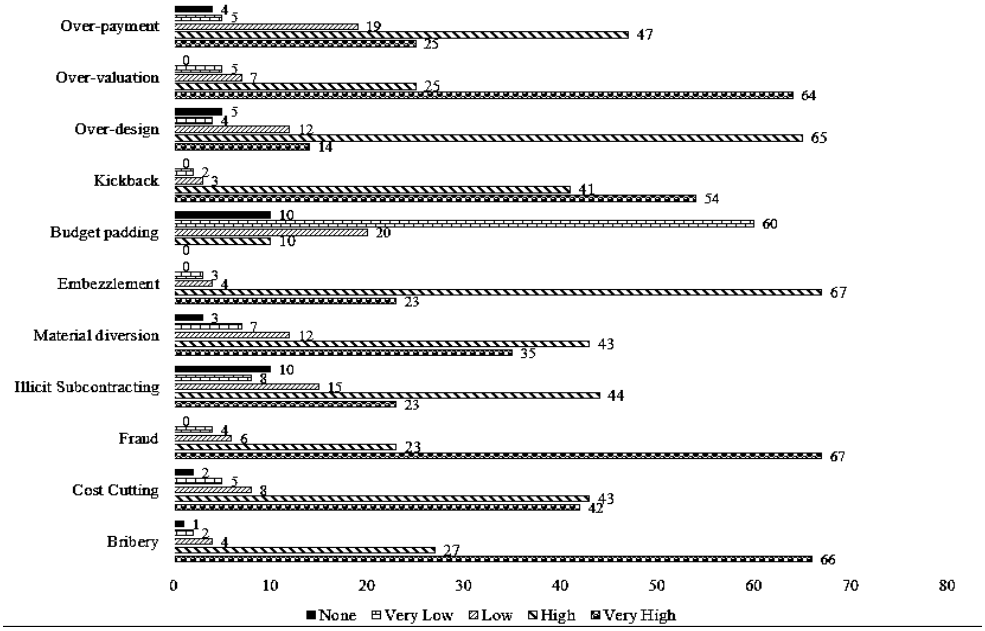

Figure 6: Identified corruption sources and their frequency of occurrence in construction project delivery in Nigeria (Source: Authors Field Survey, 2018)

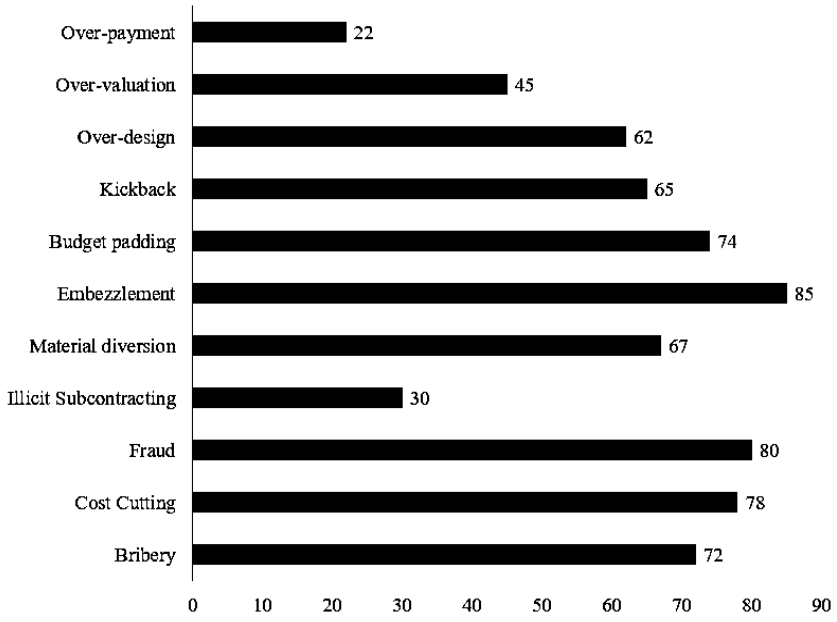

Figure 7: Identified corruption sources according to their severity of impact on construction project performance in Nigeria (Source: Authors Field Survey, 2018)

5. Conclusion

Corrupt tendencies in Nigeria construction projects arise from multifarious sources and pervade various milestones of project execution covering both precontract and post contract stages. Corrupt activities in construction project delivery in Nigeria has been variously identified as a cankerworm that severely impacts project performance. Findings of the study revealed that bidding and construction stages ranked highest with regards to corruption susceptibility of project milestones at pre-contract and post-contract stages; while contract fraud and bribery recorded the highest frequency of occurrence among identified construction corruption sources studied. The findings also revealed that contract embezzlement, fraud and cost -cutting ranked most in severity of impact on project performance among other identified sources corruption in Nigeria.

6. Recommendations

1) Entrenching the culture of transparency, good practice and ethical conduct in construction project and infrastructure procurement in Nigeria.
2) Ensuring integrity of project participants especially in the appointment of consultants and selection of contractors.
3) Developing a template for cost control and ethical performance of all project stakeholders throughout the pre-contract stages, post-contract stages, and entire project development circle.
4) Institutionalizing project accountability and auditing in all construction and infrastructure development projects in Nigeria.

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Root Causes of Delays in Ghanaian Public Sector Competitive Tendering Process

Jemima Antwiwaa Ottou[1], Bernard Kofi Baiden[2] and Gabriel Nani[3]

Abstract

Undue delays in public sector competitive tendering are perceived to persist because efforts to address them are not targeted at the root causes. This research highlights the need to identify the root causes of delays in public works competitive tendering process in order to identify actual causes of delay and not perceived causes. A multiple case study of three Ghanaian public entities was used to identify the root causes of delays in the competitive tendering process. The root causes of delays in the competitive tendering process are delays in approval processes and improper procurement planning. Root causes of delays should be identified in order to address actual delays and not perceived ones. This approach departs from the identification of symptoms as causes and focuses on actual causes of delays, enhancing process efficiency through innovation.

Keywords: Competitive tendering, delay, perceived cause, root cause.

1. Introduction

Undue delays continue to persist in the competitive tendering processes of construction projects in public sector entities. These delays have ended up wasting the already scarce public resources (Lynch, 2013a) and have prevented construction projects from fully achieving their expected outputs (Lynch, 2013b). Delays persist because, attempts to address them have addressed only its symptoms as spontaneous assumptions and indiscriminate guess work (McCarty and Fisher, 2007) are employed to identify the causes of delays. There is therefore the need to apply tools that can identify root causes of delays instead of their symptoms.

Quality management tools such as failure mode effect analysis (ASQ, 2018), mind maps, problem trees (UN Women, 2012), fault tree analysis (Marshall, 2012), check sheets, control chart, histogram, flow chat, and scatter diagram (Bhat, 2014) have been applied in identifying causes of business problems. These tools however, lack the ability to combine rigour and ease to systematically identify root causes of problems in order to facilitate effective solutions. It has been argued that the best tools are the ones that are rigorous and can easily be understood and implemented by a variety of professionals (Bhat, 2014). The concurrent application of 'Pareto analysis', 'brainstorming', and '5 whys' provide opportunity to rigorously identify root causes of business problems in a simple way. This paper focuses

[1]Department of Construction Technology and Management, Kwame Nkrumah University of Science and Technology; Kumasi / Business School, Ghana Institute of Management and Public Administration, Accra, Ghana; jemaot@gmail.com
[2&3]Department of Construction Technology and Management, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana.

on identifying the root causes of delays in public sector competitive tendering as literature on causes of delay is scanty with very little focus on identifying it root causes.

In this paper, literature was reviewed on the causes of delays and the quality management tools that can be applied to ensure methodological rigour and application ease in identifying the root causes of delays. A multiple case study was conducted to identify the root causes of delays in the competitive tendering process of selected public entities in Ghana.

1.1 Objectives of Study

In order to identify the root causes of delays in public works competitive tendering process, the following objectives were set for the study.

i. Establish the existence of delays in the public works competitive tendering process in Ghana.
ii. Identify the root causes of delays in the public works competitive tendering process in Ghana.

1.2 Scope of the Study

The study focused on national and international competitive tendering process for construction projects commenced between 2013 and 2015 in three selected best performing public entities in Ghana.

2. Root Cause Analysis of Delays

There are several tools for identifying the root causes of a business problem. Exemplar Global College (2015) identifies brainstorming, 5 whys, flow charting, fish bone diagrams, and affinity diagrams as examples of such tools. Even though these tools can be used independently to identify the root causes of problems, the rigour in method is enhanced when two or three tools are combined and used concurrently (Exemplar Global College, 2015). The combination of tools also addresses the weaknesses that are brought to bear, when they are used independently. For example, although brainstorming can lead to some great hypotheses, the data can be difficult to analyse without applying a tool than can categorize the ideas.

To identify the root causes of business problems, it is important to identify the effect of such problems. Business problems are the same as the effects of several causes of the problem that need to be addressed. A typical example of an effect that has resulted in the poor performance of public sector competitive tendering is delay (Ren et al. 2012; Nzau and Njeru, 2014). Delay refers to the inability of the various process steps within the competitive tendering process to meet their planned deadlines (Lynch, 2013a; Lynch, 2013b). The competitive tendering process in this paper spans from the commencement stage, preparation of tender documents, advertisement, receipt of bids, opening of bids, evaluation of bids, concurrence from the relevant authority, to award of contract. These process steps were adopted in this paper because, they represent the process generally involved in competitive tendering and endorsed by ISO 10845-1 as well as Ghana's Public Procurement Act 663 (Amended to Act 916).

Pareto's analysis, brainstorming, and 5 whys can be applied concurrently to identify root causes of competitive tendering process delays. There is however a need to discuss the direct causes of delays in the competitive tendering process of public works procurement.

2.1 Causes of delays in public competitive tendering process

The competitive tendering process in the public sector is characterised by undue delay (Lynch, 2013a; Lynch, 2013b). These delays are due to several factors which have been discussed in ensuing sections.

2.1.1 Delay in preparing technical specifications and scope of works

Technical specifications are documents that provide vivid description of what and how works must be done. Scope of works determine the boundaries of the works to be carried out. It is therefore necessary that these documents are well understood by contractors and evaluation panel members (Lynch, 2013a; Lynch, 2013b).

Where an entity lacks the expertise to prepare these documents, the tendering process is delayed to enable the entity procure the services of such experts (Uyarra et al. 2014). Alternatively, the entity commences the tendering process with poorly prepared technical specifications and has to cope with request for clarifications from the prospective bidders which may eventually lead to extension of bid closing date leading to delays (Mahmood, 2010).

2.1.2 Failure to commence tendering process

Failure to commence the tendering process as planned is a very common cause of delay in public institutions (Lynch, 2013a). In most cases there exist an approved procurement plan but the challenge is that procurement activities are usually carried out without strict adherence to the approved plan. The reason for this could be the lack of political will (Murray, 2009), unforeseen occurrences, lack of funds, or even a change in the organisation's program (Uyarra et al. 2014).

2.1.3 Extension of bid submission date

In some instances, bid submission dates have to be extended for genuine reasons (Lynch, 2013a). Some of these reasons are: errors in tender documents; request for extension by prospective bidders; poor response to invitation to treat; unforeseen events such as demonstrations, strikes, and act of God (Lynch, 2013a); and request for clarification by prospective bidders leading to amendment of tender documents (CIOB, 2010). These factors are difficult to predict and hence their occurrence lead to extension of the bid submission date thus causing delays.

2.1.4 Delay in opening bids

Bids must be publicly opened immediately after the bid submission date and time. However, some events that are out of the control of the entity occur that sometimes forces them to postpone the opening of bids causing delays (CIOB, 2010; Lynch, 2013a).

2.1.5 Delays in the evaluation of bids

Even though the entities organise the evaluation of bids received, the evaluation is handled by an independent panel made up of three or more persons who may not be employees in the procuring entity. The challenge here is the unavailability of panel members as they may be engaged in other activities at different times. This delays the starting or finishing of the evaluation process and hence, the tendering process (CIOB, 2010; Lynch, 2013a; Lynch, 2013b). Another reason for delaying the evaluation of bids is the time required by panel members to seek clarification from bidders (Chimwani et al. 2014). These

clarifications have to be in written documents to enhance proper record keeping and transparency. Sending letters and waiting for responses from prospective bidders tend to delay the evaluation process.

2.1.6 Delays in approval process

Public competitive tendering requires approvals at various stages in the process. Approvals at different levels are required depending on the method of tendering and the amount involved. Approvals are given within the entity and from external authorities. Awaiting these approvals can cause undue delay due to poor management of process (Lynch, 2013a; Lynch, 2013b; Uyarra et al. 2014). These delays by the approving authority can be due to the cancellation of a meeting or not having enough time to address all issues set before them at a particular time. Approval from donors or funding organisations also causes delays of such nature.

2.1.7 Contractor challenging the tendering process

Contractors have the right to formally challenge the tendering process if they believe that the procuring entity did not comply with procurement rules or they have been treated unfairly once they have the required evidence. This sometimes causes undue delays as the entity has to suspend the procurement processes for the concerns to be addressed (Lynch, 2013a).

2.1.8 Improper procurement plan

Some public entities also fail to plan appropriately for the tendering processes (Yu et al. 2009; Lynch, 2013b). The plans are sometimes not realistic as timelines are too short. For this reason, these entities record high incidence of delays which in the actual sense are not delays.

Towards addressing delays

Having identified the potential direct causes of delays in public works competitive tendering processes, it has become necessary to also discuss the way to effectively address these delays.

2.2 Addressing Delays in Public Competitive Tendering

A sustainable way of dealing with public works competitive tendering delays is by identifying the actual causes of delays and addressing them. The actual causes of delays can be identified by applying the Pareto's analysis, brainstorming, and 5 whys concurrently to identify the root causes of delays. Until the root causes of delay are identified, any attempt to address perceived causes of delays may just be addressing the symptoms of delay and not delay itself.

2.2.1 Case study design

The potential direct causes of delays in the competitive tendering process were identified through literature review. Further, a case study strategy was used to identify the root causes of delays in same. Thus, three excellent ranked public entities were selected form the 2014 maturity table of Public Procurement Authority where 38 out of 546 public entities in Ghana were assessed to be excellent performing. Excellent ranked entities which were adopted as critical cases (Yin, 2014) were targeted because they could provide the necessary documentary evidence required for the study. Three (3) entities were selected because these were the entities that agreed to be part of the study. Also, findings from these critical cases can be logically generalised as the situation in Ghana since the worst or moderate performing entities are not likely to experience better conditions.

Documentary evidence (procurement plans and updates) from 2013 to 2015 of three cases were used for this research because the procurement processes used for the 2014 assessment spanned from 2013 to 2015. To ensure external validity, analytical generalization (Yin, 2014) was employed. This required the use of a case study protocol in order to ensure reliability (Yin, 2014). A cross-case comparison was planned and maintained thus each case was treated as unique to ensure it retained its contextual individuality. The procedures for data collection and analysis were well structured and standardised to ensure the cross-case comparisons was robust (Bryman, 2008).

Having selected the cases to be studied brainstorming teams comprising key personnel that handled the competitive tendering process in the various entities from 2013-2015 were formed in each case. Then, the causes of delays were identified asking "why" to the fifth level in a brainstorming session. Further, all the identified causes were tabulated and the root causes were identified using Pareto's analysis (vital few and trivial many). Causes with a frequency of less than five (5) were categorised as trivial many whereas those with a frequency of more than or equal five (5) to were categorised as vital few. The vital few causes were further reviewed by the brainstorming team to determine the possibility for the entity to address them, before a group consensus was reached on the root causes of delays in each case.

It is necessary to also note that, since the study involved human participants some ethical considerations came to play. Confidentiality and anonymity were adopted to ensure that study participants were protected from harm, hence the exclusion of a narrative description of the cases investigated. The consent of the participants was also sought by fully informing them of the procedure and allowing them to choose to participate in the study. Further, honesty with professional colleagues was ensured in order to maintain proper ethical standards.

3. Analysis and Results

Having selected the cases, the existence of delays was established by reviewing the planned and actual timelines for the various process steps within the competitive tendering process. In Case 1 there were seven (7), Case 2 there were eight (8), and Case 3 there were seven (7) competitive tendering processes from 2013 to 2015 respectively which were analysed. Table 1 presents a summary of the performance of processes handled by the respective cases.

From Table 1, it is clear that 100% of the competitive tendering processes delayed in Case 1 and Case 2 whiles 57% of processes delayed in Case 3. Since the existence of delays have been confirmed, further analysis using the 'Pareto's analysis, brainstorming, and 5 whys' concurrently was employed to identify the root causes of the delays.

Table 1: Delayed and Timely Competitive Tendering Processes

Processes	Case 1	Case 2	Case 3
Total Number of Processes	7	8	8
Number of Timely Processes	0	0	3
Number of Delayed Processes	7	8	4

Source: Documentary Analysis

3.1 Case 1

A list of all the identified causes through 5 why approach used in the brainstorming session was extracted. The identified causes were categorised based on the number of times or frequency they were established as causes in the brainstorming session. Further, the causes were categorised as vital few and trivial many as shown in Table 2.

From Table 2, the root cause of delays in the competitive tendering processes is likely to be bureaucratic process steps as it has the highest frequency of nine (9). Thus, a group discussion was held by the brainstorming team and it was agreed that bureaucratic process steps was the root cause of the delays within the competitive tendering process.

Table 2: Categorisation of Causes of Delay

Category of Causes	Case 1	Case 2	Case 3
Vital Few (causes with frequency of ≥ 5)	Bureaucratic process steps with a frequency of 9	Insufficient planned timelines with a frequency of 5	Insufficient planned timelines with a frequency of 9
Trivial Many (causes with frequency of < 5)	A total of 15 deferent causes with frequencies ranging from 1-4	A total of 20 deferent causes with frequencies ranging from 1-3	A total of 23 deferent causes with frequencies ranging from 1-2

Source: Brain Storming Session

The trivial many causes were, unforeseen occurrences; limited funds; prioritisation of projects; delays in prioritisation; delays in the review of award letter by legal department; delays in review of award letter; delays in receiving approval letter from external body; delays in reviewing the evaluation report; delays in submitting evaluation report; delays in budget revision; legal department reviews; technical department reviews; irregular meeting times of external board; delays in issuing or sending approval letter and request for clarification.

3.2 Case 2

From Table 2, the root cause of delays in the competitive tendering processes is likely to be insufficient planned timelines as it had the highest frequency of five (5). Thus, a group discussion was held by the brainstorming team and it was agreed that insufficient planned timelines was the root cause of the delays within the competitive tendering process.

The trivial many causes were poor teamwork; attitude of staff; varying guidelines from donors; use of multiple languages; multiple source of funds; project extending across national boundaries; extended reviews; challenges in preparing tender documents; delays by publishers; advertisement handled by a different unit; deliberate delay to avoid foreign holidays; unforeseen occurrences; request for extension from bidders; bidders seeking clarification; tender documents poorly prepared; negotiation before award; independent consultant to prepare tender documents; unforeseen occurrences; resettlement of project affected persons; preparation of resettlement action plan; and constitution of joint implementation committee.

3.3 Case 3

From Table 2, the root cause of delays in the competitive tendering processes is likely to be insufficient planned timelines as it has the highest frequency of 9. Thus, a group discussion was held by the brainstorming team and it was agreed that insufficient planned timelines was the root cause of the delays within the competitive tendering process.

The trivial many causes were, entity head not readily available; approval required from entity head; entity head busy with other official duties; difficulty for panel members to meet because of other responsibilities; delays by publishers; advertisement handled by public relations; prioritising of news to be published by publishers; delays in sending advert to publishers; delays in receiving approval to advertise from entity head; delay by evaluation panel members; due diligence by panel members; clarification seeking from bidders; panel members evaluating bids for more than one project at a time; negotiation before award; issues raised by review board to be clarified with prospective contractor; specialised nature of works; extended reviews; political influence; subjective aspect of report; delays in submitting report to external body; report requires approval by entity tender committee; awaiting approval from entity tender committee; and preparing minutes of the entity tender committee meeting.

3.4 Cross Case Synthesis

Empirically, the root cause of delays in Case 1 was bureaucracy process steps. This result is in line with the findings from the literature review where Uyarra et al. (2014), Lynch (2013a), Lynch (2013b) identifies delays in approval processes as a cause of delay in the competitive tendering process of public entities. In Case 2 and Case 3, the root cause of delays was insufficient planned timelines. This finding confirms the literature findings where unrealistic planned timelines for process steps due to poor planning is identified by Lynch (2013b) and Yu et al. (2009) as the significant factor causing the process delays.

Thus, it can be concluded that the root causes of delays in the competitive tendering processes in Ghana are, delays in approval processes and improper procurement planning. Thus, the empirical findings on the existence of perceived and actual delays are presented in Table 3.

From Table 3, it can be deduced that without the identification of root causes of delays, the perceived problem for all the three cases was delays in their competitive tendering process. However, with the identification of the root causes of the perceived problem it became clear that whereas delays actually existed in Case 1, Case 2 and Case 3 on the other hand recorded perceived delays due to poor planning of process timelines.

Thus, it can be deduced that the real existence of a perceived problem can be established by identifying the root causes of the problem. This will aid entities to address real problems instead of perceived problems and hence promote efficiency in the competitive tendering process by targeting real problems. This approach to addressing delays will enhance innovation in infrastructure delivery.

Table 3: Empirical Finding from the Three Selected Cases

Empirical Findings	Case 1	Case 2	Case 3
Existence of Perceived Delays	Yes	Yes	Yes
Existence of Actual Delays	Yes	No	No

4. Conclusion and Future Research

Actual and perceived delays exist in the competitive tendering process in Ghana. The root causes of these delays are, delays in approval processes and improper procurement planning. Since the cases selected are critical, it can be concluded that when public entities in Ghana plan procurement well and expedite action in approvals, delays can be addressed. Therefore, researchers and practitioners should depart from identifying causes of delays in competitive tendering process through spontaneous assumptions and indiscriminate guess work by applying tools that can identify the root causes of delays.

The research advocates that for delays to be addressed, it is important to identify the root causes to ensure sustainable measures. Also, for actual causes of problems to be identified, the root causes of the problem must be identified. This will promote efficiency in the competitive tendering process and enhance innovation in infrastructure delivery as scarce public resources will not be wasted on addressing perceived delays. Those likely to benefit from this include, engineers, quantity surveyors, project managers and procurement experts. Future research will focus on proposing strategies to address the delays.

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A Skills Measurement Framework for the Construction Industry: A Case of Lusaka Province

Pauline Phiri[1], Erastus Mwanaumo[2] and Balimu Mwiya[3]

Abstract

The purpose the study was to develop a skills measurement to enhance skills development for the Construction industry in Zambia. The cyclic nature of the construction industry gives rise to skills mismatches which cause fluctuations in skills demand and supply. This study investigated the issue of skills mismatches and developed a skills measurement framework to address it. Transportation infrastructure development was the primary focus due to the government's plan to implement transportation infrastructure development projects. The research design employed a mixed method approach to include both quantitative and qualitative data. A total of 162 firms consisting of contractors, consultants, government institutions and local authorities in Lusaka Province whose core of business was inclined towards construction and development of transportation infrastructure were identified and used as the sample frame. Stratified random sampling was used to select respondents in the sample size. The method employed for data collection was the distribution of fifty (50) structured questionnaires and the conducting of three semi- structured interviews with curriculum development experts in higher education institutions offering construction related courses. This was done with the aid of an interview guide. Quantitative data from the questionnaires was analysed using statistical software and qualitative analysis from interviews was analysed using content analysis. The most influential factors of supply and demand were; defined career paths, education and training requirements, salary scale and technological progression. Results revealed that the type of mismatches that existed were a skills gap and skills shortage. They revealed a shortage of Engineers and Construction Supervisors. Skills gaps were identified in the preparation of design specifications, estimation of project costs and preparing detailed cost plans, preparing construction method statements and technical specifications, as well technical and financial reporting. A sequential five-stage skills measurement framework structure was designed that investigated important aspects for skills development which are responsive to industry needs. The stages yield outputs which identify factors influencing skills demand and supply and skill competency requirements in construction, and assess the ability of the workforce meet the required skills competencies.

Keywords: Construction, competency, skills mismatch, transportation infrastructure

[1]Associate Engineer; WCE Zambia Limited; P/Bag E10 Box 390, Lusaka Zambia; elpirezo@gmail.com
[2]Lecturer; Department of Civil and Environmental Engineering; University of Zambia; P.O. Box 32379, Lusaka; balimu.mwiya@unza.zm
[3]Assistant Dean Postgraduate; Department of Civil and Environmental Engineering; University of Zambia; P.O. Box 32379, Lusaka; Erastus.mwanaumo@unza.zm

1. Introduction

Human resource is a key input in construction industry (Neyestani, 2014). The various construction activities in their progressive stages require diverse skill sets at different professional levels and in varying quantities, and thus skills competency will always be a matter of concern in the construction industry. A major aspect to consider is the cyclical nature of construction work because it results in fluctuations in potential output, employment and training levels (Agapiou, et al., 1995). This leads to varying skills needs in response to dynamic changes in the construction skills market, which is a key skills challenge. A skill issue that results from the cyclic nature of the labour market is skills mismatch. Obadic (2006) defines the concept of labour mismatch, as the existence of disequilibrium or maladjustment between labour supply and demand. Skills mismatches occur when workers have either fewer or more skills than jobs require. In the modern labour markets, different forms of labour skills mismatch coexist. (GACE, et al., 2014). Common factors influencing the demand and supply of skills in the labour market include an ageing population (OECD, 2017), demography, education and training, technological change (UKCES, 2013) globalization and changes brought about by government policy (CTD, 2004). Identifying the form of mismatch that is prevalent enables a direct approach to address the skills issue that is affecting industry performance. What needs to be determined is whether there is a skills mismatch or disequilibrium when a labour shortage occurs (Reddy, et al., 2016).

Gauging labour market conditions that determine the skills demand and supply cycle of labour in construction is a challenge in Zambia because construction sector specific aggregated labour market information is scarce. (Koyi, et al., 2012). A result is that training institutions are insufficiently responsive to market demands which make the labour supply rigid. (DFID, 2014). Some of the available sources with scanty construction sector information are the National Development Plans (NDPs). The Seventh National Development Plan (7NDP) outlines one of development outcomes to be improved transport systems and infrastructure. It highlights government plans to invest in infrastructure development of railway, aviation, road and maritime and inland waterways. (MoNDP, 2017). This signifies a focus on transportation infrastructure development in the Zambian construction sector, however it does not add specific focus on development of the relevant skills associated with it. Zambian transportation infrastructure has been unsustainable and exhibited slow growth due to weak structural and management capacity (ZDA, 2014). General economic diversification in line with global trends is minimal, and the lack thereof, to some extent, been constrained by the shortage of technical and professional skills in the domestic labour market (UNDP, 2016). A working paper by Moono and Rankin (2013) indicated that there was difficulty in sourcing and retaining skilled and experienced labour in construction. In addition, they discovered an evident gap between education providers and industry such that relevant skills needs were not being addressed.

The nature of skills incompetency is in terms of cognitive skills, which are the ability to discern when and how to apply knowledge in a practical sense (Greene & Papalambros, 2016) and non-cognitive skills which deal with individual behaviours, personal characteristics and attitudes in the workplace. (Gutman & Schoon, 2013). Selected indicators provide signals on whether demand outstrips the supply for specific occupations at a particular point in time (Reddy, et al., 2016). Indicators provide relevant data in order to monitor and assess organizational labour strategies. A profound weakness of the use of indicators is that a more direct measure of skills rather than qualifications would be preferable but is not possible because of limited data availability (OECD, et al., 2013). The difficulty in formalising the notion of skill

mismatch is the identifying of job requirements (Fichen & Pellizaari, 2014). A framework should be constructed to identify skills supply and demand mismatches at the detailed occupational level, according to standard occupation codes to measure skills imbalances in the labour market (Rasool, n.d.). International Standard Classification of Occupations (ISCO-08) is an ideal tool for organizing jobs into a clearly defined set of groups according to the tasks and duties undertaken in the job.

The challenge therefore lies in identifying skills mismatches and planning for and implementing skills development programmes that will bridge the gap between education and industry. This study investigated construction skills mismatch identification through skills competency analysis. With technological progression being a key influential factor of skills demand and supply, skills of managers, professionals and associate professionals were assessed. This was because the skills are 'primarily' reported at these skill levels.

2. Methodology

2.1 Research design

The research examined the state of the Zambian construction industry labour market environment of the transportation sub sector in Lusaka Province. It investigated on what factors were influencing the demand and supply of skills, the on-the job skills requirements for the different phases of construction, the skills competencies of the existing workforce and the strategies implemented by training institutions when conducting skills audits for curriculum review and design.

2.2 Research instruments

Data was collected through the use of structured questionnaires and by the conducting of semi- structured interviews with the aid of an interview guide. The sampling frame was formulated by selecting contractors from a published list of National Council for Construction (NCC) registered contractors (Grades 1-4), consultancy firms that were registered with Association of Consulting Engineers of Zambia (ACEZ), government agencies and local authorities that conduct civil engineering works and higher-level institutions that offered Science Technology Engineering and Mathematics (STEM) programmes. A total of 162 firms and organisations conducting transportation infrastructure development were identified and used as the sampling frame. Stratified random sampling from the four tiers was used to select respondents in the sample size consisting of 53 firms and institutions.

The interviews targeted curriculum development experts in higher education institutions with a minimum of two years of experience in curriculum review and training programme development. The particular selection of the institutions was based on the identification of construction related programmes offered by institutions that were randomly selected from a list of Universities, Colleges and TEVET institutions in Lusaka. These accounted for 9 randomly selected institutions. Following a review of the list of institutions and programmes, it was observed that there were outstanding bodies that encompassed the curricula of majority of other institutions. These included NCC, the statutory body responsible for the promotion, development, training and regulation of the construction industry in Zambia, and TEVETA the regulator of all institutions providing technical education, vocational and entrepreneurship training.

The University of Zambia was also one of the selected institutions. The interviews were conducted from these three institutions.

The skills framework design incorporated information from the questionnaires and interviews. Information collated from the interviews provided insight on how local higher educational institutions conduct skills audits for curriculum development. This led to the formulation of a sequential five-stage framework structure, indicating the required input and the corresponding output of each progressive stage. The stages involved in skills assessment in the framework was derived using common principles applied in local skills audits identified from the interviews. The questionnaire survey provided data sets for the input into the framework. The questions investigated: (1) factors influencing skills demand and supply, (2) skill competency requirements in construction and (3) the ability of the workforce meet the required skills competencies.

2.3 Data analysis

Data collected from the questionnaires was analysed using statistical techniques and presented as percentages, frequencies and mean scores for various competency items. Skills measurement was conducted using the rating scale in table 1.

Table 1: Rating scale for skills competency ranking

Rating Scale	Description of Level of skill competency	Competency ranking
5	Experienced: Rich set of specialized skills allowing for knowledge transfer in training	Very High (5)
4	Extensive Knowledge: Regularly apply knowledge in accomplishing job	High (4 > 5)
3	Moderate Knowledge: Professional training received in area, occasionally applied	Medium (3 > 4)
2	Limited Knowledge: Knowledge from some formal training but rarely applied	Low (2 > 3)
1	Passing knowledge: knowledge from a few hours of training, but never applied	Very Low (< 2)

Data from the interviews was analysed using content analysis. The process involved categorisation of verbal data by collecting similar words and phrases to draw realistic conclusions of condensed word units. The end result was a set of codes that described the findings according to set out themes of each section of the interview guide.

3. Results and Discussion

3.1 Questionnaire findings

A total of fifty (50) self-administered questionnaires were distributed through electronic mail and hand delivery. Thirty-eight (38) questionnaires were filled and returned, giving a 76 percent response rate.

3.1.1 Industry demographics

Findings depicted the investigated construction skills market to consist of a younger workforce with the whole sample size consisting of individuals less than 40 years old. The educational and professional qualifications were characterised by 89.5 percent of respondents having a Bachelor's Degree or higher. The Research findings also indicated that transportation infrastructure development in Zambia is dominated by the road sector with 86.8 percent of the respondents' organizations having road construction projects. There was a challenge in identifying respondents to participate from the rail and air sectors.

3.1.2 Factors influencing skills demand and supply

Results indicated that social factors, as well as education and training were most prominent. The importance of meeting education and training requirements was highlighted in response rates for the reasons for the inability to fill vacancies. These were: company is unable to pay market rate (23.7%), lack of relevant work experience (23.7%), lack of the qualifications needed (10.5%), not enough people with job-specific skills in the industry (10.5%), lack of technical or practical skills (7.9%), poor attitude/motivation or personality (5.3%), not enough people interested in doing this kind of job (5.3%), low number of applicants (2.6%), job requires unsociable work hours (2.6%) and unknown reasons (7.9%). The lack of relevant work experience was a key reason. This information corresponds with the fact that a large number of respondents had less than five years of work experience. A total of 71.1 percent of respondents had less than five years of work experience. 15.8 percent had 5-10 years of experience, 5.3 percent had 10-15 years of experience and 7.9 percent had more than 15 years of work experience in the industry. With the market saturated with graduates and the need for relative work experience in construction, the logical option would be to invest more in on the job training and industrial training programmes.

Skills requirements

The frequency of task execution was used as a means of identifying what the skills requirements were, as shown in table 3. The rating scale shown in table 1 was used for ranking of skills competencies of respondents.

Table 2: Investigated Factors influencing skills demand and supply

No.	Factor description	Type of factor	Mean Score
1	Personal interest in doing this type of job	Social	4.66
2	Your attitude, motivation, or personality	Social	4.61
3	Personal technical and practical skills	Education and training	4.50
4	Salary scale	Economic	4.45
5	Relevant work experience	Education and training	4.24
6	Personal qualification level	Education and training	4.16
7	Ability to use emerging technological design software and tools	Technological	3.82
8	Company accreditation by national bodies affiliated to construction	Governmental	3.79
9	Personal professional accreditation by national bodies affiliated to construction	Governmental	3.66
10	Company participation in international construction projects	Globalisation	3.45
11	Personal mobility for job-related transfers	Demographic	3.39
12	Government plans to promote job creation through implementing the construction projects	Governmental	3.34
13	Favourable work hours	Economic	3.29
14	Government financing of the construction projects	Governmental	3.08
15	Government funding of construction education and training programmes for continuous professional development within projects	Governmental	2.89

(Scale parameters: 1=Not important, 2=slightly important, 3=not sure, 4=important, 5= very important)

Table 3: Skills requirements for tasks

No.	Skills requirement	Mean Response	Phase
1	Supervising and coordinating construction works on site	4.11	Construction
2	Examining and inspecting work progress	4.08	Construction
3	Ensuring adherence to construction legislation and standards of performance	3.68	Construction
4	Ensuring that construction workers follow established occupational health and safety policies and procedures	3.63	Construction
5	Addressing work defects, and close out of contracts	3.55	Project Completion
6	Consulting with clients and stakeholders for design purposes	3.34	Planning
7	Preparation of technical reports	3.26	Planning
8	Preparing construction drawings using engineering software	3.18	Design
9	Reviewing updated activity schedules and financial reports to gauge progress	3.11	Construction
10	Reviewing and resolving design and operational problems through the application of engineering technology	3.08	Operation and Maintenance
11	Estimating project costs and preparing detailed cost plans	3.05	Planning
12	Negotiating with building owners, property owners and other stakeholders affected by construction works	2.95	Construction
13	Conduct surveys to establish baselines, elevations and other geodetic measurements	2.84	Planning
14	Managing budgets and controlling project expenses	2.76	Design
15	Preparing technical specifications	2.68	Design

16	Organizing and managing project labour and delivery of materials, plant and equipment	2.58	Construction
17	Preparation of financial reports	2.58	Construction
18	Conflict resolution when working with others	2.55	Interpersonal
19	Undertaking research to analyse functional, economic, environmental, social requirements for design	2.55	Planning
20	Organising and selecting project staff	2.53	Design
21	Preparing construction method statements	2.50	Design
22	Training and mentoring of apprentices	2.51	Interpersonal

(Scale parameters were 1=I do not know, 2=not frequent, 3=moderately frequent, 4= frequent, 5=very frequent)

Skills measurement

From the results can be argued that the fact that majority of the tasks were applied moderately frequent, that would be an indication that the skills are not really needed. This could be why the proficiency ratings were low. However, as observed in the air industry, this leads to outsourcing, indicating that there are some skills needs required that are requested for in low frequencies from local staff. The focus seems to be more on supervision of works and less on planning and design, which considering the qualifications of respondents is an underutilisation of knowledge skill competency. There was an indication that knowledge transfer on the job was not prioritised in organisations, as it was ranked the least required task. In terms of occupational role requirements, findings indicate that Engineers and Construction Supervisors constituted the higher percentage compositions of construction staff and yet they were the most sought-after occupations. This was an indication of a skills shortage of such occupations. Results indicated the required high skilled occupations to be: Engineers (57.9%), Construction Site Supervisors (50%), Land Surveyors (28.9%), Quantity Surveyors (13.1%), Architects (10.5%), Project Managers (5.3%) and Traffic Planners (2.6%).

Table 4: Skills competency ratings of workforce

Rank No.	Skills Ability	Rating Average	Std. dev.	Phase
1	Examining and inspecting work progress	4.05	1.012	Construction
2	Supervising and coordinating construction works on site	3.92	1.148	Construction
3	Addressing construction defects,	3.82	1.312	Project Completion
4	Ensuring adherence to construction legislation and standards of performance	3.63	1.239	Construction
5	Stakeholder engagement	3.62	1.233	All phases
6	Ensuring that construction workers follow established occupational health and safety policies and procedures	3.53	1.268	Construction
7	Preparing construction drawings using engineering software	3.53	1.370	Design
8	Analysing functional, economic, environmental, social requirements for design	3.42	1.287	Planning
9	Organizing and managing project labour and delivery of materials, plant and equipment	3.37	1.441	Construction

10	Reviewing and resolving design and operational problems through the application of engineering technology	3.37	1.364	Operation &Maintenance
11	Preparation of technical reports	3.34	1.512	Construction
12	Closing out of contracts	3.32	1.435	Project Completion
13	Preparing technical specifications	3.26	1.427	Design
14	Conducting surveys to establish baselines, elevations and other geodetic measurements	3.26	1.537	Planning
15	Conflict resolution when working with others	3.24	1.234	All stages
16	Estimating total costs and preparing detailed cost plans and estimates	3.24	1.480	Planning
17	Organising and selecting project staff	3.13	1.436	Design
18	Preparing construction method statements	3.13	1.379	Design
19	Determining needs, like traffic volumes and growth, local development and safety factors	3.08	1.323	Planning
20	Training and mentoring of apprentices	3.05	1.432	All phases
21	Preparation of financial reports	2.89	1.410	Construction

3.1.3 Interview findings

The purpose of the interviews was to identify how training institutions carry out skills labour market assessments for the design of the skills measurement framework. The processes involved are shown in table 5.

Table 5: Coding framework from content analysis of interviews

Theme		**Final Code**
1	Skills Needs Identification	1. Stakeholder Consultation 2. Labour Market Evaluation 3. Job Profile Definition 4. Skills Mismatch Analysis 5. Training Needs Analysis
2	Internal Capacity for Review	
a	Financial Capacity	1. Government 2. Self-funded 3. Private Sector
b	Human Resource	1. Government 2. Teaching/Institutional Experts 3. Industry Representatives
3	Curriculum Design	1. Curriculum Review 2. Job Profile Development 3. Curriculum Design Validation 4. Updating of Curriculum
4	Partnerships	1. Statutory Bodies 2. Industry
5	Shortfalls	1. No enforcement polices 2. No programme evaluations 3. Lack of focus on industrial training

One of the shortfalls of the curriculum design process was the absence of programme effectiveness assessments. There is a need for monitoring and evaluation to ensure that the newly formed strategies of skills development yielded outputs of increased productivity of the workforce after up-skilling. The institutions did not have a programme evaluation process to determine whether the newly introduced programmes yielded the required outputs in industry in terms of meeting required skills competency needs. Another shortfall highlighted was the intense focus on improving learning programmes with minimal attention given to the improvement practical skills training that would allow scholars to have hands-on training direct in industrial projects. A matter of concern was also the absence of enforcement policies with regards to industrial training which would link the knowledge and practical competencies to meet industry requirements. By taking the shortfalls of the curriculum design process, it can be deduced that there is more focus on improving on knowledge skill competency compared to practical skill competency. This entails that graduates may gain the knowledge but not necessarily know how to apply it in industry. The lack of enforcement policies on the skills development in organisations contributes to industry not realising the importance of the role that they play in skills development.

Skills measurement framework design

The skills mismatch in the construction industry can be attributed to more focus on skills development of the knowledge skill competency in comparison with practical skill competency development. The main function of the skills measurement framework shown in figure 1 is to align skills competencies with changes in the internal and external environment of the industry. It consists of five consecutive stages of skills needs investigation as is carried out by curriculum development institutions as determined from interviews. The aim is to firstly gauge the current state of the construction labour market by identifying factors that are influencing skills demand and skills supply to provide insight on which type of construction activity is viable and predominant. Thereafter skill competency requirements can be aligned with organisational needs and processes. The processes in transportation infrastructure development were identified as planning, design, construction, close out and operation and maintenance (TranBC, 2018). Skills competencies dimensions were defined for each construction stage. Each stage required defining what constitutes the ability of the workforce to effectively and adequately perform tasks. Measurable aspects from the study were construction occupation groups and their associated job tasks and duties as well as education and qualification attained. In order to identify the mismatch, a construction workforce skill competency surveys in the form of questionnaires and interviews with construction industry experts were conducted. Current vacancies and their difficulty in filling were investigated to get an overview of prevailing labour market needs. Mismatches were identified by outlining the nature of tasks required on a frequent basis and comparing it to the ability of the workforce to effectively and efficiently perform tasks with the use of a rating scale.

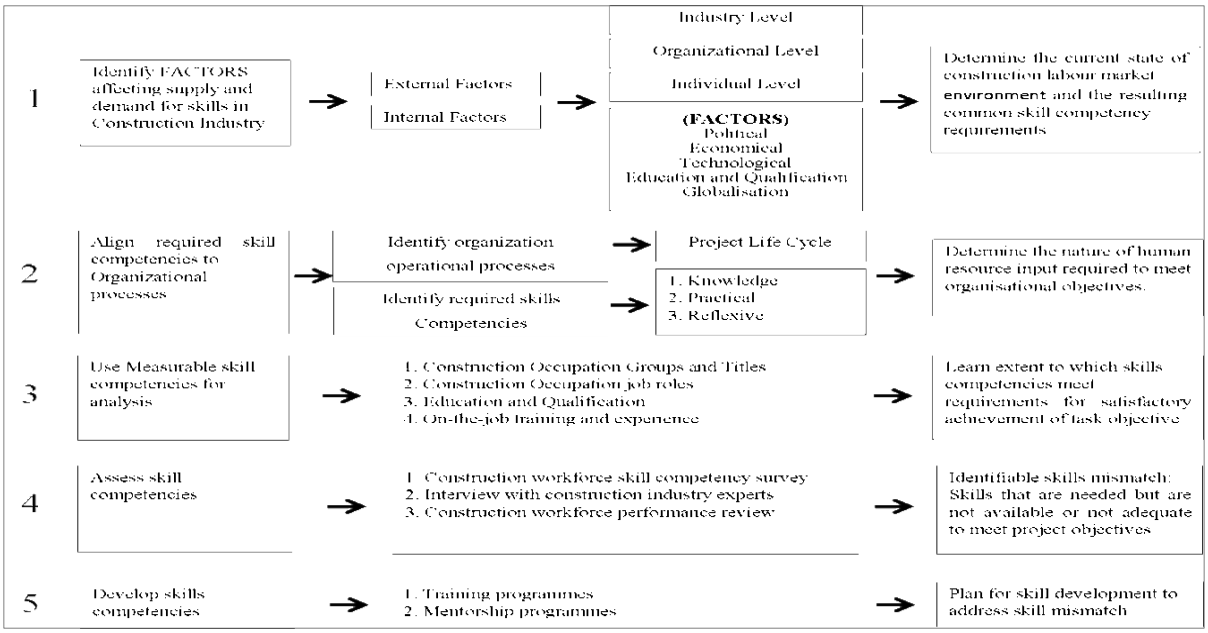

Figure 1: Skills measurement framework

4. Limitations and Recommendations

A limitation to the study was the lack of enthusiasm of individuals to participate in research leading to a lower response rate than was initially planned for. There was also the high probability of potential bias of skills proficiency rating by respondents. Difficulty in finding labour market information that is specific to the construction sector for literature review on a local context was also a limitation. A recommendation is that organisations should investment in on-the-job training programs in construction organisations in response to labour market changes in the industry. Another recommendation would be to formulate and enforce policies that entice organisations to offer industrial training to allow for graduates and students to have practical experience to compliment knowledge competencies. This could be in the form of internship and mentorship programmes. In future research, the skills measurements framework could be used on a narrower scale to conduct sub-sector specific skills needs assessments.

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Analysis of the Factors Influencing Residential Housing Consumers' Location Preferences in Uyo

Godfrey Okon Udo[1], Awa Kalu Nwojo[2] and Uduakobong Enamidem Akpan[3]

Abstract

The study was carried out to examine the residential housing consumers' location preferences in Uyo. Data were extracted from a combination of questionnaire, interviews and discussions with about 900 respondents drawn from households in Uyo Capital City Development Authority (UCCDA). The data were subjected to binary logistic regression analysis to identify the major factors influencing residential housing consumers' location preferences in Uyo. Secured neighbourhood with fewer incidences of crime, decent environment, regular power supply and accessibility were identified to be the most influential factors on the residential housing consumers' location preferences in Uyo. The outcome of the binary logistic regression analysis further illustrated that present location significantly influenced location preference of the respondents. About 53.8% of the respondents preferred living in housing estates to non-housing estates; while 46.2% prefer to dwell in non-housing estates. Present location of the Uyo urban settlers significantly influenced their residential location preferences. This paper provides a greater understanding of the interactions between present housing and preferred housing location as well as the relationship between them.

Keywords: residential housing, consumers' location preferences, Uyo Capital City Areas, property market.

1. Introduction

Urban centres are characterized by diversity of human activities which tend to generate many economic opportunities. The drive to explore and exploit these opportunities draws people from all works of life to the cities. The influx of settlers to the urban centres involuntarily generates pressures on general accommodation needs and this usually triggers increase in real estate development to meet the increasing accommodation demands.

Urban settlers are often faced with choices of where to live. Neighbourhood preferences drive residential housing mobility which in most casesare encouraged by better neighbourhood characteristics and cost factors. Animashaun (2012) has suggested that residential housing consumer location preferences refer to the factors which operate to induce or encourage households to change their residence in the city. Observations over the years have shown that housing choices may be affected by residential history and market factors or forces that are external to the household.

[1,2&3] Department of Estate Management, University of Uyo, Nigeria, godfreyudo@uniuyo.edu.ng; kalunwojo4@gmail.com; uduakobongakpan@uniuyo.edu.ng

Uyo Urban has experienced unprecedented influx of peoplein the past two decades. To meet the accommodation needs in Uyo in terms of dwellers preferences, it is pertinent to identify the major factorsthat drive consumers' location preferences in Uyo Capital City Areas, hence this study.

1.1 Problem statement and justification

To provide affordable housing in good number, investors and the government face the problem of determining the most productive location for property investments. This is a task requiring skill and expertise. Ability to do this is highly dependent on the expertise necessary to determine consumer preferences accurately. It has come to notice that most developers in Uyo are faced with the challenge of determining the accommodation needs of renters and have often provided residential housing types outside the needs of modern urban renters, thereby falling short of their expectations and experiencing low patronage and high vacancy rates.

This study therefore seeks to improve our understanding of residential housing consumers' location preferences in Uyo Capital City Development Areas. This will help investors to easily determine the best locations that provide more housing options to households and are likely to encourage residential housing mobility within the property market.

1.2 Objective of the study

This study is primarily aimed at studying the residential housing consumers' location preferences in Uyo Capital City Development Area with the view to determining the factors that influence residential housing consumers' location preferences in Uyo.

2. Literature Review

Brown and Moore (1970) identified five categories of factors that may affect household's choice of neighbourhood which are: accessibility (to city centre, communication services, green areas, etc); physical characteristics of the neighbourhood (material condition of street and side walk, layout, beauty); services and facilities (quality and accessibility); social environment (socio-economic, ethnic and demographic composition, friends and friendliness); and individual site and dwelling characteristics (costs, housing size, etc). These categories are rated among the most important factors when choosing neighbourhood.

Residential housing consumers' location preferencesmay be affected by some individual factors. Conway (1985) and Selier and Klare (1991) suggest that chief among these factors are proximity to employment, duration of residence, employment status, income level, gender and family status. There are direct relationship between housing choices and economic status of migrants. Proximity to existing or potential employment, measured in distance or travel time is a major determinant of locationdecision of housing movers. Often it is only after migrants reach the stage of a secure job with reasonable income that they are able to become owners of a dwelling. Mmuka (1993) identified household income, ethnic status, employment status and neighbourhood status as major factors that influence residential location preference in Nairobi, Kenya.

In the study carried out by Opoku (2010) to examine dwelling, tenure and housing preferences among low-income consumers' in Saudi Arabia, he discovered that majority of the respondents prefer the small house to duplex apartment as well as buying to renting. Using open interviews with professionals who were familiar with the variety of consumer preferences. Tom (2006) has reported qualitative evidence on residential location preferences, tastes and intentions of consumers in Randstad, Holland. The results show that, for the majority of housing consumers, the functionality and spaciousness of the house itself matter more than location. In a similar study carried out by Tom (2006) in Helsinkin, the finding shows that location (accessibility and pleasantness) was the important choice criterion. Adewale (2016) identified quality environment, availability of infrastructural facilities, adequate security, socio-cultural activities, accessibility to work place, open space and closeness to place of birth as major determinants of housing preferences of resident of Ile-Ife, Nigeria. Doris, James and James (2019) in their study on consumer behavior and choice of housing in Kenya with the middle to low income rental consumers in Nairobi as their focus, established from their findings that consumer tastes and preferences were the influencing factors on renters choice of housing. Coetzee (2016) has studied the housing preferences among middle income earners in Potchefstoom. The results of his study show that the residents preferred housing related attributes to neighbourhood and location related attributes. He also discovered that there is a relationship between housing preferences and socio-demographic and socio-economic characteristics of the respondents.

3. Research Methodology

The research covered many settlements within the territory described as Uyo Capital City Development Authority (UCCDA). The study is aimed at home owning and renting households. Some push factors already identified by other studies were very crucial to our analysis. They include dislike for housing occupied, dislike for type of people in the neighbourhood, family composition, eviction notice, house rent, etc. the study established the relative importance of these factors in the study area. Data was elicited by the use of questionnaire with about 900 respondents drawn from households in Uyo Capital City Development Authority. The data were subjected to principal component analysis and binary logistic regression analysis to extract significant components. Binary logistic regression analysis is used to predict the odds of being a case based on the value of the independent variables (predictor). This method is used for analyzing a dataset in which there are one or more independent variables that determine an outcome.

3.1 The study area

Uyo was a small village (Atta- Uyo) in Offot clan, with a dispersed settlement pattern typical of the area. It was thinly populated by peasant farmers. The village was bordered on the North by Afaha Oku, on the South by Aka Village, on the east by Anua and Itiam and on the West by Oku and Iboko. Previously, the actual area of Uyo was very small covering not more than 16 square kilometers (Akwa Ibom State, 1989).

Uyo served as a Local Government headquarters in the then Cross River State, Nigeria. With the creation of Akwa Ibom State on 23rd September 1987, Uyo assumed the status of a state capital. The assumption of Uyo as the state capital brought about increase in population, human activities and rapid urbanization. The limit of the present Uyo urban area as at 1989 covered an estimated area of about 60km^2. It lies and situates between latitude 4^0 59' and 5^0 04'N and longitude 7^0 50'E and $7^0$52'E and is located on an

elevation of about 60.96 meters (2090ft) above sea level (Uyo Capital City Development Authority, 2007).

Apart from institutional buildings, the predominant housing types in Uyo are houses rented as single rooms, with shared facilities and family houses that are clustered in groups. Other classes of buildings of significant proportion include detached/semi-detached bungalows and houses mostly sited in developed housing estates and government reserved areas (GRAs). The last known population of Uyo stood at 847,500 in 2015 (population.city), but with the estimated population growth rate of 7.65% per year, Uyo population in 2019 is estimated to be 1,138,019.

4. Results and Findings

Out of a total of 900 copies of questionnaire distributed, 857 completed copies were returned. The sample population was distributed across different classes of Uyo residents ranging from self-employed (22.1%) to civil/public servant (42.7%) andprivate sector workers (35.2%) as shown in table 1. The respondents were further classified into their various designations in table 2.

Table 1: Occupation of Respondents

		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	Self-Employed	189	22.1	22.1	22.1
	Civil/Public Servant	366	42.7	42.7	64.8
	Private Sector	302	35.2	35.2	100.0
	Total	857	100.0	100.0	

Source: Field data collection

Table 2: Designation of Respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Junior Staff	161	18.8	21.8	21.8
	Senior Staff	333	38.9	45.1	66.9
	Management Staff	120	14.0	16.3	83.2
	MD/CEO	94	11.0	12.7	95.9
	Others	30	3.5	4.1	100.0
	Total	738	86.1	100.0	
Missing	System	119	13.9		
Total		857	100.0		

Source: Field data collection

The identified groups were junior staff, senior staff, management staff, managing directors/chief executive officers and other unclassified designations with their salary grade levels. Income was not a significant input at this of the study and so was excluded from the analysis.

The results of the respondents' location/neighbourhood preferences show that 53.8% of the respondents preferred living in housing estates to non-housing estates; while 46.2% prefer to dwell in non-housing estates. The four topmost factors out of the nine major location factors that are mostly considered by Uyo city dwellers in their choice for location/neighbourhood preferences include: secured neighbourhood with fewer incidences of crime (12.13%), decent environment (12.07%), regular power supply (11.98%), and accessibility (11.89%), see Table 3. This indicates that the provision of adequate security, good sanitation, regular power supply and provision of access roads are vital to neighborhood development in our urban centres and to meet the basic needs of urban settlers.

Table 3: Factors Influencing Choice of Residential Housing Neighbourhood

Neighbourhood Factor	Mean Response	Percentage %	Rank
Proximity to work and other places of interest	3.84	11.08	7th
Accessibility	4.12	11.89	4th
Decent environment	4.18	12.07	2nd
Regular power supply	4.15	11.98	3rd
Available water supply	4.09	11.81	5th
Closeness to friends and tribesmen	2.63	7.59	10th
Affordable rent/cost of land	3.40	9.82	9th
Secured with less incidence of crime	4.20	12.13	1st
Less congested	4.02	11.6	6th

The results presented in figure 1 illustrate that 58.7% of the self-employed, 51% of the civil/public servants and 54.3% private sector respondents prefer residential estates to non-estate residential neighbourhood. This indicates that a greater percentage of the respondents across different occupation in Uyo prefer to live in residential estates compared to living in non-estate residential neighbourhood.

The interpretation of figure 1 is that despite that majority of the movers (as shown in Table 4) relocated to non-estate residential neighbourhood, agreater percentage of Uyo residents prefer residential estate neighbourhood. It may be further construed from the respondents' reactions that where people move to may be constrained by affordability/availability of preferred accommodation and locations.

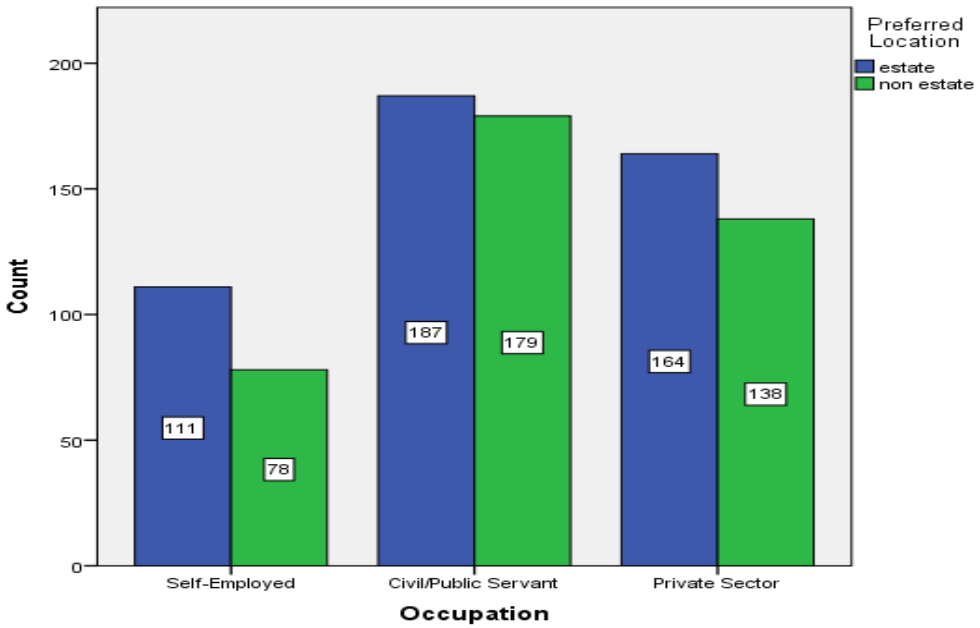

Figure 1: Bar Chart Showing Occupation of Respondents and Preferred Location

To identify the major factors influencing residential housing consumers' location preference, binary logistic regression analysis was employed.

Table 4: Binary Logistic Regression Showing the Factors Influencing Residential Housing Consumers' Location Preference

Variables in the Equation								
	B	S.E.	Wald	df	Sig. (P-value)	Exp(B) (Odd Ratio)	95% C.I.for EXP(B) Lower	Upper
PL(non-estate)	2.518	.653	14.858	1	.000	12.406	3.448	44.638
FL (RC)			3.015	3	.389			
FL(non-estate)	-.984	1.016	.937	1	.333	.374	.051	2.740
FL(other locations)	.697	.873	.638	1	.424	2.008	.363	11.106
FA (1 bedroom -RC)			6.746	7	.456			
FA(2 rooms)	.556	.338	2.706	1	.100	1.744	.899	3.384
FA(self-contained)	-.402	.327	1.513	1	.219	.669	.353	1.269
FA(2 bedroom flat)	.460	.471	.952	1	.329	1.584	.629	3.987
FA(3 bedroom flat)	.204	.499	.167	1	.683	1.226	.461	3.260
FA(1 bedroom flat)	-.210	.735	.082	1	.775	.810	.192	3.424
FA(family house)	NA	NA	NA	1	NA	NA	NA	NA
FA(5 bedroom flat)	NA	NA	NA	1	NA	NA	NA	NA
PA (1 bedroom -RC RC)			9.941	8	.269			

PA(2 rooms)	-.335	.411	.666	1	.414	.715	.320	1.600
PA(self-contained)	-.883	.376	5.524	1	.019	.413	.198	.864
PA(2 bedroom flat)	-.722	.407	3.145	1	.076	.486	.219	1.079
PA(3 bedroom flat)	-.760	.434	3.062	1	.080	.468	.200	1.096
PA(1 bedroom flat)	-1.527	.796	3.683	1	.055	.217	.046	1.033
PA(4 bedroom flat)	-1.742	1.004	3.013	1	.083	.175	.025	1.252
PA(5 bedroom flat)	-1.127	1.684	.448	1	.503	.324	.012	8.793
PA(family house)	-1.140	1.085	1.104	1	.293	.320	.038	2.681
RS (Landlord- RC)			3.327	2	.189			
RS(Tenant)	-.217	.350	.385	1	.535	.805	.406	1.597
RS(Squatter)	1.224	.804	2.322	1	.128	3.402	.704	16.436
Times (Once- RC)			3.740	4	.442			
Times(Twice)	-.460	.301	2.340	1	.126	.631	.350	1.138
Times(thrice)	-.181	.328	.304	1	.581	.834	.439	1.588
Times(four times)	-.626	.467	1.799	1	.180	.535	.214	1.335
Times(five times)	-.658	.607	1.176	1	.278	.518	.158	1.701
Occupation (Self-employed RC)			1.862	2	.394			
Occupation(civil/public servant)	-.252	.515	.240	1	.624	.777	.283	2.131
Occupation(Private Sector)	-.520	.461	1.269	1	.260	.595	.241	1.469
Designation (Junior Staff -RC)			2.339	4	.674			
Designation(Senior staff)	.046	.333	.019	1	.890	1.047	.545	2.011
Designation(Management Staff)	-.010	.399	.001	1	.980	.990	.453	2.163
Designation(MD/CEO)	-.754	.601	1.573	1	.210	.471	.145	1.528
Designation(Others)	.157	.644	.060	1	.807	1.171	.331	4.134

F1	.121	.106	1.291	1	.256	1.129	.916	1.390
F2	-.019	.134	.020	1	.887	.981	.754	1.277
F3	-.361	.147	5.994	1	.014	.697	.522	.931
F4	.072	.128	.316	1	.574	1.075	.836	1.382
F5	.036	.114	.101	1	.751	1.037	.829	1.297
F6	.001	.086	.000	1	.991	1.001	.846	1.185
F7	-.014	.085	.027	1	.870	.986	.834	1.166
F8	-.047	.139	.117	1	.732	.954	.727	1.252
F9	.103	.113	.832	1	.362	1.108	.888	1.383
Constant	-1.346	1.214	1.229	1	.268	.260		

a. Variable(s) entered on step 1: PL (present location), FL (former location), FA (former accodation), PA (Present Accommodation), RS (Status in Current Residence), Times, Occupation, Designation, F1 (Proximity to work and other places of interest), F2(Accessibility), F3 (Decent environment), F4 (Regular power supply), F5 (Available water supply), F6 (Closeness to friends and tribesmen, F7 (Affordable rent/cost of land), F8 (Secured with less incidence of crime), F9 (Less congested)

The independent variables employed are: Present Location (PL), Former Location (FL), Former Accommodation (FA), Present Accommodation (PA), Status in Current Residence (RS), No of Times of Change of Location (Times), Occupation, Designation, Proximity to work and other places of interest (F1), Accessibility (F2), Decent environment (F3), Regular power supply (F4), Available water supply (F5), Closeness to friends and tribesmen (F6), Affordable rent/cost of land (F7), Secured with less incidence of crime (F8) and Less congested (F9).The dependent variable used in the analysis is Location preference.

Binary logistic regression model:

$$Logit(y) = \log\left(\frac{\pi_i}{1-\pi_i}\right) = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \cdots + \beta_p x_{in}$$

$\beta_1, \ldots, \beta_p$ are the regression coefficients

Y is the dependent variable

$X_{i1}, \ldots, x_{in}$ are the independent variables

π_i is the probability of preferring non estate and $1 - \pi_i$ the probability of preferringthe estate.

$$\text{Log (F)} = \log\left(\frac{\pi_i}{1-\pi_i}\right) = \beta_0 + \beta_1 PL + \beta_2 FL + \beta_3 FA + \beta_4 PA + \beta_5 RS + \beta_6 Times + \beta_7 OCC + \beta_8 DESIG + \beta_9 F1 + \beta_{10} F2 + \beta_{11} F3 + \beta_{12} F4 + \beta_{13} F5 + \beta_{14} F6 + \beta_{15} F7 + \beta_{16} F8 + \beta_{17} F$$

Since the dependent variable must be binary (dichotomous) before binary logistic regression could be applied, non-estate was coded as 1 while estate was coded as 0since the location was categorized into two (estate and non-estate).

The result shows that Present Location significantly influenced location preference of the respondents. The result gave the odd ratio of 12.406 for present location (non-estate) since estate was used as the reference category. This implies that those presently living in non-estate are 12 times more likely to prefer non-estate compared to those presently living in estate. This was statistically significant since the p-value was less at the level of significance (P=.000<.05). The odd ratio for Present Accommodation (self-contained) was 0.413 which implies that respondents currently occupying self-contained accommodation were less likely to prefer non-estate compared to those occupying 1 bedroom apartment. That is, those occupying 1 bedroom apartment were more likely to prefer non-estate location compared to those in the Reference Category (1 bed room). This was statistically significant since P=.019<.05(level of significance). Decent Environment had the odd ratio of 0.697 which implies that decent environment with the odd ratio of less than 1.0, is less likely to cause one to prefer non-estate. This has influenced the choice of estate significantly (P=.014<.05) compared to non-estate. The rest of the factors did not have significant influence of location preference.

5. Conclusion and Recommendations

Residential housing consumer location preferences refer to the factors which operate to induce or encourage households to change their residence in the city. Urban settlers are often faced with choices of where to live. To provide affordable housing in good number, investors and the government face the problem of determining the most productive location for property investments. Ability to do this is highly dependent on the expertise necessary to determine consumer preferences accurately.

The four topmost factors out of the nine major location factors that are mostly considered by Uyo city dwellers in their choice for location/neighbourhood preferences include: secured neighbourhood with fewer incidences of crime, decent environment, regular power supply and accessibility. These therefore show that the provision of adequate security, good sanitation, regular power supply and provision of access roads are vital to neighborhood development in our urban centres and to meeting the basic needs of Uyo urban settlers.

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Perceived Unethical Engineering in Road Construction in Zambia

Alinani Msisya[1]

Abstract

The value of money in the engineering projects procured and constructed in Zambia has attracted attention especially in the road subsector. The public has vested interest in the public road infrastructure especially road construction. The Public uses visual assessments to check the quality and life spans of new road projects before defects appear to measure durability. There are many assertions of shoddy works and the public consider the engineers involved in the Feasibility Study and Detailed Engineering Design, Procurement, Construction Supervision and Construction of road infrastructure to be corrupt or unethical for accepting shoddy works. Members of the public access road projects quality by visually comparing different projects without understanding the scope of the works procured. A desktop study of five (5) selected projects was undertaken by considering their theoretical design life without taking into account axle loads as these are urban roads and were expected to be lightly trafficked. Data of the five (5) newly constructed urban roads with a design life of 15 years was collected from progress reports of a road agency in Zambia. The service life of the roads was considered before a rehabilitation was undertaken to check whether the roads had the envisaged project design life inclusive of the required maintenance regime. The year of construction and the year of failure /reconstruction was noted to determine the years of service of the roads. Any failure of a road before seven (7) years of service was considered premature. While engineers may have certified that the construction meet the required technical standards using the structural laboratory tests, the functional performance of the road projects through premature failure reviewed problems in the quality and durability of the project. The question is whether the perceived unethical behavior of engineers lead to premature failure of road infrastructure ultimately leading to loss of Value for Money for public funds. The paper aims to shed light on the importance of ethical engineering practice and concludes that perceived negligence and unethical behavior from the from engineers plays a key role in final road infrastructure quality with the public not trusting the engineers. It was concluded that financing modalities, procurement methods and not applying international best practice principles of contract management lead to poor value for money which can be directly linked to unethical engineering decisions.

Keywords: corruption, ethics, functional performance, value for money, visual assessment

[1] National Road Fund Agency, Lusaka, Zambia, FEIZ, R.Eng alinanimsisya@gmail.com

1. Introduction

Engineers design and build products that are used in everyday life by all members of the public. The public use of the engineering products usually makes them open to public scrutiny and perception of their quality and durability. This paper discusses civil engineering products particularly road projects in Lusaka Province of Zambia. The names of the roads, contractors , consultants and implementing agencies a are withheld in order to avoid putting them in the limelight as this paper deals with Ethical issues.

By Law (Engineering Institution of Zambia Act 17 of 2010) every engineer in Zambia is required to be registered with Engineer's Registration Board (ERB) and Engineering Institution of Zambia (EIZ) in order to practice engineering. The Engineering Institution of Zambia was re-established under the EIZ Act No. 17 of 2010 for the purpose of promoting and regulating the engineering profession. Under regulation the act provides for the registration of engineering organisations and regulates their professional conduct. The EIZ has Code of Ethics (EIZ Constitution 2013) for the Engineering Institution of Zambia which has the ethical fundamental principles and canons that every member is supposed to abide by.

The Infrastructure forum in Zambia (2017) indicated that besides all this provisions and the requirement of quality assurance plans by contractors, employing design and supervision consultants by implementing agencies, there are many assertions of shoddy works and the public consider the engineers involved in the Feasibility Study and Detailed Engineering Design, Procurement, Construction Supervision and Construction of road infrastructure to be corrupt or unethical for accepting shoddy works. His Excellency President of the Republic of Zambia Mr Edgar Chagwa was concerned with the behavior of Engineers when he officially opened the EIZ symposium in Livingstone on 26th April 2019. As President Edgar Lungu condemned the current project costs escalated through systematic variations in the country: "I have said it before and I will say it again in a very harsh tone that I will not tolerate this unethical behaviour Mr president (EIZ President) and it needs to be curtailed henceforth," (http://www.rda.org.zm/index.php/news).

The paper aims to shed light on the importance of ethical engineering practice and concludes that perceived negligence and unethical behavior from the from engineers plays a key role in final road infrastructure quality with the public not trusting the engineers.

1.1 Objective

Road projects in Zambia are built by the government and financed from general taxes, fuel levy and road tolls. Roads cost considerable amounts of money to build and the public has vested interest in the road infrastructure. The objective of the this paper is show that premature failure of the selected road projects leads to conclusion that engineers involved are perceived to be unethical and accept substandard quality of works and the thereby practicing unethical engineering.

1.2 Rationale

Zambia is a landlocked Sub-Saharan country with a total surface area of 752,614 square kilometers with a population of about 17million in 2018. Zambia has low population density and therefore the cost of providing road infrastructure is considerably high and available resources need to used efficiently. (Zambia Central Statistical office)

Promoting Ethical engineering practices therefore entails that limited resources available are utilized efficiently and value for money is realized at the first attempt of investment in the roads sector. Unethical engineering practices entails reinvestment of funds in the same roads that fail again and again limiting the impact of available resources to cover development of roads in other areas of the country.

2. Literature Review

The Southern Africa Transport and Communications Commission (SATCC) Standard specifications for road and bridge works is widely use code of practice in design and rehabilitation of Roads in Zambia

Road Pavements are typically designed for a specified "design life". Design life (or "design period") is the time from original construction to a terminal condition for a pavement structure. A terminal condition refers to a state where the pavement needs reconstruction. Structural design is carried out so that the pavement structure is sufficient to withstand the traffic loading encountered over the pavement's design life. It is recognized that intermittent maintenance and rehabilitation efforts may be needed to preserve a pavement's surface quality and ensure that the structure lasts through the design life. (www.pavementinteractive.org)

In Zambia roads have a typical structural design life of 15-20 years with required periodic maintenance (intermittent maintenance) factored in the design life. The Periodic Maintenance is a regular maintenance activity usually scheduled every 5-7 years to keep the road in an acceptable condition for the users. The roads constructed are usually flexible bituminous pavements. It was noted that before a road is constructed a detailed feasibility and detailed engineering design is done to take care of the expected traffic loading, availability of construction materials and environmental considerations.

Terminal Structural failure is therefore expected at the end of design life with all parameters for design life staying as anticipated. Any failure occurring before the design life should therefore be attributed to unethical behavior by accepting shoddy works. The public therefore perceives failure of such road projects as a result of unethical engineering practices. Figure from the South African Pavement Design Engineering Manual chapter 10 Pavement Design shows a typical life of flexible pavement over time. The Present Serviceability Index (PSI) which is the driving quality usually driven by two major parameters Internal Roughness Index (IRI) and rutting

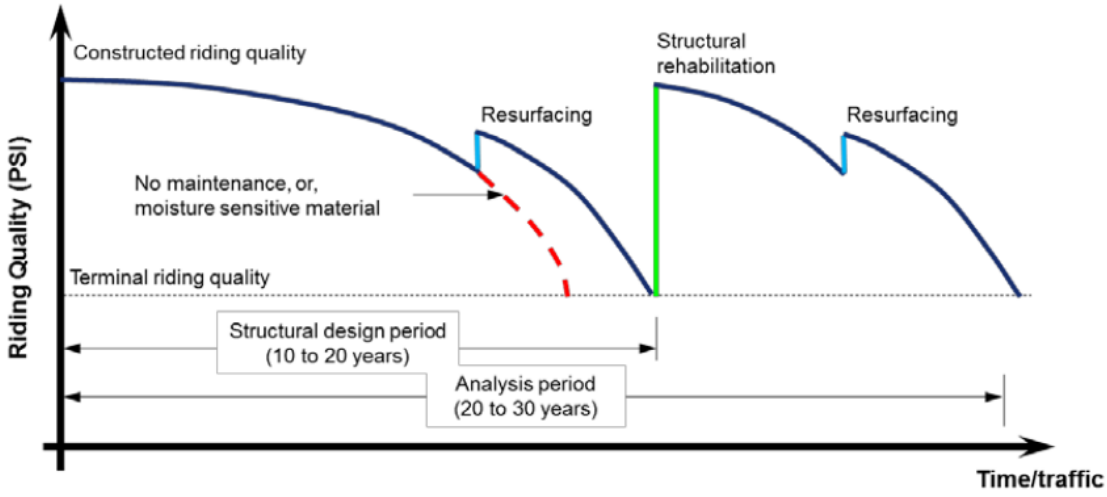

Figure 1: Typical life of flexible pavement over time (Source: *South African Pavement Design Engineering Manual* Pavement Design)

3. Methodology

Five (5) short urban roads were selected as sample for this paper. The period of analysis is less than five years therefore it was assumed that traffic would not have a major impact on the outcome. The roads selected where in urban setup where other roads constructed before had not failed with the existing traffic. The construction year was noted, a check was undertaken to verify whether periodic maintenance had been carried out and most crucial was the year of reconstruction. The years of service of the road were noted. Table 1**Error! Reference source not found.** shows a Road Failure Table of the five selected roads given pseudo names without the actual names. The names of the road agencies, consultants and contractors have been withheld to protect their identity so that they are indemnified from damage and liability that this paper can cause.

The data was collected from project progress reports and analyzed using an MS EXCEL spreadsheet. The roads under consideration were designed, supervised, constructed and certified by qualified engineers. The cost of the roads were noted using a global unit cost per kilometer based on the whole package of the contract. An average exchange rate based on the Bank of Zambia statistics from years 2008 to 2018 of 1 USD= 7 ZMW was used considering that all roads under consideration were constructed within the last 10 years. The average cost was USD700,000/km.

Table 1: **Failure Table of the selected five roads**

S/N	Road Name	Road Length km	Project distance	ZMW Cost Million	ZMW Cost/Km Million	USD Cost/Km Million	Year Constructed	Design Life	Years of service	Periodic Maintenance undertaken	Year Failed	Year Reconstructured	Total lost investment USD m
1	A	1	2.6	14.5	5.6	0.79	2008	15-20	7	NIL	2015	2019	0.71
2	B	0.9	24	97	4.0	0.57	2012	15-20	4	NIL	2016	2018	0.64
3	C	2	24	97	4.0	0.57	2012	15-20	4	NIL	2016	2019	1.42
4	D	0.75	18	102	5.7	0.81	2012	15-20	3	NIL	2015	2018	0.53
5	E	1.4	18	102	5.7	0.81	2012	15-20	3	NIL	2015	N/A	1.00
Total/Average		6.05	86.6	412.5	5.0	0.71			4.2				4.3

4. Discussion

The failure modes of the pavements were different but what is common is that they all reached the terminal condition before their design life. Analysis of the five roads totaling 6.05km sampled shows that the roads failed within an average 4.2 years of service before they were due for periodic maintenance.

The roads showed visible failure from visual assessments within two years of construction. Even the public who not experts could clearly see that they were not constructed to required standards.

It is important to note the pavements needed reconstruction as they had reached a terminal condition.

The total investment lost considering an average cost was USD700,000/km was USD 4.3m for the 6.05km. This is loss is only Road Agency costs but costs to the road users such Vehicle Operating Costs and travel time have not been considered implying the loss is significantly high.

Probable causes of premature failure of the roads can be listed as follows:

- Influenced Procurement
  Procurement is critical to the success of a project. Did the Implementing Agency procure the right service providers for the Feasibility Study and Detailed Engineering Design, Construction Supervision and Construction? This the question of the Public and stakeholders.
- Inadequate design
  Inadequate design could be a possible cause for premature failure of the roads. Did the Implementing Agency have the right capacity to review, critic and approve the designs. Implementing agencies tend to trust everything that comes from consultants as gospel truth. Did the design consultant have the adequate capacity to undertake the projects or was the wrong consultant selected at procurement? These are the questions of the Public and stakeholders.
- Inadequate Contractor Capacity
  Did the contractor have the adequate capacity to undertake the projects or was the wrong contractor selected at procurement? This the question of the Public and stakeholders.
- Inadequate Supervising Consultant
  Did the supervising consultant have the adequate capacity to undertake the projects or was the wrong consultant selected at procurement? This the question of the Public and stakeholders.
- Inadequate Monitoring and Evaluation
  Implementing agencies have teams that are responsible for monitoring and evaluation of the performance of the Supervising consultants and Contractors. The teams participate in monthly progress meetings and are privy to what is going on and help management of Implementing Agencies make informed decisions on the course of projects. Was monitoring and evaluation of the project adequate? Were all decisions made on the project ethical? Theses are the questions of the Public and stakeholders.
- Unethical Perception of Engineers
  The EIZ Code of Ethics requires engineers to be accountable and be held in high esteem for their actions and the probable causes of premature road failures engineers play critical roles

actively and there it is expected that the projects must be delivered at the right cost ,time and quality.

For the Public the only conclusion that remains and accounts for the premature failures of the road projects is unethical behavior of engineers. Unethical behavior include:

(a.) Inadequate specifications at procurement to favour targeted firms
(b.) Underestimating quantities and Engineers estimates for targeted firms to be eligible
(c.) Accepting Bid prices without basing them on the Detailed Engineer's Estimates
(d.) Certifying shoddy works for kickbacks
(e.) Ignoring contract terms even when it is clear there is poor performance from the contractors and consultants
(f.) The funds used to pay are not from my pocket

These corrupt and unethical behaviour could be at the core of premature road failures.

5. Conclusion and Recommendations

The functional performance of the five (5) roads sampled clearly shows that the roads were not fit for purpose as roads failed before the end of their design life. It can be deduced from the structure failure of roads in less 15 years of their design life that their design and construction did not meet requirements alluded to in the literature review.

The Public perception that there was no value for money because of short design lives of roads due shoddy works was confirmed. The Public is not getting the full value of money invested in road infrastructure due to professionals not upholding their ethics as all stages in from project inception, design. Procurement, construction and operation are undertaken by Engineers making decisions through the life of the project.

The only explanation available for the failure of the roads could them be linked to unethical Engineering and corrupt practices.

The roads covered in this paper are from real projects undertaken in Zambia which neither performed to expectations of the public nor met the engineering design life due to shoddy standards of construction.

This review was limited by the few number of roads analysed, the visual assessment used in determining failure of roads, lack of traffic loading information and short period of observation. Further research could be undertaken by using detailed engineering tests especially related to the physical condition and riding quality of roads to determine structural failure over at least not less than twenty (20) years or longer to create reliable database for road failure.

It is recommended the Ethical Engineering practices be emphasized by the EIZ and all Institutions that employee engineers through deliberate ethics trainings and Technical Engineering audits of ongoing projects. Value for Money should be a major tenant of Ethical Engineering.

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Effectiveness of Waste Management Control Systems in Bloemfontein

Fidelis Emuze[1] and Michael Oladokun[2]

Abstract

Construction industry is regarded as one of the major producers of waste. With the increase of construction waste in South Africa, due to it being a developing country, effective management of construction waste has become key. The study aims at identifying and assessing the effectiveness of waste management control systems in Bloemfontein area of South Africa. The study used survey research design. A review of published and peer reviewed literature was used to create open-ended questionnaire for construction professionals. Sixty-two copies of questionnaires were administered to contractors who are registered with the construction industry development board (CIDB) under the "general building works" class with grades ranging from four to nine out of which 25 duly completed questionnaires were received back. The results indicated that landfill is the most widely used current waste management system by the contractors in the study area. Also, the findings showed that inadequate planning is the factor that is most responsible for waste generation in the study area. Further, planning and design strategies is seen as the practice which is the most effective to minimise waste. Overall, the most effective measure to use to control waste was that of ordering exact material quantities. The study concluded that these findings will allow practitioners to re-think the subject of construction waste and how to effectively manage, minimise and prevent it in order to contribute towards sustainability.

Keywords: Bloemfontein, construction waste, control systems, South Africa, waste management.

1. Introduction

The construction industry of South Africa has immense development opportunities arising from the fact that it is still a developing country. It is however true that the construction industry is considered to be one of the major producers of waste (Al-Hajj and Hamani, 2011). Stemming from this, increase in construction waste is inevitable. This gives rise for the need to effectively manage such waste to ensure sustainable developments (Leandro, 2012).

According to Presley and Meade (2010), the three primary bottom-line components of sustainability is that of the economic, social and environmental. Evidently, these three components will play a crucial role

[1] Professor; Department of Built Environment; Central University of Technology, Free State; Republic of South Africa; Email: femuze@cut.ac.za.
[2]Research Fellow; Department of Built Environment; Central University of Technology, Free State; Republic of South Africa and Senior Lecturer; Department of Building; University of Uyo; Nigeria; Email: moladokun@cut.ac.za

in any new development in order to have a sustainable project. The latter of the three, namely environmental aspects, is considered in regards to construction waste. According to Cha, Kim and Han (2009) the construction industry is forced by legislation, pollution, resource depletion and other factors to give more consideration to environmental factors. This is done due to the fact that environmental sustainability has become the main driving force to improve the construction industry (Cha, Kim and Han, 2009). It is essential to manage construction waste to ensure sustainability and innovation, which are required to ensure waste minimization (Oladiran, 2009).

Formerly, the problem of construction waste was not as evident as it has become in recent years. The South African Waste Information System and the National Environmental Management: Waste Act (Act 59 of 2008) only became effective as from 2005 and 2009 respectively. These regulations, only coming into effect in recent years, proof that the problem of construction waste only became noteworthy recently. It is evident that construction waste needs to be managed in order to save on costs. In this study, focus was directed towards waste management control systems in order to analyse the effective management of construction waste in Bloemfontein area of South Africa.

2. Review of Related Literature

2.1 Construction waste management

Construction waste can be divided into three categories namely material, labour and machinery waste (Silva and Vithana, 2008). This study focused towards the material waste. The ultimate goal is to achieve a state of "zero waste" in this current age of environmental crises. It is, however, challenging to achieve that in the construction industry. All stakeholders should be involved to reduce waste at the source and develop effective waste management systems. This should be done by reusing or recycling of materials and components (Osmani, 2012). According to Yakes (2013) the most efficient way to address construction waste is to minimize the production thereof throughout the design and construction stages. If it proves to be too difficult to avoid waste other strategies such as handling of waste and recycling thereof should be considered (Yakes, 2013).

The fact that waste is inevitable and it is almost impossible to eliminate the generation thereof, has given rise to negative perceptions and Kulatunga, Amaratunga, Haigh and Rameezdeen (2006) echoed that these perceptions are the main barriers to effectively manage waste. It is thus crucial to ascertain the effectiveness of waste management systems on site. This can be done by comparing the actual versus the planned quantities of: materials used, the waste generated, waste that was reused or recycled, amongst others (Ling and Nguyen, 2013). According to Shen et al. (2004), waste management strategies are not implemented due to the increase in management and operation costs, the lack of trained staff and expertise, lack of legal enforcement. Tam and Tam (2006) advocated that a comprehensive construction waste management system needs to be implemented on every construction site and causes of construction waste and ways to minimize it should be identified and the most favourable solution should be implemented.

2.2 Causes/sources of waste

Various causes of waste occur and based on the assertion of Al-Hajj and Hamani (2011), waste can broadly be categorised as waste due to design, procurement, handling of materials and that of operations (as cited in). According to Shakantu, Muya, Tookey and Bowen (2008), the inefficient use of resources should also be seen as a root cause of waste.

Studies showed that waste sources can fall into four main themes, which are early involvement of project stakeholders, ineffective project communication and coordination, unclear allocation of responsibilities, and inconsistent procurement documentation (Arif et al., 2012; Gurau et al. 2011). Furthermore, Osmani (2012) estimated that 33% of material waste is due to failure of architects to design-out waste. From these it can be seen that the design and procurement plays a vital role in the causes of waste.

Studies done by Yeheyis et al. (2013) found that there are two main factors which generate construction waste, these are: the fact that waste minimization is not seen as a priority during design stage and that there is a lack of interest on the client side to minimize waste. The studies conducted by (Dainty and Brooke, 2004) showed the following sources are responsible for the generation of construction waste: design changes, leftover materials, design/detailing and insufficient protection of works. It is noted in the studies done by Shen et al. (2004) and Hao, Hill and Shen (2008) that the waste is highly related to the quantity of purchased materials. It is quite clear that there will be no motivation to work sparingly if there is an excess amount of materials.

2.3 Construction waste control systems

Due to the trend of sustainable developments there has been an increase of possible waste management tools to use (Tam, 2008). With this increase of management systems and tools it studies still show that, even though with such systems, most waste which can be recycled and reused, most often usually gets dumped in a landfill (Shen, Tam, Tam and Drew, 2004). Miles et al. (1999) (as cited in Dainty and Brooke, 2004) states that landfill is the most common disposal technique in the construction industry.

Studies done by Arif, Bendi, Toma-Sabbagh and Sutrisna (2012) reveals that some drivers can however promote waste minimization such as; proper training or site staff and the enforcement of legislation. Close attention needs to be given toward the enforcement of such legislation. Effective utilization and implementation are a necessity to effectively manage construction waste. Eleven practices have been proposed by researchers worldwide such as Arif et al. (2012), Dainty and Brooke (2004), Tam and Tam (2006), and Wang et al. (2008) who all agree that these practices help to implement waste minimization. Some of these practices includes, inter alia: The standardization of design, workforce education on environmental aspects, on time deliveries, controlling of stock to minimize over ordering, penalties for poor waste management, amongst others.

Various methods can be used to control waste. Studies from Silva and Vithana (2008) indicate that the use of pre-cast concrete elements has shown significant reductions in waste of up to 30-40%. Silva and Vithana (2008) further states that waste quantification is one of the primary requirement in order to minimize waste. In another vein, Hao, Hill and Shen (2008) echoes that on-site sorting would also have been an effective measure if not for the requirements of enough space on site, skilled workers and the necessary equipment needed. As such, this is not practiced by many contractors.

3. Research Methods

To examine the effectiveness of the existing waste management control systems a questionnaire survey was conducted to collect the needed data. The objectives gave rise to establish where waste comes from, the root cause; how to minimize it and implement effective waste control systems. It was necessary to consult and obtain information from professionals within the construction industry in order to acquire the information needed. The population for the study was all contractors registered with the CIDB under the "general building works" class with grade ranging from four to nine in Bloemfontein. 62 of such contractors were identified from the database of the CIDB. As such, all the 62 contractors were sampled and contacted to enquire whether they will be willing to take part in the study. Of the 62 contractors, only 25 of responded and participated in the study. Those that participated in the study are contractors with Grade 4 up to 7.

According to CIDB (2016), Grade 4 general building works contractors (4GB) are contractors that must have completed a contract with the value of not less than R900 000 and either have best turnover not less than R2 000 000 or have available capital not less than R200 000. Grade 5 general building works contractors (5GB) are contractors that must have completed a contract with the value of not less than R1 500 000 and either have best turnover not less than R3 250 000 or have available capital not less than R650 000. Grade 6 general building works contractors (6GB) are contractors that must have completed a contract with the value of not less than R3 000 000 and either have best turnover not less than R6 500 000 or have available capital not less than R1 300 000. Grade 7 general building works contractors (7GB) are contractors that must have completed a contract with the value of not less than R9 000 000 and either have best turnover not less than R20 000 000 or have available capital not less than R4 000 000.

Data obtained from the study were analysed using descriptive analysis.

4. Results and Discussion

4.1 Background information about the respondents

Based on the preliminary analysis conducted, Grade 6 (6GB) contractors are eight in number representing 32%. This is followed by the 5GB contractors, which are seven representing 28%. The 4GB and 7GB contractors are five in number each representing 20% each. Upon the question of the years of experience in the construction industry, 44% of the respondents indicated that they had between 3-5 years, 28% of the respondents had between 6-8 years of experience and the remaining 28% had between 9-11 years of experience. This by implication means that the respondents have requisite years of experience to participate in the study. A question was posed to enquire whether the companies struggle to effectively manage construction waste. Three possible responses were: yes, no and unsure. 56% of the respondents indicated that they do struggle regarding the management of waste and the remaining 44% said no. None of the companies used the unsure option.

4.2 Construction waste management systems

As identified from the literature, the respondents were asked whether or not they use certain systems to manage waste in their construction companies. These five waste management systems included: landfills, segregation, reclamation, re-use and physical waste management facilities. Respondents were also given the opportunity to state other relevant methods in the spaces provided. The result of the survey regarding this question is shown in Figure 1. The result shows "landfill" as being the most widely used with 32%. The second most widely used system is that of "segregation" with 21%. This is followed by "reusing" and "reclamation" with 19% and 15% respectively. It can be seen that "physical waste management" is still the least used system to manage waste with 13%.

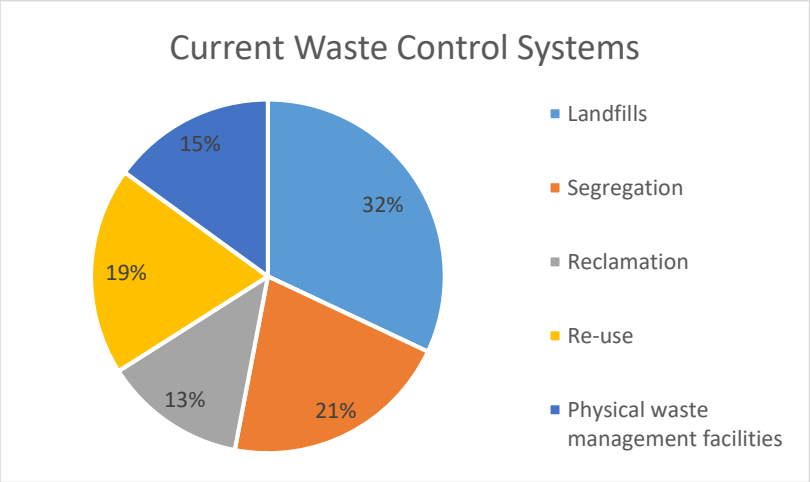

Figure 1: Waste Management Control Systems

4.3 Causes of waste

Regarding the question on factors that are responsible for waste, Figure 2 shows the result emanating from this study. The findings revealed that "Inadequate planning during pre- and post-tender stages" was found to be the main cause of waste with a mean of 4.6. This is followed by "rework and defects" and then "poor material handling" with means of 3.5 and 3.3 respectively. "Poor construction methods" and "unskilled labour" were ranked least as causes of waste with means of 2.8 and 2.4 respectively.

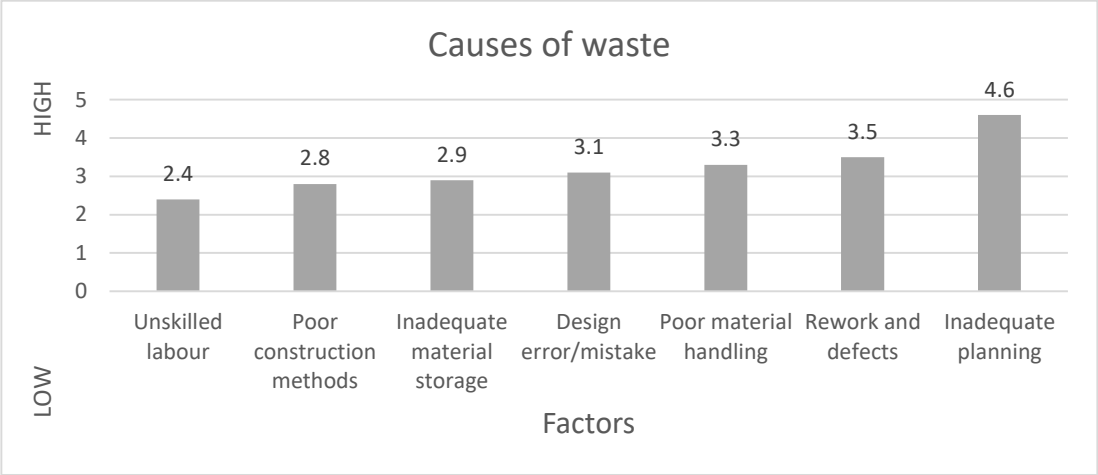

Figure 2: Causes of waste

4.4 Practices to minimize waste

In the questionnaire, the respondents could rate four primary practices of minimizing waste based on the practices they use. Additionally, space was provided in the questionnaire for respondents to include other practices apart from the four provided. These four practices were: Adequate storage, training employees, material recycling and planning and design strategies. Figure 3 captured the data from the respondents. "Material recycling" proved to be the least used practice to minimize waste, being used only 18% of the time. The "training of employees" is also not seen as the most effective way to minimize waste with 21%. The remaining two practices are used most of the time to minimize waste. For example, "adequate storage" with 30% and "planning and design strategies" with 31%.

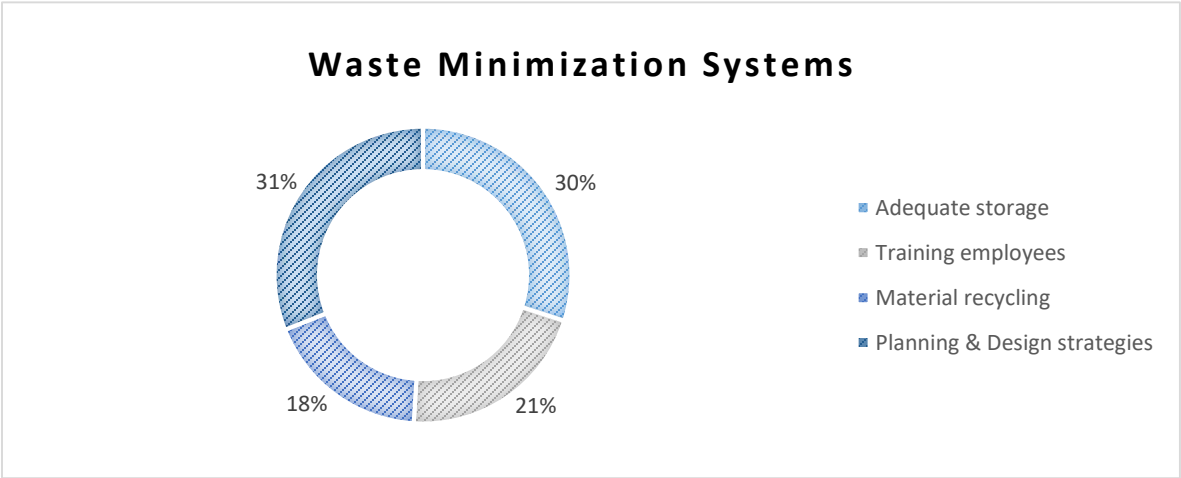

Figure 3: Waste Minimization Systems

4.5 Effectiveness of construction waste control systems

Eight measures were chosen from the literature reviewed to form part of the study in order to test their effectiveness. These eight measures include: Ordering exact material quantities, adequate site management, adequate material specification, adequate material handling, proper storage, personnel training, re-using waste on site and recycling waste on site. Respondents were asked to rate the effectiveness of those waste control systems. The mean score for each effectiveness of construction waste control systems was calculated. The mean scores were then converted into percentages in order to reveal the effectiveness of each system. The finding as shown in Figure 4 revealed that "ordering exact quantities of materials" and "re-using waste on site" as the most effective with 84% and 82% effectiveness level respectively. The measures of "adequate material specification" and "personnel training" were regarded as the least effective with 56% effectiveness level each. The average and standard deviation of all effectiveness level for all the waste control systems were computed as well as shown in Figure 4. The average percentage mean score is 71% with a standard deviation of 11%. From those computation as illustrated in Figure 4, it can be seen that the measure of "ordering exact material quantities", "adequate site management", "proper storage", "re-using waste on site", and "recycling waste on site" are the ones above the average percentage, whilst the others fell below.

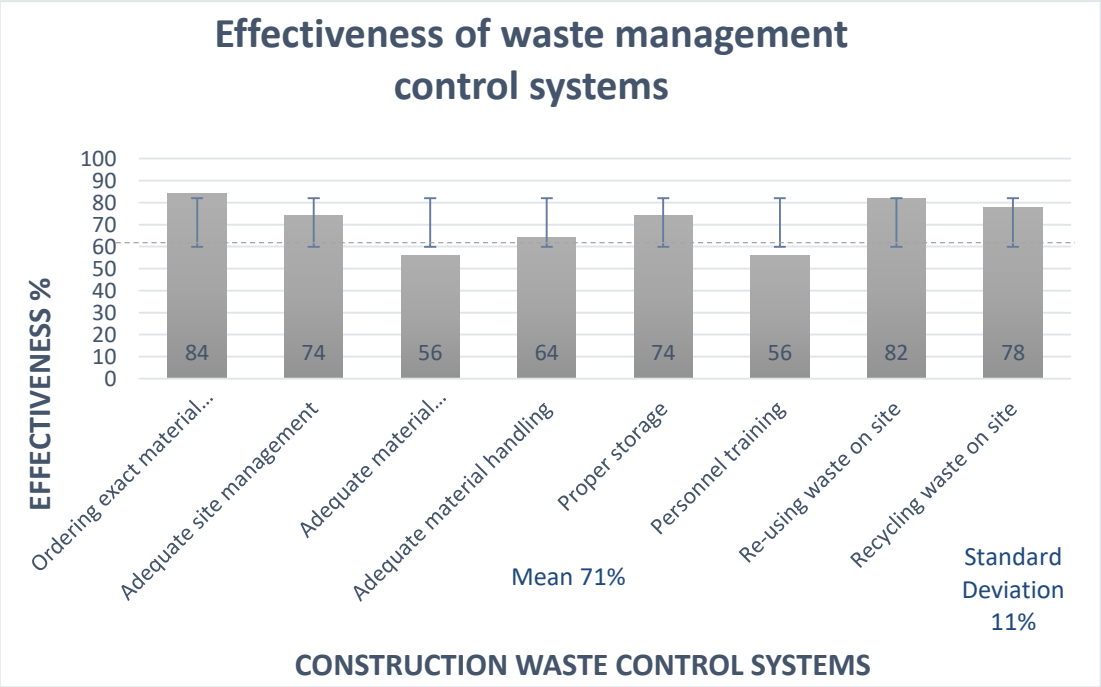

Figure 4: Effectiveness of waste management control systems

From the findings emanating from the study regarding construction waste management systems is illuminating and profound. Yakes (2013 pointed out that waste on construction sites is evidently unavoidably. As such, the way the generated waste is treated and controlled matters most (Tam and Tam, 2006). The finding from this study suggests that waste from construction sites are being controlled and managed as the current control system in use is landfills. The finding is consistent with previous study like that of Shen et al. (2004) where the outcome of their study showed that most construction waste usually gets dumped in landfills.

On the causes of waste, however, the findings from the study showed that inadequate planning at both the pre- and post-tender stages was the main cause of waste on construction sites. Planning is key to waste management as the ability to involve the main project stakeholders early enough during the project lifecycle. According to Arif et al. (2012), effective project communication and coordination, clear allocation of responsibilities, and consistent procurement documentation if properly done may aid adequate planning at both the pre- and post-tendering stages of any construction project. This then portends to mean that this study is consistent with previous study in the subject.

As echoed by many studies, several waste management control systems have been found to be effective. For example, the findings from the work of Silva and Vithana (2008) indicate that waste quantification is one of the effective ways to minimize waste. In another vein, Hao, Hill and Shen (2008) advanced that on-site sorting would have been an effective measure if not for the requirements of enough space on site, skilled workers and the necessary equipment needed. However, the findings from this study suggest that ordering exact quantities of materials and re-using waste on site are the most effective means of waste control on construction sites, which will eventually lead to waste minimization on sites.

5. Conclusion, Recommendations and Further Studies

The aim of this study was to evaluate and assess the effectiveness of waste management control systems currently being used within the construction industry in Bloemfontein, Free State. From the findings emanating from the study, it can be concluded that landfill is the most widely used current waste management system by the contractors in the study area. The study further reached the conclusion that inadequate planning is the factor that is most responsible for waste generation in the study area. Planning and design strategies is the practice which is the most effective to minimize waste and overall the most effective measure to use to control waste was that of ordering exact material quantities. These findings will allow practitioners to re-think the subject of construction waste and how to effectively manage, minimize and prevent it in order to contribute towards sustainability.

It should be noted that any strategy or control systems requires adequate management and implementation needs to be enforced. Contractors should prioritize the reduction and prevention of waste and should be informed about the benefits pertaining to such implementation. It is therefore also important that when these systems are implemented that it should be done as part of an integrated strategy.

This study, only focused upon material waste, opens the door for future studies to be done on labour and machinery waste. The limitation of contractors within the general building categories allows future studies to be done whilst considering civil, structural and mechanical works.

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Exploring the Impact of SMME Participation in Township Development Projects

Hlulani Mathebula[1], Fidelis Emuze[2] and Michael Oladokun[3]

Abstract

The aim of the study is to assess how granting small, medium and micro-enterprises (SMMEs) the responsibility and duty to manage and carry out subcontracting work would affect the overall project negatively, compromising the expected work standards and inconveniencing the main contractor's reputable work ethic. A descriptive survey research design was employed in this study. Data were collected through the use of semi-structured questionnaire. Forty (40) questionnaires were purposively administered to construction managers, project managers, site managers, quantity surveyors and architects in Port Elizabeth area of South Africa out of which 21 were duly completed and returned. The salient research findings revealed that most SMMEs required certain attributes to achieve work conformance, project sustainability and appropriate working relations with the main contractors. The findings also revealed that external factors also contributed to the ability of SMMEs to operate and function prudently, like credit accessibility and corruption, among other factors. Based on the research findings it is concluded that SMMEs require training, support from contractors in the construction industry, ease of access to financial credit and the introduction of uncompromising tendering policies to achieve better operations.

Keywords: Construction, contractor, SMMEs, participation, projects.

1. Introduction

According to the Department of Trade and Industry (DTI) (2013), the emergence of small, medium and micro-enterprises (SMMEs) is a stimulant to achieve the growth of the economy and development in South Africa. The participation of SMMEs in township development projects, as an approach to empower previously disadvantaged persons, has an effect in the construction industry with resultant repercussions severely affecting the industry as a whole.

In township development projects like the construction of community service facilities, including hospitals, public schools and clinics, the subcontracting of work to SMMES has been encouraged with

[1] Honours Student; Department of Construction Management, Nelson Mandela University, North Campus, Summerstrand, Port Elizabeth, South Africa.
[2]Professor; Department of Built Environment; Central University of Technology, Free State, South Africa / Research Associate, Nelson Mandela University, South Africa; Email: femuze@cut.ac.za.
[3]Research Fellow; Department of Built Environment; Central University of Technology, Free State; South Africa / Senior Lecturer; Department of Building; University of Uyo; Nigeria; Email: moladokun@cut.ac.za.

the aim of uplifting local businesses through the transfer of skills and knowledge through work experience. It is obvious that the African National Congress regime in South Africa involved the local SMME contractors in projects as part of a strategic approach to achieve radical economic transformation, which aims at empowering societies and bringing about change in previously disadvantaged areas.

Factors including competence, compliance and the capabilities of SMMEs contribute to the influence SMMEs have on projects when they take part in township development projects. Concerns that exist around the participation of SMMEs in township development projects form the basis of the research.

The objectives of the study were:

- To establish how the inadequate construction management competencies, result in non-conforming work produced by construction SMMEs;
- To reveal how inadequate financial capacity leads to the failure of SMMEs to carry out their work through to completion;
- To establish how an absence of business ethics and integrity results in situations where SMMEs tender for works above their contracting capacity, and
- To reveal how the profit orientation of SMMEs leads to cost saving by unlawful means.

The paper includes a review of the literature used as secondary data for the study, the research method adopted in the study, the research findings and a conclusion in accordance with the study objectives.

2. Review of Related Literature

2.1 SMME as a stimulant to the South African economy

Tshikudo (2012) mentions that SMMEs contribute significantly in almost all economies, but this is predominantly the case in those countries regarded as developing countries with many employment and income distribution challenges, for instance a country like South Africa. SMMEs represent an important vehicle for addressing the challenges of job creation, economic growth and equity in South Africa (Gasa, 2012). However, it is posited that new SMMEs are a significant force behind the prevalence and progression of capitalism such that the innovative activities of entrepreneurs are a major contributor to what is referred to as a creative “destruction process” by causing persistent disruptions to an economic system which is in equilibrium, creating opportunities for economic rent (Dhanah, 2016).

2.2 The production of non-conforming work by SMMEs

2.2.1 Strategic planning

Sandada (2015) posits that while strategic planning in large organisations has been studied extensively, not enough attention has been given to strategic planning in SMMEs. Donkor, Donkor and Kwarteng (2018) argue that the managers of SMMEs might not have adequate knowledge about the rewards accruing to the business, if they do not practise strategic planning.

2.2.2 Employee training and skills

The challenges faced by the business world, especially the development of SMMEs, cover broad aspects, one of which includes increasing the quality of human resource in terms of management skills, organisation and technology, including the scale of a business (Murithi, 2017). Employees who do not receive adequate training may have difficulty meeting expected performance standards. and while other employees may be self-motivated and take it upon themselves to learn how to perform their jobs better, other may not have this kind of initiative (Olawale and Garwe, 2010).

2.3 SMMES fail to carry work through to completion

2.3.1 Availability of capital

According to Dhanah (2016), it is SMME contractors that underestimate the amount of capital they will need to contract. As a result of such underestimation they are forced to close before they have the opportunity of succeeding in the work they undertake. Majama and Magang (2017) points out that estimating contributes to a business's financial capacity and underestimating guarantees a stumbling block when the business has to carry out a job. Such situations are common in small businesses because their estimators lack experience.

2.3.2 Labour force competencies

According to Moilwa (2013), there is a labour problem in the form of a lack of skilled technicians, capable management and competent labour as a result of the tendency of SMMEs to invest less in training the SMME personnel. Donkor et al. (2018) are of the opinion that South Africa is experiencing a major crisis of insufficient skilled labourers available for employment in construction businesses, and with the increase in demand for construction products and services, this shortage consequently increases.

2.4 SMMEs engage in project cost saving through unlawful means

In a report published by SEDA (2016), it is said that SMME entrepreneurs do not invest in their knowledge but are more concerned with making money. Muriithi (2017) opines that corruption is a major challenge facing businesses in Africa. Further, Muriithi (2017) was of the view that this form of malpractice forces SMMEs to divert their well-intended finances to non-financial activities.

3. Research Methods

In the study, primary and secondary data were used to address the study objectives and the aim of the study. A review of literature was conducted, which constituted the secondary data of the study, and a survey instrument was used for the study's primary data. The study adopted a descriptive survey research design. Forty semi-structured questionnaires were purposively administered face-to-face to construction managers, project managers, site managers, quantity surveyors and architects in Port Elizabeth area of South Africa. Of the total forty (40) questionnaires administered, twenty-one (21) were duly completed

and returned back, which constituted a 52.5% response rate. Descriptive statistics was used for data analysis in the study.

4. Research Findings and Discussion

Table 1 indicates the extent to which work conformance factors were perceived to be of importance by construction industry professionals. The responses are represented by means of a table in percentages ranging from 1 (not important) to 5 (very important) as well as mean scores (MSs) ranging from a minimum of 1.00 to a maximum of 5.00.

As indicated in Table 1, the MSs are greater than 4.00 but less than 5.00, which indicates that adequate knowledge and information, strategic planning, SMME contractor competence, SMME employee competence, SMME contractor experience and employee training are deemed to be between a near-major and a major extent, important for the work conformance of SMMEs. The factor ranked 1 with a MS of 4.43, which falls between 4.00 and 5.00, indicating that professionals in the construction industry perceive adequate knowledge and information to be the most important factor that contributes to the production of conforming work. While the finding from this study is illuminating and profound, it is however, contradict the outcome of Kwarteng (2018) which argues that the managers of SMMEs might not have adequate knowledge about the rewards accruing to the business, if they do not practise strategic planning.

Table 1: The importance of factors of work conformance

Aspects	Unsure	Not……..Very					MS	Rank
		1	2	3	4	5		
Adequate knowledge and information	0.0	0.0	4.8	9.5	23.8	61.9	4.43	1=
Strategic planning	0.0	4.8	0.0	9.5	19.0	66.7	4.43	1=
SMME contractor's competence	0.0	0.0	9.5	4.8	28.6	57.1	4.33	2=
SMME employees' competence	0.0	0.0	4.8	14.3	23.8	57.1	4.33	2=
SMME contractor's experience	0.0	0.0	0.0	23.8	23.8	52.4	4.29	3
Employee training	0.0	0.0	9.5	4.8	38.1	47.6	4.24	4

Table 2 indicates the extent to which the factors of SMME financial dynamics were perceived to be of importance by construction industry professionals. The responses are represented by means of a table, with percentages ranging from 1 (not important) to 5 (very important) as well as mean scores ranging from a minimum of 1.00 to a maximum of 5.00.

As identified in Table 2 the MSs are greater than 4.00 but less than 5.00, which indicates that timely payments by the main contractor, progress with work leading to the issue of payment certificates, and the financial management of SMME businesses are deemed to be between a near-major to a major extent important in the contribution of financial dynamics of SMMEs for the carrying out of work through to completion. The MS of 3.71 is between 3.00 and 4.00, which indicates that access to financial credit is perceived to be between to some extent and to a near-major extent important for the financial dynamics

of SMMEs for the carrying out of work through to completion. Also, the MS of 3.71 also indicates that the professionals perceive access to financial credit as the least important factor in the given list of factors.

Table 2: The importance of factors of the financial dynamics of SMMEs

Factors	Unsure	Not…….…….....…..Very					MS	Rank
		1	2	3	4	5		
Timely payments by main contractor	0.0	0.0	0.0	4.8	19.0	76.2	4.71	1
Work progress in order to issue payment certificate	0.0	0.0	9.5	4.8	28.6	57.1	4.33	2
Financial manage-ment of SMME business	0.0	4.8	4.8	9.5	23.8	57.1	4.24	3
Ability to access financial credit	4.8	9.5	14.3	4.8	14.3	52.4	3.71	4

Table 3 indicates the extent to which the factors that constitute the capabilities of SMMEs to tender for work were perceived to be of importance by the construction industry professionals. The responses are represented by means of a table with percentages ranging from 1 (not important) to 5 (very important), as well as mean scores ranging from a minimum of 1.00 to a maximum of 5.00.

As identified in Table 3, MSs that range between 4.00 and 5.00 indicate that managerial competencies, knowledge of the type of tender or contract, labour force competencies and industry familiarisation and support are to a near-major to a major extent important for SMMEs' capabilities to tender for work. The MS of 3.71, which is between 3.00 and 4.00, indicates that the availability of capital is between to some extent and to a near-major extent important for the capabilities of SMMEs to tender for work.

Availability of capital was ranked fifth of the five factors that contribute to the capabilities of SMMEs to tender for work with a MS of 3.71 This indicates that the professionals in the construction industry perceive availability of capital as the least important factor of the given factors of SMME capability to tender for work.

Table 3: The importance of factors of SMMEs' capabilities to tender for work

Factors	Unsure	Not……Very					MS	Rank
		1	2	3	4	5		
Managerial competency	0.0	4.8	0.0	4.5	19.0	71.4	4.52	1
Knowledge of the type of tender or contract	0.0	0.0	4.8	4.8	33.3	57.1	4.43	2
Labour force competency	0.0	4.8	0.0	9.5	33.3	52.4	4.29	3
Industry familiarisa-tion and support	0.0	0.0	9.5	9.5	38.1	42.9	4.14	4
Availability of capital	4.8	9.5	4.8	19.0	14.3	47.6	3.71	5

Table 4 indicates the extent to which the factors relating to the conduct of SMMEs were perceived to be of importance by the construction industry professionals. The responses are represented by means of a table in percentages ranging from 1 (not important) to 5 (very important) as well as mean scores ranging from a minimum of 1.00 to a maximum of 5.00.

As seen in Table 4, the MSs are greater than 4.00 but less than 5, which indicates that honesty, accountability, work prioritisation, transparency and integrity are deemed to be between a near-major extent and a major extent important for the conduct of SMMEs. The MS of 3.90, which lies between 3.00 and 4.00, indicates that the professionals in the construction industry perceive business motive declarations to be between to some extent and to a near-major extent important for the conduct of SMMEs.

The MS of 3.90 ranked business motive declaration fifth of the six factors of conduct, making it the last factor of conduct among the given factors of conduct of SMMEs. The ranking indicates that the professionals in the construction industry perceive business motive declaration as the least important factor of conduct by SMMEs from the given list of factors of conduct.

Table 4: The importance of factors constituting the conduct of SMMEs

Factors	Unsure	Not……Very					MS	Rank
		1	2	3	4	5		
Honesty	0.0	0.0	9.5	0.0	14.3	76.2	4.57	1
Accountability	0.0	0.0	9.5	4.8	28.6	57.1	4.33	2=
Work prioritisation	0.0	0.0	4.8	9.5	33.3	52.4	4.33	2=
Transparency	0.0	0.0	0.0	19.0	47.6	33.3	4.14	3
Integrity	0.0	4.8	4.8	19.0	23.8	47.6	4.05	4
Business motive declaration	0.0	0.0	0.0	38.1	33.3	28.6	3.90	5

Table 5 indicates the extent to which professionals in the construction industry agree with factors relating to the financial motives of SMMEs as well as their impacts. The responses are represented by means of a table in percentages ranging from 1 (strongly disagree) to 5 (strongly agree) as well as mean scores ranging from a minimum of 1.00 to a maximum of 5.00.

As identified in Table 5, the two MSs are greater than 4.00 but less than 5, indicating that the professionals in the construction industry strongly agreed between to a near-major extent and to a major extent that SMMEs are profit-oriented and SMMEs compromise on quality to save money. The MS, greater than 3.0 but less than 4.00m indicates that the professionals in the construction strongly agreed between to some extent and to a near-major extent, that SMMEs employ incompetent workers at low payment rates. The MS, lying between 2.00 and 3.00, indicates that the professionals in the construction industry strongly agreed that between a near-major extent and to some extent, incompetent SMMEs engage in bribery to secure work in order to make a profit.

Table 5: Agreement to the financial motives of SMMEs and their effects

Statement	Response (%)						MS	Rank
	U	SD	D	N	A	SA		
SMME are profit-oriented	0.0	9.5	0.0	0.0	47.6	42.9	4.14	1
SMMEs compromise on quality to save money	0.0	0.0	9.5	23.8	23.8	42.9	4.00	2
SMMEs employ incompetent workers at low payment rates	0.0	0.0	19.0	19.0	28.6	33.3	3.76	3
Incompetent SMMEs engage in bribery activities to secure work to make profit	23.8	4.8	4.8	33.3	23.8	9.5	2.57	4

Table 6 indicates the extent to which professionals in the construction industry agree with factors relating to the involvement of SMMEs in township development projects. The responses are represented by means of a table in percentages ranging from 1 (strongly disagree) to 5 (strongly agree) as well as mean scores ranging from a minimum of 1.00 to a maximum of 5.00.

As indicated in Table 6, the MSs – greater than 3.00 but less than 4.00 – indicate that the professionals in the construction industry strongly agree between some extent to a near-major extent, that SMMEs lack knowledge and learn on the job, SMMEs run out of money to sustain their projects, SMMEs do not handle their finances properly and SMMEs meet the required deadlines. The MSs – greater than 2.00 but less than 3.00 – indicate that the professionals in the construction industry strongly agree between a near-minor extent and to some extent that SMMEs are corrupt, SMMEs plan their work, SMMEs meet required work standards, SMMEs employ competent workers, SMMEs' financial credit applications are constantly rejected and SMMEs are financially sound.

Table 6: The agreement to factors involving SMMEs in township development projects

Statement	Response (%)						MS	Rank
	U	SD	D	N	A	SA		
SMMEs lack knowledge and learn on duty	0.0	4.8	9.5	14.3	52.4	19.0	3.71	1=
SMMEs run out of money to sustain their project lifespan	4.8	4.8	4.8	0.0	71.4	14.3	3.71	1=
SMMEs do not handle their finances properly	4.8	0.0	14.3	19.0	38.1	23.8	3.57	2
SMMEs meet required deadlines	0.0	4.8	28.6	28.6	23.8	14.3	3.14	3
SMMEs are corrupt	9.5	4.8	19.0	47.6	9.5	9.5	2.74	4
SMMEs plan their work	0.0	19.0	28.6	28.6	19.0	4.8	2.62	5
SMMEs meet the required performance standards	0.0	19.0	23.8	38.1	19.0	0.0	2.57	6=
SMMEs employ competent workers	0.0	9.5	38.1	38.1	14.3	0.0	2.57	6=
SMMEs' financial credit applications are constantly rejected	23.8	4.8	4.8	28.6	33.3	4.8	2.57	6=
SMMEs are financially sound	0.0	23.8	28.6	38.1	9.5	0.0	2.33	7

5. Conclusion and Recommendations

The study reveals the outcomes of the participation of SMMEs in township development projects. It is revealed that SMMEs face challenges that can be detrimental to a small business's wellbeing. These challenges faced by SMMEs are both internal and external. Internal challenges include management incompetency, while external challenges include the inability to access credit, among other challenges. The challenges revealed how inadequate construction management competencies – including managerial and labour force competencies – can affect conforming work, as well as addressing other objectives of this study. It was concluded that involving SMEs in township development projects can have negative effects. The recommendations include:

- The training of SMMEs for the specialised work they tender for in projects, which can provide the SMMEs with work familiarisation and improved competence
- Support for SMMEs by larger contracting firms which can assist in the transfer of skills and broadening of the knowledge among SMMEs.
- SMMEs should be provided with access to financial assistance and initiatives by the government and construction industry institutions.
- Uncompromising tendering policies and process should be established, which can mitigate corruption and bribery aimed at securing work and allow for qualified SMMEs to tender for work.

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Indicators of Management Capability in Small and Medium-Sized Construction Organisations: A Literature Review

Marcia Mampholo Raphiri[1], Innocent Musonda[2] and Chioma Sylvia Okoro[3]

Abstract

Most construction small and medium-sized Enterprises (SMEs) do not have the necessary capabilities to manage construction projects, in terms of use of resources, and expertise to deliver construction projects within time, below budget and at a required quality standard. Poor management capability leads to delays, cost overruns, and compromised quality standard. The objective of this paper is therefore to identify indicators of management capability to successfully deliver construction projects. A review of extant literature was undertaken. The sources of materials were databases accessible from the university's coffers, including Science Direct, Ebscohost, Academic Search Complete, as well as Google and Google scholar. Journal articles, conference proceedings, theses and dissertations were consulted. The materials were selected based on their currency and possession of keywords related to the study. Findings revealed that the indicators of management capabilities are resource base, project governance, organisational structure, technical personnel, productivity and workload of the organisation. The paper contributes to the existing theory on improving performance of construction SMEs. Further, the study is envisaged to be beneficial to construction SMEs development board, SMEs management, owners and project teams in utilising resources effectively in order to deliver construction projects within contract duration, below budget and at a required quality standard.

Keywords: construction projects, management capability; performance, SMEs

1. Introduction

The construction industry's contribution to the gross domestic product of South Africa decreased by 0,7% in the fourth quarter of 2018 (Statistics South Africa, 2018). This shows that there is a lack of progress in the construction industry development. This is partly as a result of poor performance of SMEs in the construction industry, which threatens their survival in a highly competitive environment such as construction (Malisiovas, 2010). Small and medium enterprises are main revenue generators in South Africa and the main source of business employment globally (Bureau for Economic Research (BER),

[1]Postgraduate student, Construction Management and Quantity Surveying Department, University of Johannesburg, South Africa; mampholomarcia@yahoo.com
[2]Associate Professor, Construction Management and Quantity Surveying Department, University of Johannesburg, South Africa; imusonda@uj.ac.za
[3]Lecturer, Finance and Investment Management Department, University of Johannesburg, South Africa; chiomao@uj.ac.za; chiomasokoro@gmail.com

2016; Organisation for Economic Co-operation and Development (OECD), 2018). However, SMEs, with limited capital investment, and who may need financial and managerial support to effectively run his or her business, are influenced by managerial factors, which hinder their performance in terms of quality of work, tender preparation and estimation, as well as timely completion of projects (Kulemeka et al., 2015). Ultimately, poor performance of construction SMEs adversely affects the economy.

Previous studies have identified causes, provided solutions and recommendations on how to improve SMEs poor performance (Doloi et al., 2012; Wentzel et al., 2016; OECD, 2018). In addition, the government implemented solutions, provided recommendations and proposed other initiatives to improve the performance. However, the problem is still persistent and this is partly as a result of poor management attributes (Forth and Brynson, 2018). However, few studies have focused on management capabilities from a project perspective, as a contributor to poor performance of SMEs. In some studies, the management capabilities are focused on business capabilities rather than from project perspective (Killen and Hunt, 2013; Rungi and Kolk, 2012). Further, the study by Kulemeka et al. (2015), examined characteristics and proclivities of construction SMEs in Malawi, which affect their performance. However, this study dwelt on the performance indicators including tender preparation and estimation, timely completion of works and quality of works. The study however acknowledged that plant and equipment, supervision staff, experience, skilled labour and professional management contribute to SMEs' performance. Nonetheless, it appears that there is limited literature that focused on management capability in relation to project performance and this is the premise of the current study.

Many construction SMEs do not complete construction projects within time, within budget and at a required quality standard. Previous studies have shown that the construction SMEs lack resources in completing construction projects. However, to deal with this, companies would subcontract the works to other companies who have the necessary resources to perform the works (Nowotarski and Paslawski, 2015). Having necessary resources is not enough. Organisations need to have the right people with the right skills to use the resources with competence and to make them economical (Donyavi and Flanagan, 2009; Rungi, 2014). Moreover, companies may have the necessary resources and the right technical personnel but they accept projects which are too big for their resources to cope with (Nowotarski and Paslawski, 2015). In order to complete those projects, they end up hiring more resources, which may not be the right decision as this could cost more. The lack of contractors' ability to use resources therefore leads to poor performance of construction projects which ultimately will affect the overall performance of the company (Kulemeka et al., 2015). Failure of construction projects to meet performance targets affects the overall performance of the organisation (Vleems, 2018). Hence, many construction companies are liquidated or shut down. People lose jobs which invariably increases poverty, unemployment rate and crime in the country. Therefore, research on the capability of construction SMEs to manage resources is vital.

The current paper therefore aims to investigate the indicators of SME's capability to use resources successfully in order to deliver construction projects within time, below or within budget and at a required quality standard. The findings will benefit SME development board, SMEs management, owners and project team on how to use resources effectively in order to deliver construction projects successfully.

2. Methods

The current study is a preliminary review and part of an on-going Master's degree research. To achieve the objective of the current study, literature was reviewed on indicators of management capabilities from journals, conference proceedings, books and dissertations. The sources of materials were databases accessible from the university's coffers, including Science Direct, Ebscohost, Academic Search Complete, as well as Google and Google scholar. Journal articles, conference proceeding, thesis and dissertations were consulted. The materials were selected based on their currency, with literature spanning over a 15-year period (2004 to 2018) as well as possession of keywords related to the study including construction, SMEs, performance, and management capability. The findings are presented hereunder.

3. Findings on management capability indicators

Successfully managing construction projects in order to complete within contract duration, below budget and at a required quality standard requires management capability (O`Regan and Ghobadian, 2004). The indicators of management capability as observed from the preliminary literature review are discussed hereunder.

3.1 Resource base

The lack of management capability is when the contractor does not have the sufficient resources to successfully deliver a project given available resources. The resources in the construction projects are materials, plant, tools, equipment, and manpower along with money, time and space (Donyavi and Flanagan, 2009; Kumari and Vikranth, 2012). The project delivery within budget, contract time and required quality standard depend upon having the necessary resources with the right people at the right place (Donyavi and Flanagan, 2009).

Companies may have resources but they need to have skills and competences to use and make them economically worthwhile for their business (Rungi, 2014). Morgan and Gbedemah (2010) stated that availability of resources will enable the project team to make appropriate decisions but if they are unavailable, it becomes difficult to plan for project activities.

3.2 Technical personnel

Having the right people goes hand-in-hand with having the right skills to successfully complete a project. According to Aje et al. (2009) experienced technical personnel are responsible for formulating and taking decision at the right time for the project to be completed within budget, duration and to the required quality standard. The companies require to have the right personnel to perform the works. If the project team is capable in terms of having the right skills, experience and the competence, productivity will be improved and thus resulting in reduced costs and maximal efficiency. This was supported by the study by Hove and Banjo (2018), which showed that lack of skills or competence have a negative effect on the performance of construction projects. The project team takes longer time than anticipated to complete the tasks or activity which will affect other activities in the programme of works or schedule. The delay in other activities will eventually delay the overall project completion timeline. The equipment should be used with detailed work method and time motion for each type of activity in order to monitor productivity (Kumari and Vikranth, 2012). According to Malisiovas (2010), increased construction productivity can be attained with the right skills to perform the job.

Therefore, the project team should have the capability, in addition to an ability to use the available resources effectively to perform their roles and processes to deliver the project objectives, albeit in line with management systems deployed to fulfil certain functions as discussed hereunder (Morgan and Gbedemah, 2010).

3.3 Organisational structure

Zuofa and Ochieng (2016) opined that organisational structure is the formal system of tasks and authority relationships that guide how people cooperate and use resources to attain organisational goals. Aje et al. (2009) stated that organizational structure of the company has a significant impact on construction project performance. They further opined that organizational structure of the company has significant impact on construction project performance and furthermore. Effective management of the organization brings about teamwork resulting in effective project delivery in time, within cost and to the required quality standard. Previous studies have shown that systems play the most important role in subsequent resource, capability and performance relationships (Ismail et al., 2012).

3.4 Project governance

Morgan and Gbedemah (2010) stated that the poor project governance influences the timeline for project delivery which will lead to increased costs and ultimately project failure. The basic function of project governance is to define how resources and risks are to be allocated to different participants in the project (Klakegg et al., 2007). Project governance characteristically provides the best indication of who is involve in the project; and who in the project organisation is responsible for any course of action through its life cycle (Ekung et al., 2017). Increasing numbers of studies have demonstrated strong relationship between project governance with project success. In addition, Morgan and Gbedemah (2010) and Windsor (2018) noted that good project governance focuses on both doing the right projects and completing them right for the first time. Doing the projects right means project control processes are effectively managed to deliver the set project goals which will benefit both the business and stakeholders. Project governance comprises project objectives, project sponsorship, project management, disclosure and reporting.

3.4.1 Project direction

The project direction is concerned with project portfolio and entails ensuring that they are aligned with the company's objectives or strategy including among others, profitability, reputation and sustainability (Morgan and Gbedemah, 2010; Rungi, 2014). According to Windsor (2018), the project portfolio management ensures that all active projects in the organisation meet strategic objectives and are managed efficiently to meet the project and business objectives. Windsor (2018) added that project portfolio management is about doing the right projects at the right time.

3.4.2 Project sponsorship

Morgan and Gbedemah (2010) opine that a company which has a good project governance will have a project sponsorship. In addition, they stated that project sponsorship is the linkage between the senior management of the organisation and the project team and is the platform where integration of project objectives is aligned with the organisation's strategy and a communication route where project managers report project progress and issues affecting the success of the project. The project team obtains authority and makes decisions on the issues of the project and matters which are out of their control are escalated

to the senior executive of the company. The significance of project sponsorship is that project objectives are delivered accordingly.

3.4.3 Disclosure and reporting

The culture of openness and honesty in the organisation is the key for effective reporting (Morgan and Gbedemah, 2010). Progress report requires reliability and timeliness in order ensure that the right decisions are made at the right time for the project (Morgan and Gbedemah, 2010). Without the right decisions being made at the right time, the project is likely to fail. As a construction project is a temporary activity, there are start and the end dates (Cartlidge, 2015). The same disclosure and reporting should apply to suppliers and subcontractors. They need to be transparent on their performance especially if risks involved require to be managed (Morgan and Gbedemah, 2010).

3.5 Productivity

According to Kumari and Vikranth (2012), where the number of resources are involved, time is the essence of the productivity, for instance, "for plants, the upward trend of productivity and shift hours in the night time during summer season recommends shifting of activities to night time for more productive output". The equipment should be used with detailed work method and time motion for each type of activity in order to monitor productivity (Kumari and Vikranth, 2012). An improved productivity can be achieved when the right personnel have the right tools or equipment with the right skills to perform the job (Masiliovas, 2010). According to Aje et al. (2009), the effective use of plant and equipment has a significant impact on construction time performance. Randunupura and Hadiwattege (2013) added that the contractor's efficient management of plant and equipment enhances proper execution of the project and speeds up the delivery of the project. This relates to financial planning with regard to purchasing, leasing, managing, repairing and/or replacing plant and machinery, and in turn delivery of projects within its planned duration for completion as well as costs (time and cost performance).

3.6 Workload of the organisation

Without winning tenders or orders, it is impossible for a company to stay in business. There will be no work for employees, no revenue and profit for the company. However, in the case where a company receives two or more contracts or projects at the same time, there is a need to select orders which are cost/profit-effective, feasible and reject other orders.

According to principle, "working more is better than not working at all" is usually applied. However, Morgan and Gbedemah (2010) argued that companies need to work on the right projects which benefit the business and that are aligned with the organization's strategy. Companies would prefer to accept more contracts or orders than to reject them, although they do not have sufficient resources to support all the projects (Morgan and Gbedemah, ibid.). The projects will suffer high costs due to hire or purchase of resources. Rungi (2014) supported that companies need to take new strategically aligned projects, especially when all the resources are already consumed by other existing projects in progress and these new projects may cause the existing projects to be delayed.

4. Summary of Findings

The literature was reviewed on indicators of management capabilities from journals, articles, books and dissertations. It was argued that regardless of the resource base which an organisation has, and the ability to leverage resources to undertake the entity's works, other factors are crucial in the successful delivery of projects. These include:

- Technical personnel: having experienced technical personnel, who are responsible for formulating and taking decision at the right time for the project to be completed; The technical personnel with the right skills, experience and the competence will improve productivity in reducing costs and maximising efficiency.
- Organisational structure: it will guide people on how to cooperate and use resources to attain organisational goals. It brings about teamwork resulting in effective project delivery on time, within cost and to the required quality standard. It also plays an important role in subsequent resource, capability and performance relationships.
- Project governance: It is how resources and risks are to be allocated to different participants in the project. The project governance provides the best indication of who is involved in the project and who in the project organisation is responsible for any course of action through its life cycle. The project objectives, project sponsorship, project management, disclosure and reporting are collectively called project governance.
- Productivity: the productivity can be achieved when the right personnel have the right tools or equipment with the right skills to perform the job. Equipment should be used with detailed work method and time motion for each type of activity in order to monitor productivity.
- Workload of the organisation: Organisations would prefer to accept more contracts or orders than to reject them, although they do not have sufficient resources to support all the projects. New projects will end up being completed late, with cost overruns and compromised quality standard.

The above factors therefore hinder the ability of SMEs to successfully deliver construction projects. Effort has to be made by management in these organisations to improve and sustain performance in the identified areas.

5. Conclusion

This paper set out to explore indicators of management capabilities in construction SMEs. Literature review was undertaken in both international and South African context, from various sources which identified indicators of management capabilities as project governance, technical personnel, workload of the organisation, productivity and organisational structure. The findings give valuable insight for the improvement of construction SMEs in completing projects within time, below budget and at a required quality standard. Therefore, it is recommended that in order to improve performance of construction SMEs, construction SMEs need to accept orders which are aligned with their company's goals. Before they can carry out any project, they need to ensure that they have sufficient resources, skilled personnel, and good project governance systems to complete the work.

Being a literature review, the current study is limited in its generalisation. Further studies are on-going to validate or refute the findings using primary data collection techniques in order to find lasting or sustainable solutions to construction SMEs' poor performance.

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Retrospective Analysis of Failure Causes of Small Scale Contractors' Business in Zambia: Contractors' Perspective

Sidney Kawimbe[1]

Abstract

The construction industry has been one of the fastest growing industries in Zambia, contributing about substantially to the national Gross Domestic Product (GDP). However, this growth appears lopsided towards foreign owned companies who account for less than 5 percent of registered contractors, but have a share of over 90 percent of the works contracts. This has been attributed to inadequate financial and technical capacity among local contractors, fragmented nature of the industry, excessive competition, relatively low entry barrier, high uncertainty and risk involved. As in the case of any other business sector, failure, collapse, bankruptcy, and/ or closure are common words in the construction industry since construction industry involves many risks. The objectives of this research have been achieved by means of interviewed questionnaire. It is well established that a number of factors contribute disproportionately to the failure of Small Scale Contractors (SSCs) in Zambia. This paper examined the contribution of managerial, financial and external factors to the failure of SSCs in the Zambian context. The research adopted a positivist theoretical perspective by utilising a questionnaire as a primary data collection instrument within the qualitative research technique. Data was collected from a total of 348 respondents being business owners of failed businesses, business managers and owners of currently surviving businesses. The data was analysed with the aid of both Microsoft Excel and Statistical Package for Social Sciences (SPSS) programs. The results ascertain that insufficient skills in the domain of financial management, lack of business management skills, misapplication of business working capital, overtrading and corruption are among the factors that contributed to failure of SSCs in Zambia.

Keywords: Construction Sector, local contractor, national construction council, small-scale contractors

1. Introduction

Humans have been involved in construction industry since the beginning of civilization. Even in ancient time, construction and architecture marvels were created and are considered now the wonders of the world, such as pyramids of Egypt, the Great Wall of China, Taj Mahal and also the Eiffel Tower of Paris. During the eighties, the construction industry expanded and its total annual value around the world was about 1.5 billion dollars. While during this century the construction activity is revolutionalised to include high rise buildings, infrastructure facilities, dams and irrigation works. As a result of this, the annual value

[1] Zambia Centre for Accounting Studies (ZCAS) University

of construction business reached over 3.5 trillion dollars annually worldwide and apparently there is no slowdown in sight, Jackson (2004).

The construction sector is a very important industrial sector of any national economy. Murie (2003) cited by Mwanaumo (2011) reported that globally, the construction industry is huge in nature contributing more than 3 trillion United State Dollars. The global contribution of the construction in terms of Gross Domestic Product (GDP) is estimated to be around 10%, Murie (2007). Terms such as industry Collapsed, failed, bankrupt, broke, and bust are common. None of these are pleasant words, and this is not a very pleasant subject, but in real life companies do collapse, they do fail, do 'go bust'. The risk of business failure exists in every industry. However, construction companies are particularly vulnerable to bankruptcy due to the excessive competition, relatively low entry barrier, high uncertainty and risk involved, and unpredictable fluctuations in construction volume, Edum-Fotwe et al., (1996); Kangari, (1988); Kale and Arditi, (1999). Small and medium enterprises (SMEs) in general and Small Scale Contractors (SSCs) in particular have been viewed as very important vehicles for the development of an economy especially developing economies through for example creation of employment, increasing tax base for the country, improving incomes for the low earners among other benefits. For instance, Tambunan, (2006) posited that SMEs in developing countries are important socially and economically for a number of reasons, including wide dispersion across rural areas and important for rural economies, their ability to employ a significant amount of the labour force in their local economies; and their ability to provide an opportunity for entrepreneurial and business skill development.

2. Literature Review

The objective of this chapter is to broaden on perspectives on factors that collude in causing SSCs' failure as cited by literature and explaining the SSCs failure phenomena needed to inform the methodology. The review examines the different perspectives (causal descriptions) under which SSCs failures have been discussed. The chapter ends with a critical evaluation of conventional SSC theories as well as lessons that could be learnt from the existing theories for researchers interested in undertaking similar studies in the Zambia and the sub region context.

The literature review on the causes of failure of SSCs begins with the discussion of the importance of business management principles and resources as outlined by various researchers and how non-adherence to them – or the lack of them – can lead to business failures. This is followed by an examination of the international literature on business failures aimed at providing an idea of the nature of those theories. As causes of small business failure reported by the literature are many and varied according to Gitman *et al* (2009). There is a need to classify these causes into categories and themes. An important element of this literature review relates to an attempt made by Kawimbe (2017) of the present research to classify the numerous failure theories reported to be causes of small business failure themes, Longenecker, Simonetti & Sharkey (1999); Carter & van Auken (2006). These causes have been classified into three broad themes to enhance understanding.

This classification principle is again applied in Chapter 4 where factor analysis is used to obtain the failure factors from the research area. The theoretical discussions begin by defining the basic concepts used in this research as a backdrop to the substantive issues that are elaborated on later. To set the scene, it begins with definitions of research theories and their roles generally in research studies.

3. Conceptual Framework

A conceptual framework represents the researcher's synthesis of literature on how to explain a phenomenon. It maps out the actions required in the course of the study given his previous knowledge of other researchers' point of view and his observations on the subject of research. In other words, the conceptual framework is the researcher understands of how the particular variables in the study connect with each other. Thus, it identifies the variables required in the research investigation. It is the researcher's "map" in pursuing the investigation. As McGaghie *et al*. (2001) put it: The conceptual framework "sets the stage" for the presentation of the particular research question that drives the investigation being reported based on the problem statement. Firm Growth and Sustainability (G&S) is usually measured as financial and nonfinancial performance measures. G&S comprises of financial efficiency measures such as return on investment and return on equity, and profit measures such as return on sales and net profit margin, Li, Huang, and Tsai, (2010). Nonfinancial measures include customer satisfaction; turn over, employee growth, and market share. Some of the nonfinancial measures are end performance measures such as market share and share growth, while some of them may serve as leading indicators of end-result financial performance. The figure below shows the study's conceptual framework which illustrates the relationship between the variables of the study. The independent variable in this study are the factors that appear to collude in stifling growth and sustainability of SSCs and these have been grouped in three categories: managerial factors, external factors and the financial factors. The dependent variable is the growth and sustainability of SSCs. A conceptual framework below shows the link between dependent and independent variable.

The conceptual frame work indicates relationships between various variables at play. In order for the sector to grow there is need for all stakeholders to play their role and enable a conducive environment at all levels of participation. In this case the following is true of the various factors above:
Government Policy- Effective government policies and programs are required to ensure that SSCs in construction sector operate in a favourable and conducive political, economic and social environment. These policies include fiscal and monetary policies that affect the prices of key production factors, namely tax regulation, interest rates, exchange rates or economic policies such as membership to trade bodies, import and export policies, trade and inflation etc. Other policies that could affect Small Scale Contractors may arise from political policies such as labour laws, sector preferences and empowerment policies. All these policies and program may impact the SME sector negatively or positively depending on its objectives. The sector is also influenced by many stakeholder interventions and programs.

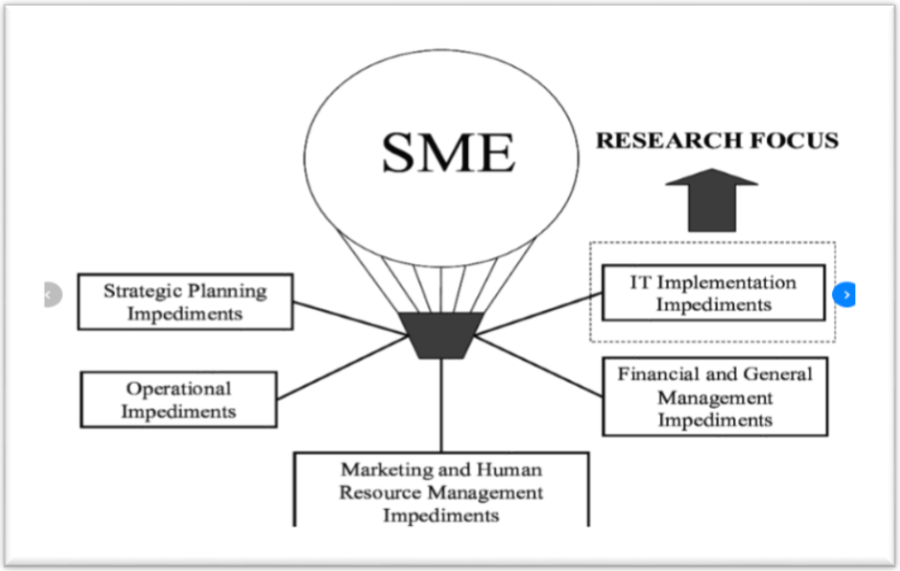

Figure 3.4 Conceptual Framework (Source: Stewart, 2002)

4. Methods

The study adopted an exploratory research method. Data extraction from the respondents was collected through structured questionnaire methods. For purposes of survey, some contractors were met in person and explanations were given for the need for the study. The equal distribution is not ensured and location importance or priority is not given. This approach to data collecting was the main form used in the thesis as it is subjective in nature and proved to be an effective method to provide an in-depth understanding of relationships between various variables and how these variables interplay with one another. The method also allowed for thorough interrogation and interviewing of the participants in the research. It enabled the researcher to explore every variable, examine it in relation with other variables and be able to track down their effect and impact and overall impact, and examine various actions (consequences) taken by different organisations in addressing the issue at hand.

4.1 Research approach

The approach adopted in this research is exploration in that the aim is to establish and or explore factors that collude to stifle growth of SSCs in Zambia. This approach involves the attempt to determine "what is happening, seeking new insights, and asking questions that assess new phenomena". The research method requires skills and research to enhance the ability of observations, getting information, and theorizing the findings. Saunders et al (2007) asserted that the main steps for carrying out an exploratory research include: searching literature; conducting an interview with the subject experts; and holding focus group discussions. A descriptive study, on the other hand, involves accurate portrayal of events, persons, or situations. In this method, the problem is structured based on the previous research problem and may involve multiple variables. Thus, researchers consider it as a means to an end rather than an end in itself. The research aims at discussing a problem based on the previous and current understanding of the issue.

As such, it helps to explain the current characteristics and problems affected the SSCs in Zambia. Different variables that contributed to the problem were addressed through the use of an exploratory method.

4.2 Research design

This research is exploratory in nature as it attempts to explore the causes of SSCs failure in Zambia from the perspective of the contractor's themselves. Their subjective perceptions formed the core data of the study; hence it needed the method that would deal with the topic in an exploratory nature. For the purpose of this study, the research paradigm that was followed is of qualitative nature, using semi-structured interviews as discussed later in the chapter. Leedy (1993) explains that qualitative research is based on the belief that first-hand experience provides the most meaningful data. It is also believed that qualitative data gives large volumes of quality data from a limited number of people. It is aimed at understanding the world of participants from their frame of reference, Walker (1985. In qualitative research, the researcher is in continuous interaction with the participant in an attempt to discover the participants' meaning of his/her life world, Mashego, (2000); Neuman, (2000). The research design as a problem solving tool follows the process as recommended by Zikmund (2003); Cooper & Schindler (2008); Mouton (2002) and Fouche & Delport (2006) as well as Bryman & Bell (2011).

4.3 Research population

Kombo and Tromp (2006) define population as a group of individuals, objects or items from which samples are taken for measurements. In other words, population refers to a total group of persons or the comprehensive collection of items that are relevant to the study, Steyn *et al* (1987) cited by Mwanaumo (2013) Willian (2011) argues that population in research does not necessarily mean a number of people, rather it is a collective term used to describe the total quality of things (or cases) of the types of objects, orgaisations people of even events. Therefore population can be certain types of objects, organisations people of even events. Still others such as Walpole and Myers (1988) posited that a population consists of the totality of the observations with which we are concerned. In this research, the target was drawn from the entire country (10 provinces) totaling 4,861 (Four Thousand Eight Hundred and Sixty One) SSCs that are registered with the NCC, (NCC, 2018).

4.4 Sampling Techniques

Non probability or non-random sampling represents a group of sampling techniques that helps researchers to select units from a population that they are interested in studying. Further, Bryman and Bell (2011) define non-random sampling as a sampling technique in which the researcher selects samples based on the subjective judgment of the researcher rather than random selection. In non-probability sampling, not all members of the population have a chance of participating in the study unlike probability sampling, where each member of the population has a known chance of being selected. In this research, quota sampling was used to select the sample because any other sampling method would not have been ideal considering that Zambia with 10 (ten) province has rural and urban provinces. Most SSCs are concentrated in Lusaka and Copper belt provinces hence to avoid any biasness, a quota sampling was utilised.

4.5 Sampling Plan

The sampling plan was designed in such a manner that the resulting data contained a representative sample of the parameters of interest and allowed for all questions as stated in the goals to be answered. The most appropriate methods of sampling that the research undertook was the random sampling. A random sample would be representative of the population and usually eliminates bias by giving all individuals an equal chance to be chosen. The questionnaire was sent out to a total of 348 contracting companies asking their contribution in ranking the 14 factors identified in terms of severity using an ordinal scale. The ordinal scale was as presented in Table 1.

Table 1: Response classification

Scale	Interpretation
0	No influence
1	Very low influence
2	Low influence
3	Moderate influence
4	High influence
5	Very high influence

A total of 348 completed questionnaires were returned, representing a good response rate of 100 per cent. According to Baruch & Holtom (2008) the average rate of 53% with a standard deviation of 5% is deemed is deemed representative enough.

4.6 Sample size determination

The studied target population includes contractors who hold valid registration from the NCC and contractors whose businesses had failed. Considering that the sector populations was, 3,861, a systematic random sample at confidence level of 95 percent and 5 percent confidence interval, with Zscore of 2.58 was selected to ensure a sample of 348 was selected using the following equation:

$$S = X^2 NP(1-P) \div d^2(N-1) + X^2 P(1-P)$$ where:

S= required sample size.

X2 = the table value of chi-square for 1 degree of freedom at the desired confidence level (2.58).

N = the population size.

P = the population proportion (assumed to be .50)

d = the degree of accuracy expressed as a proportion (.05). Representative sample of all contractors.

Based on the population of 3,643 with a confidence level of 95%, the sample size was therefore computed as follows:

$$S = 1.96^2 \text{ X } (3643 \text{ X } 0.5) / 0.5^2 \text{ X } (3643-1) + 1.96 \text{ X } (1-0.5)$$

S = 348 respondents

5. Data Presentation and Analysis

The previous section presented a detailed discussion of the research design and methodology relevant for the success of the researcher's objectives. The chapter covered the research design, a description of the data collection and data analysis tools employed. The present section focuses on the research findings as gathered from the literature review and questionnaire surveys. This is the most crucial part of the thesis as it involves the process of data collection, findings, analysis and interpretation of data in order to get the final results. The chapter summarizes the results of the study and analysis in reference to literature review. This chapter reports the findings under three categories namely financial, external environment and managerial. This chapter will also provide information about the instrument that was used during the study. These instrument used was a questionnaire which ass used on SSC enterprise owners. Furthermore, this chapter also discusses the response rate that was recorded during the course of this study; the non-response rate is also presented here.

5.1 Importance Index

For analysing data by ordinal scale, an importance index was used. This index was computed using the following equation as posited by Lim and Alum (1995):

$$\text{Importance Index} = \frac{[(5n5+4n4+3n3+2n2+n1) \times 100]}{[5(n1+n2+n3+n4+n5+n0)]}$$

Where n0 is the number of respondents who answered "no influence", n1 is the number of respondents who answered "very low", n3 is the number of respondents who answered moderate influence, n4 is the number of respondents who answered "high influence", and n5 is the number of respondents who answered very high influence. Accordingly, if all participants answer one factor to be "no influence" then the importance index is 0, which means that this factor is not relevant and last in rank. On the other hand, if all answer "very high influence", then the importance index is 100, which means that this factor has very high relevance and is the first in rank. Table 2 shows the possible ranges for the importance index and the corresponding impact levels.

The importance index (Table 3) for all factors was calculated. The group index was calculated by taking the average of factors in each group. The weighted mean, standard deviation, standard error of the mean, 95 per cent confidence interval, and coefficient of variation are calculated in order to measure the dispersion and homogeneity of the data.

Table 2: Importance Index Range

SN	Importance Index Range Percentage	Impact Level
1	0	No Impact
2	<20	Very Low
3	20-40	Low
4	40-60	Moderate
5	60-80	High
6	80-100	Very High

Table 3: Importance Index

Rank	Reason	Importance Index
1	Difficult in acquiring work	94
2	Difficult getting payment from client	92
3	Lack of experience in the firm's line of business	89
4	Lack of managerial experience	81
5	Poor corporate governance structure	80
6	Corruption	79
7	Lack of funding	78
8	Poor record keeping	77
9	Misapplication of funds	76
10	Lack of knowledge of differentiating business from personal capital	76
11	Nepotism and lack of qualified staff	73
12	Buying jobs	72
13	Change in type of work	70
14	Size of work program	59

5.2 Difficulty in acquiring work

Table 4.5 shows that out of the 348 respondents that were asked to state what they considered as the key factor that contributed to the failure of their businesses, 307 or 88% of the respondents indicated that they considered difficult in acquiring work especially from government as one of the main cause of their business failure. The claimed that most often, the government awards contracts to the big construction such as Avic International (a Chinese construction company) and China Geo. The two companies are believed to account for 90% of government contract, Mwandamena (2016). Only 41 or 12% of the respondents indicated that they were able to get contracts from the government and the private sector. This resonates with the claim by the NCC chairman that only 5% of contracts are awarded to the local SSCs. This was affirmed by a one respondent who stated:

> *"I registered a company four years ago and have complied with all the regulatory regime of both ZRA, NCC, PACRA, Engineering Institute of Zambia (EIZ) Grade 5 and all other bodies. However, it has been difficult to get work despite biding on several occasions. I have now run out of money to pay for bidding documents as it is expensive. I am now considering venturing into trading business if I can find some money from somewhere as construction business is now tricky", (Respondents No 56").*

Table 4: Difficult in acquiring work

SN	Ease of acquiring work especially from government	Responses	Percentage
1	It is difficult to get awarded contracts from government and private sector	307	88%
2	It is easy to get contracts from easy to get contracts from government and private sector	41	12%
	Total	**348**	**100%**

5.3 Delayed payment

Table 5 show that 254 or 73% or respondents reported that payments from their client who in most cases is the government is delayed. 90 or 26% reported that they were not sure if the payments were delayed as they considered delay by so called a few months is not necessarily delay but government beauracracy. A further 4 or 1% indicated that they did not experience any delay in payments from their clients. One respondent stated that:

> *"We won a tender to construct a clinic by the government through the Ministry of health in 2012 following the then president Michael Sata (MHSRIP) that the government would construct 650 rural health centres country-wide. I mobilised on site and obtained a loan from bank (name withheld). Half way the project, we ran out of money as the Ministry of Health did not fulfil their contractual obligation of releasing funds on a phased approach. As a result, the bank had to foreclose on my property which was pledged as collateral and to-date we have not been paid. This has led to laying off all the workers and we are still owing huge sums to the statutory bodies like National Pensions Scheme Authority (NAPSA). I can safely say we are insolvent and will not continue in business" (Respondent No 59)*

The construction process will be delayed and the list goes on. But one thing is for sure: delayed payments or non-payment to contractors have a negative influence on the overall construction process. It should be understood that 'the practice of efficient and timely payment in construction projects is a major factor that can contribute to a project's successes as reported by Camilleri (2011).

Table 5: Delayed payments

SN	Timely receipt of funds	Responses	Percentage
1	Always delayed	254	73%
2	Not sure	90	26%
	No delays	4	1%
	Total	**348**	**100%**

6. Summary of Findings

The discussion centred on the most important findings regarding the failure causes of SSCs from the perspective of the contractors themselves. From the study, the following key findings were identified:

- It is not surprising to those familiar with Africa generally and Zambia particularly that 307 out of 348 or 88% of the respondents reported that their businesses had collapsed or were struggling due to difficulty in acquiring work. This variable ranked highest on the Importance Index (II) at 94 indicating that it is a high impact factor.
- Difficulty getting payment from the client ranked second on the (II) at 92. Out of the 348 respondents, 254 or 73% reported that the biggest challenge to their business growth was difficulty in getting payment from the client, especially local and central government. Most African countries are heavily indebted and a big chunk of their national budgets is channelled to debt servicing leaving SSCs and other businesses grappling with unpaid invoices from the local and central government. Since the biggest client of SSCs in Zambia is government, this in turn is leaves SSCs in dire situations and has led to most of them folding or going into voluntary liquidation as they end up failing to pay bills mostly employee remuneration and statutory obligations.
- Lack of experience ranked third on the (II) at 89. Due to corruption in the construction value chain, connected SSCs are awarded contracts even in areas where they lack experience. This was confirmed by 57% or 200 out of the 348 respondents who claimed that undeserving or some contractor especially foreign owned ones where bribery was rife. This is confirmed by the high corruption perception with Zambia ranking at 97% on the CPI by the Transparency International Zambia
- Weak corporate governance structures ranked fifth at 80 on the (II). 300 out of 348 or 86% reported that they did not have any corporate governance structures in their businesses due to partly the high cost of setting such structures and partly to the size of their businesses. Only 7% indicate that they had put in place some sort of board of directors. Further it was difficult to verify the independence of these boards. In the few boards that were put in place, the office bearers would be the same family members without any expertise and their composition would be a formality to probably lobby for government incentives.
- Lack of financing ranked 78 on the (II). Out of 348 respondents, 206 reported that they had borrowed from financiers for their businesses particularly to finance a specific job. 142 reported that they had never borrowed from any financing company. This is in sharp contrast to the general belief that lack of financing is a major hindrance to the growth of SMEs.

7. Conclusions and Recommendations

This exploratory study examined the reasons for SSCs failure in Zambia. Based on the structured surveys administered to SSCs, several factors were identified that were responsible for SSCs failure: difficulty in acquiring work, difficulty in getting payment from client especially the local and central government, lack of experience in the firm's line of business, lack of managerial experience and poor corporate governance structures. Others were corruption, lack of financing, poor record keeping and misapplication of funds. Yet other reasons were cited such as lack of knowledge of differentiating business from personal capital, nepotism and lack of qualified staff, buying of jobs, change in the type of work and size of work

programme, although the last four did not feature highly on the Importance Index (II). Therefore, in conclusion, the local contractors will remain unsustainable and their performance unsatisfactory without the intervention of government. In order to address the challenges faced by local contractors in Zambia, it is important for government to review the policy with regard to capacity building of local contractors

From the foregoing analysis, findings and conclusions in the study, the following recommendations can safely be made for the stakeholders.

- Publicise through public tenders available contracting jobs especially by government: difficult in acquiring work was cited as among the highest ranked reasons why businesses failed. The reason was ranked first at 94 on the (II). In this vein, the government and other key players in the construction sector needs to publicise and award tenders in a transparent matter so that SSCs may be awarded the contracts and remain in business. This has been tried by the major players, the government through the 20% subcontracting to Zambian contractors but with limited success as the governments still prefers awarding contracts to foreign owned contracts citing lack of capacity and incompetence issues with local contractors
- To ensure proper and accurate records keeping, appropriate technology and qualified manpower with expertise in functional areas of management should be engaged and properly compensated based on their education, experience and skill and dedication. Efforts should be made to maintain accurate records on finances, inventory, revenues, expenses, and so forth. Accounts should be kept on a daily, weekly, monthly, and annual basis using current technology
- Fight Corruption**:** Corruption is dishonest behaviour by people in positions of power such as government officials and is usually accompanied by the acceptance of bribes. Corruption should be dealt with by the law but in Zambia. It is the law that has ignored this state of affairs and allowed the economy to become corrupt. This study deems it necessary for the government to implement serious measures to fight corruption in Zambia. Government should minimise the power of individuals as well as the bureaucratic procedures. Information should be easy to access, laws should be upheld and enforced and transparency and respect must be demanded. Corruption ranked 6th on the (II). It is worth mention that the vice is a key factor in that deserving SSCs are ignored at the expense of corrupt elements as can be from the respondents' answers where 200 out of 348 or 57% indicated that corruption was the main cause of their closures and lack of growth of their businesses.
- Create facilities for entrepreneurial skills and training development: **b**eside the entrepreneurship programme in the on-going secondary school curriculum reform in Zambia and new incubator support programme from NSCR and Bongo Hive, this study suggests that there should be more facilities for entrepreneurial skills and training development, institutions that are active in promoting entrepreneurship. Training and development programmes should encourage entrepreneurship and offer education on all aspects of the management process and business systems. Furthermore, large companies, private agencies and non-government organisations should help small businesses via their social responsibility programmes by providing funds to the relevant institutions for effective research, training and skills development.
- Lack of managerial skills: the reason ranked 4th on the possible causes of business failure by SSCs. The SSCs should seriously consider upgrading their skills through short courses and other informal learning processes.

- Corporate Governance: businesses need to enhance and formulate and implement corporate governance structures in their businesses if they are to grow. Poor corporate governance structures ranked 5th on the main causes of SSCs business failure. This is confirmed by the number of respondents that reported not having any corporate governance structures. Out of the 348 respondents, 300 or 86% reported that they had no corporate structures in place while a paltry 7% indicated that they had some semblance of corporate governance structures while a further 7% reported they were not sure.

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Assessment of Success Factors for Achieving Effectiveness and Efficiency of Construction Contracts in Nigerian Construction Industry

Mohammed Jamilu Bala-Maiauduga[1], Abdelnaser Omran[2], Abdullahi Nafiu Zadawa[1] and Alhassan Dahiru[3]

Abstract

There is a serious public outcry about numerous abandoned public projects across Nigeria despite the huge financial commitment. Most of these projects are within the construction industry. Various factors have been attributed to this damaging scenario, with project analysis and management being the most notable. This research is aimed at assessing the success factors for achieving effectiveness and efficiency of construction contracts in Nigerian taking Bauchi State as a case study. The respondents for this study came from a population of contractors who are working in Bauchi State in Nigeria. A total of 100 questionnaires were distributed to the respondents and 67 completed questionnaires were duly returned, yielding a 67% response rate. Average Index Method and frequency analysis were used for the analysis. From the results, five major critical success factors in achieving efficiency and effectiveness in construction contracts identified are; defined project objectives by the client; experienced workforce; adequate site supervision; best procurement method in relation to a project and developed and outlined project scope. Thus recommended that, these factors should be the priority of client's especially public client at state and federal government's level in Nigeria for achieving effectiveness and efficiency construction contracts.

Keywords: Construction contracts, effectiveness, efficiency, Nigeria.

1. Introduction

There is a serious public outcry about numerous abandoned public projects across the country despite the huge financial commitment. Most of these projects are within the construction industry. There are various factors that were attributed to this damaging scenario with project analysis and management being the most notable. Other factors include change in price of building materials and shortage of local manpower required to plan, manage and execute the projects (Okwandu and Owuala, 2005).

[1&3]Quantity Surveying Department, Faculty of Environmental Technology Abubakar Tafawa Balewa University PMB 0248 Bauchi, Nigeria; jbmaiauduga@yahoo.com
[2] Faculty of Engineering Sciences; Bright Start University, El-Breqa, Libya.
[4]Department of Quantity Surveying, Faculty of Earth and Environmental Sciences PMB 3011, Bayero University Kano, Nigeria.

Construction as a whole has become increasingly complex, thus, many owners have come to realize that they need skilled professionals to assist in planning, executing, monitoring, coordinating, controlling and advising the clients with respect to decisions throughout the entire process.

The Bauchi state Government has embarked on some many developmental projects most of which are within the construction industry. Therefore, it engages a large number of consultants, contractors and other related personnel. Due to the magnitude of the projects going on concurrently, the Government was necessitated to establish the office of project monitoring and that of budget monitoring price intelligent and public procurement unit. It is argued that the government needs to define more appropriate performance criteria for measuring project managers' performance and encourage their professional development. These can be used to engender a more appropriate set of management behaviour that will leads to improved project outcome. Project management competency represent the most significant as it is people who deliver projects and not process and system (Cooke-Davies, 2001).

Indeed, effective project management can be seen to be dependent upon the project managers' competency and authority (Jaselskis and Ashley, 1991). Accordingly, in recent years there has been growing emphasis within research and practice on the need to improve the performance of contractor's project manager in order to meet the increasing demands being placed on the industry by its clients. Most contracting organisations are beginning to focus attention on proactively managing the performance of their key managers and professional staff in order that they work and behave in a way which supports the desired growth and direction of the organisation (Moore et al,2003).

2. Literature Review

Construction contracts are mostly awarded to a general contractor who manages the project from inception to completion and subcontracts some portion to a nominated subcontractor. The general contractor is responsible for the executing the project according to the client satisfaction on schedule, within budget and with all necessary safety. Seeley (1997) described the construction industry as one of the most important sectors of the economy, which integrates a wide variety of professionals, skilled and unskilled personnel who engage in the provision of goods and services ranging from construction, alteration, refurbishment to repairs of building and civil engineering structures. All these professionals come and work together under various types of contractual agreements to actualize the client's brief and deliver the project.

According to APCC (2002), governments as major clients within the construction industry have a significant impact on project outcomes through their practices and through the conduct of public sector procurement processes and therefore, are a major influence on the construction industry and its performance. Construction procurement is often complex, inherently risky, and requires specific skills and expertise to optimize outcomes. Governments as 'clients' have specific responsibilities when engaging with the construction industry. From the literature review conducted sixteen success factors in achieving effectiveness and efficiency has been identified as presented Table 1.

Table 1: Factors in achieving effectiveness and efficiency in construction contracts

S/No	Factors in achieving effectiveness and efficiency in construction contracts
1.	Defined project objectives
2.	Experience work force
3.	Adequate site supervision
4.	Best procurement method in relation to a project
5.	Developed and outlined project scope
6.	Frequent progress meeting
7.	Selecting criteria for consultant and contractors
8.	Coordination between technical team and contractors
9.	Ensuring realistic estimate
10.	Efficient time management
11.	Prompt payment to contractors
12.	Adequate budget
13.	Proper monitoring and reporting mechanism
14.	Effective risk management
15.	Non-interference by gov't or its agent
16.	Clear and simple communication line

3. Research Methods

This study adopts the use of questionnaire as the main instrument for data collection. The questionnaire was designed in line with the literature review and distributed to various stake holders within the state which was subsequently collected and analysed using statistical package for social sciences. Sekaran (2006), described that, how variables are coded and scaled, use of unambiguous words and general appearance should be the emphasis when designing a questionnaire. Data was obtained from a population of contractors who are working in Bauchi State in Nigeria. A total of 100 questionnaires were distributed to the respondents and 67 completed questionnaires were duly returned, yielding a 67% response rate.

3.1 Data Analysis

The data was analysed using the average index and frequency analysis with the aid of Statistical Package for Social Sciences (SPSS). The result was evaluated in line with the four objectives of the study which was certainly the basis for conclusion and recommendation. Average Index Analysis was undertaken to analyse the data. Following (Majid and McCaffer, 1997); average index method was used to identify the most important factors in order to achieve the aim and objectives of the study. Average index presents the ranking of factors based on how they were ranked by the respondents. Table 2 defined the ranking of the 5 point Likert scale used.

$$\textbf{Average Index} = \sum ai\ xi \div \sum xi$$

Where: ai=weighting given to each factor by frequency of respondents
xi= number of respondents

Table 2: Average Index Analysis Rating Scale used

Strongly Disagree	1.00≤ AI< 1.50	Not Important
Disagree	1.50≤ AI< 2.50	Less Important
Not Sure	2.50≤ AI< 3.50	Average
Agree	3.50≤ AI< 4.50	Important
Strongly Agree	4.50≤ AI< 5.00	Very Important

4. Results Presentation

The factors consist of sixteen items which were arranged in the order of their importance. Table 4 shows that defined project objectives has an average index of 4.39 followed by experienced work force with 4.31. Adequate site supervision has 4.30 followed by best procurement method in relation to a project with 4.28. Next is developed and outlined project scope with 4.25 followed by frequent progress meeting. Selecting criteria for consultant and contractors was scored 4.09 and coordination between technical team and contractors has 4.04.

Table 4: Factors in achieving effectiveness and efficiency in construction contracts

Factors	Average Index	Ranking
Defined project objectives	4.39	1
Experience work force	4.31	2
Adequate site supervision	4.30	3
Best procurement method in relation to a project	4.28	4
Developed and outlined project scope	4.25	5
Frequent progress meeting	4.18	6
Selecting criteria for consultant and contractors	4.09	7
Coordination between technical team and contractors	4.04	8
Ensuring realistic estimate	4.03	9
Efficient time management	3.99	10
Prompt payment to contractors	3,93	11
Adequate budget	3.91	12
Proper monitoring and reporting mechanism	3.90	13
Effective risk management	3.82	14
Non-interference by gov't or its agent	3.75	15
Clear and simple communication line	3.73	16

5. Discussion of Results

Based on the ranking above, the success factors in achieving effectiveness and efficiency has been identified. The factors that are strongly agreed by the respondents are considered to be the critical success factors. The respondents tend to strongly agree with average index of 4.39 that defined project objectives by the client to be the most success factors. This clearly elaborates on the aim of the project and how it can be achieved. It is agreed upon that lack of defined project objective is one of the major factors militating against the success of any project. This finding was equally corroborated by (Wei Tong and

Tung-Tsan Chen,2007). The second highest rank of the success factors is having experienced work force with average index 4.31. The industry perceived the use of incompetent work force as a factor that contributed to the failure of so many projects. This is also similar to the findings made by (Wei Tong and Tung-Tsan Chen, 2007).

The respondent also agreed with average index 4.30 that adequate site supervision is critical in achieving success because it gives the project team an idea and update on the progress of work hence making comparison with what was initially planned and the actual progress. This will equally assist in ensuring that quality is ensured throughout the project. This is similar to the findings of (Kometa and Olomolaiye, 1997).

The respondent equally agreed that best procurement method in relation to a project should be adopted. It is discovered that using a procurement method that does not tally with the type of project is one of the root cause of project failure. Developing and defining project scope was also ranked high by the respondents as a success factor. This is due to the fact that, any project that keep changing in scope will certainly leads to both cost and time overrun which affects the success of the project. Frequent progress meeting is also identified as a success factor. Selecting criteria for contractors and consultant is also agreed by the respondent because due to the corrupt nature of the process, contracts are awarded to incompetent contractors which of course negatively affect the outcome. These were similar to the findings of (Smith and Love, 2000).

Coordination between technical team and contractor, making a realistic budget, efficient and effective time and risk management, non-interference by government or its agents clear and simple communication line and proper reporting mechanism were also agreed as critical success factor of a project.

6. Conclusion and Recommendations

The research identified thirteen critical success factors in achieving efficiency and effectiveness in construction contracts. They are as follows: Defined project objectives by the client, experienced workforce, adequate site supervision, best procurement method in relation to a project, developed and outlined project scope, frequent progress meeting, selecting criteria for consultants and contractors, coordination between technical team and contractor, ensuring realistic budget, efficient time management, effective risk management, clear and simple communication line and non-interference by government or its agents.

The aim of this study was to evaluate the degree of efficiency and effectiveness of the roles and actions of the client in managing the construction contracts which was achieved through the research objectives. This study has shown that the role played by the client as it relates to project procurement and execution is tantamount to the success of the project. Based on the findings, the study if carefully considered and implemented will certainly improve the effective and efficient management of future construction contracts. Furthermore, this study can be used by the clients to assess his status and prepare for improvement where necessary. The researcher hopes to present these findings to the Bauchi state government for immediate implementation.

Considering the fact that this is the first study on the subject matter in Bauchi state, the findings can be used as reference by researchers in the future to establish some facts related to the topic and make improvements where necessary.

6.1 Recommendation for future study

This study only considered the Bauchi state government which is a public client. However, it is recommended that, a study should be conducted on the private clients from where comparison can be made and more success factors in achieving effectiveness and efficiency can be deduced as well as strategies. This is because the private sector is more organised than the public sector. It is also recommended that the scope of this research should extend to the entire country in order to have a wider view of the problems with the aim of providing a lasting solution and increase the data for future comparison.

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Evaluation of Project Management Practices for the Delivery of Reconstruction and Development Programme (RDP) and Subsidy Housing Projects in South Africa

Tshepo Tseladikae[1], Justus Ngala Agumba[2], George Ochieng[3]

Abstract

As people migrate from rural to urban areas and the population increases in South Africa, there is need for housing provision. In relation to this migration and the demand for housing, the South African government has been providing housing for its populace who are underprivileged shortly after the dawn of democracy. The housing typology that the government has been providing to its citizens is RDP and subsidy housing. However, most of these housing projects are never delivered satisfactorily because contractors abandon the project or they are delivered late. In addition, they incur cost overruns and poor quality making it expensive and wasteful process to the beneficiaries and the government. On the basis of the aforementioned challenges, this paper determines the important project management practices for delivering successful RDP and subsidy housing projects. To address the objective of this paper, a quantitative research approach embedded in a deductive philosophy was adopted using a questionnaire survey to gather the data. The questionnaire was distributed to 153 contractors in Gauteng region who were purposively sampled. A total of 95 questionnaires were completed and were viable for analysis. The statistical parameter used to discuss the results was Relative Importance Index (RII). The result established that the five important project management practices were; Work breakdown structure, progress report, critical chain method and analysis, Gantt chart and Critical path method and analysis. This finding suggests that the contractors perceive that the project management planning best practices (tools) are vital for the success of the RDP and subsidy housing delivery in South Africa. In conclusion, it can be indicated that the contractors that are willing to tender for these housing projects should ensure that they provide evidence of these project management best practices during tendering, before they are awarded any RDP and subsidy housing tender.

Keywords: Project management practices, reconstruction and development programme, subsidy housing.

[1]Scholar; Department of Civil Engineering and Building; Vaal University of Technology; Vanderbiljpark.Andries Portgiter Boulervard, tshepotseladikae@gmail.com
[2]Senior Lecturer; Department of Building Sciences; Tshwane University of Technology, Building 3, Staatsartillerie Road, Pretoria campus; AgumbaJN@tut.ac.za.
[3]Professor, Department of Civil Engineering and Building; Vaal University of Technology; Vanderbiljpark.Andries Portgiter Boulervard.

1. Introduction

Housing is one of the primary needs of human beings. It is imperative for protecting human beings against elements, for example, rain, snow and heat. It also provides some security. The shortage of housing was already a crisis in 2003 as 6.5 billion people did not have proper housing, the shelter was of inferior material, had no proper sanitation and without a supply of potable water (UN-Habitat, 2003). By 2025, it is projected that another 1.6 billion people will demand adequate, affordable housing (UN Habitat, 2016). Furthermore, by the year 2009, 395 million, i.e. 40% of the African continent's population lived in the urban areas (UN-Habitat, 2010). It is projected that 6 out of 10 people will be residing in urban areas in Africa by 2030 (UN Habitat, 2015).

The urbanisation is due to the movement of citizens from rural areas to urban areas looking for new opportunities like employment, education and business ventures in cities (World Health Organisation (WHO), 2010). As a result of this urban migration, the demand for housing increases (Petkar & Takkekar, 2012), and the rental cost of houses is not affordable by many citizens. This need for housing has resulted in the formation of slums and informal settlements in the major cities (National Home Builders Registration Council, 2014). As the cities grow in population, the provision of affordable housing to the citizens is a challenge. This challenge has been exacerbated by a decrease in housing budgets (Salama & Sengupta, 2011).

The demand for housing has grown in South Africa, the number of people who were in need of accommodation in 2007 was 7 million (Rangasami, 2011). The last census done in 2011 suggested that 2.3 million households require housing which translated into more than 10 million people (Statistics SA, 2012). In line with this need, the government and private sector are actively engaged in the construction of houses.

As the demand for RDP and subsidy housing increases in South Africa, the contractors are mandated to complete the projects on time, within the allocated budget, to the required quality prescribed in the specifications and designs, and without the occurrence of accidents. This will ensure that the client being the government and the end users will be satisfied with the delivered houses. However, there is underperformance of the contractors to complete the projects on time, within budget and to the desired quality as specified in the contract. Furthermore, the health and safety of the site are compromised hence accidents occur. This results in delayed occupation of the houses and lack of funds to undertake other new housing developments. Based on the aforementioned challenges this paper addresses the following specific research question:

- What are the project management practices (tools and techniques), that are considered important by contractors undertaking the RDP and subsidy housing projects?

2. Literature Review

Project management in a construction project is called construction project management (CPM), which is specific to the construction industry, and the practices (tools and techniques) used may vary with the ones used in other sectors. As the projects increase in complexity and size, project management has become more critical in the construction industry (Sawalhi & Enshassi, 2001). Project management in the construction industry is considered as one of the most critical factors affecting the performance and outcome of the project (Dadzie, Abdul-Aziz & Kwame, 2012). In-line with this sentiment the use and importance of project management practices is crucial.

It is imperative to note that project management practices are categorised based on the knowledge areas of the project management body of knowledge. According to the PMBOK (2015) there are 10 knowledge areas and a plethora of project management practices (tools and techniques) as discussed informed in the following review.

- **Project Integration Management:** Integration refers to coordination of processes. Integration management is one of the most crucial components of project management, which takes into account all aspects of a project. Project integration management ensures successful coordination amongst project activities (Demirkesen & Ozorhon, 2017). Integration includes characteristics of unification, consolidation, communication, and interrelationship , and this actions needs to be applied throughout the project duration (Project Management Institute, 2017). As the project becomes more fragment or complex, the need for integration management is greater (Turner et al., 2009).
- **Integration Management practices**: Project plan is the document that outlines the project scope and identifying the objectives of the project and what is needed to attain them (Kerzner, 2009). A project Plan should be completed before the project can commence (Tayntor, 2010). The project plan is also known as Baseline plan (Meredith, Mantel & Shafer, 2017). Project charter is the document that authorises the start of a project. Thus it is important to have this document approved and signed on time (Project Management Institute, 2013).
- **Project Scope Management:** Scope management is a process of understanding the amount of work that is required to be carried out. The scope defines and clarifies what should be in the project and how the project goals and objectives will be attained. The scope also changes as the project progress and tools are needed to manage the scope changes.
- **Scope Management practices**: Scope change control-A project design may have errors or new challenges are faced as the project continues. Therefore changes to the project may be necessary. Cooke-Davies (2002) concluded that changes to scope only through a mature scope change control process would lead to project success. A scope change control is there to ensure that necessary steps are taken and approved by a project manager with his project team (Burke, 2010). Lesson learned- A “good work practice” or innovative approach that is captured and shared to allow duplication of what is learned in other projects. A lesson learned may also be an adverse work practice or experience that is captured and shared to avoid recurrence. Developing lessons learned from projects can financially benefit organisations if similar projects are undertaken in the near future. Project managers can use the information from lessons learned so as to avoid reencountering the same challenges (Patanakul, 2010).

- **Project Schedule Management:** Schedule management is the process of planning and controlling ways to spend time on specific activities. Schedule management is concerned with timely completion of construction projects, by planning for the work to be carried out and to find ways of fast-tracking it if it is falling behind (Kulemeka, Kululanga & Morton, 2015). The time taken from beginning to the end of the project is known as the project duration. Sawalhi (2001) identified seven popular time management tools and techniques that influence the success of a project. These tools include work breakdown structure, bar chart (Gantt chart) and resource levelling, critical path method, linked bar charts, schedule crashing and schedule updating. Program Evaluation Review Technique (PERT) is another common tool to schedule and monitor the time.

- **Schedule (Time) management practices:** Work Breakdown Structure (WBS) - It is the project management tool used in the detailed planning phase of the project. The WBS makes it possible to break the project bottom down into individual activities in detail to make it feasible to assign each activity with resources (Kostalova & Tetrevova, 2014). The WBS thus allows systematic planning, limits the probability of omitting key activities or undertaking some activities more times or in unsuitable periods (Brotherton, Fried & Norman, 2008). Critical Chain Method- the Critical Chain Method works, among others, with the time buffers, which make it possible to adapt the project plan to potential changes better (Goldratt, 1997). Program Evaluation and Review Technique (PERT) is a planning and control tool used for defining and controlling the tasks necessary to complete a project. PERT charts and Critical Path Method (CPM) charts are often used interchangeably; the only difference is how task times are computed. Both charts display the total project duration with all scheduled tasks shown in sequence. PERT, which does not look for only one project implementation timeline, but it determines optimistic, realistic and pessimistic alternatives of the time demands with a different probability of implementation for each activity (Hillier & Lieberman, 2015). Gantt charts- A Gantt chart displays schedule-related information; it shows calendar time task assignments in days, weeks or months. The tool uses graphic representations to show start, elapsed, and completion times of each task within a project. Gantt charts are ideal for tracking progress (Kostalova & Tetrevova, 2014). The number of actual days required to complete a task that reaches a milestone can be weighed against the planned or estimated number. The actual workdays, from actual start to actual finish, are plotted below the scheduled days.

- **Project Cost Management:** Cost management is the process of planning and managing the spending plan of a business, it involves; estimating, budgeting, financing, funding, managing, and controlling costs. In order for the project to prgress within the budget (Project Management Institute, 2017). Cost management allows a business to predict impending expenditures to help reduce the chance of going over budget. Not all cost management tools are applicable to all projects, with small projects, there is no need to use complex tools like earned value management (Turner et al., 2009). Thus the selection of cost management tools needs to be aligned with the objective of the company in order to archive success in a project. Earned Value Management- Earned value management is a cost forecasting technique used to find variances in projects based on the comparison of work performed and work planned. If the tool is used in cost it will look at

how much is spent on the project and what is likely to be spent to complete the project, providing an early warning for performance problems.

- **Internal rate of return (IRR)-**is the interest rate at which the net present value of all the cash flows (both positive and negative) from a project or investment equal zero. Net Present Value (NPV) is a measurement of the profitability of an undertaking that is calculated by subtracting the present values (PV) of cash outflows (including initial cost) from the present values of cash inflows over a period of time. Incoming and outgoing cash flows can also be described as benefit and cost cash flows, respectively, it is considered as one of the popular financial evaluation tools for construction projects (Graham & Harvey, 2002). Cost Breakdown Structure (CBS) Lists every item classified and its expenditure for the project, in order to get a more detailed estimate.
- **Project Quality Management**: Quality can be defined as meeting the legal, aesthetic and functional requirements of a project. A study by Srinivasan and Kurey (2014) confirms that an excellent quality environment can be created through a real culture where every employee should have a passion for instilling rather than merely following instructions, such as quality control tools or imitation of best procedures and practices.
- **Cause-and-effect diagram** (also known as the "fishbone" or Ishikawa diagram)-Identifies many possible causes for an effect or problem and sorts ideas into useful categories, it provides a visual map of the factors (causes) that contribute to a particular problem (effect). Control chart- Graphs used to study how a process changes over time. Histogram-The most commonly used graph for showing frequency distributions, or how often each different value in a set of data occurs. Pareto chart. This technique helps to identify major causes that need to be addressed to resolve the majority of problems.
- **Project Human Resource Management:** Project procurement management is the process of acquiring goods and services from the external service provider. This is done when the organization does not have the capacity on resources to provide such a service (Project Management Institute, 2017). Some of the identified human resource practices were: Adapting resource levels, core project team identification, team-building activities, staff monitoring, staff training and staff reward.
- **Project Communications Management:** Communication is vital for project to run smoothly and proper communication channels must be established at the start of the project, failure to have proper project management practices in place can lead to project delays and cost due to incorrect instructions (Sambasivan & Soon, 2007). Communication management practices: Progress report-outlines the total work accomplished.
- **Project Risk Management:** Project Risk Management includes identification, analysis, response planning, response implementation, and monitoring risk on a project. This is done to reduce negative risk from occurring and minimize their impact on the project (Project Management Institute, 2017) because when the risks associated with the project are not managed, then it can lead to cost overruns and delays (Nguyen & Chileshe, 2013). Risk management practices are risk register, risk assessment, safety audit and risk matrix.
- **Project Procurement Management:** Procurement management is essential for construction industry since the industry relies on products from different suppliers, and selecting the suppliers leads to achieving the project targets as they will be continuity in the construction process (Creuza et al., 2017). Procurement management practice: Procurement performance reviews, Procurement

plans, Independent estimates, Procurement audits, Make-or-buy analysis, Claims administration and Supplier list/database.

- **Project Stakeholder Management:** Stakeholders are individuals who represent specific interest groups served by the outcomes and performance of a project (Takim, 2009). They can have positive or negative interest in the project. Stakeholder analysis -Stakeholders analysis is a process of identifying the individuals who have direct or indirect interest on the project, it can be those who are affected by the outcome of the project or affect the outcome of the project.

3. Research Methodology

After an extensive literature review related to project management body of knowledge was conducted, it led to the development of a questionnaire. The questionnaire contained questions enquiring about the importance of the project management practices in the delivery of RDP and subsidy housing projects and other sections enquired on the profile of the respondent. The identified project management practices were associated with the delivery of construction projects, since this was the main purpose of the study. The questionnaire consisted of 32 project management practices categorized in 10 knowledge areas of PMBOK, it was first pilot-tested. The inputs from the pilot phase were used to revise the final version of the questionnaire before being self-administered to contractors via email and drop and collect methods. The participants were selected using purposive sampling technique. The participants were currently involved or had been involved in the construction of RDP and subsidy housing in South Africa.

Out of a total of 153 questionnaires distributed to the contractors in Gauteng region, 95 were returned and used for the empirical analysis. The response categories were 1= not at all important to 5= very important. The statistical parameter used to discuss the results was Relative Importance Index (RII). The RII is measured between points 0.00 to 1.00. The closer the score to 1.00 indicates a higher level of importance of the practice and the closer the score to 0.00 the lower the importance of the project management practice. The scores were defined as 0.00-0.20= not important, 0.21-0.40= slightly important, 0.41-0.60= Neutral, 0.61-0.80= important and 0.81-1.00= very important. IBM Statistical Package for Social Sciences was used for the analysis.

4. Results and Findings

4.1 Demographic profile of the respondents

The analysed data indicates that 21 female and 73 male responded. This indicates that the male counterparts were the majority participants in the RDP and subsidy housing projects. The experience of the respondents spanned from 1year to over 15years. Nine of the respondents had experience from 1 to 5years, 80 respondents had experience of between 6years and 10 years. The rest have over 10 years of experience. Further, majority of the participants i.e. 39 had a diploma qualification, followed by 34 respondents who had attained a first degree, 14 had honours degree and 3 had attained postgraduate qualification. This suggests that the respondents had achieved a formal education.

4.2 Important project management practices

The result in Table 1 provides the important project management practices. The result indicates that, the practices were considered to be important to very important in managing their RDP and subsidy housing projects. However, the three very important practices were, work break down structure and progress report were perceived to be the most important project management practices with RII=0.815 and were ranked first. Critical chain method and analysis was ranked third with RII=0.808. The use of Gantt chart and critical path method and analysis were ranked 4th and 5th respectively and were considered to be important. It is imperative to indicate that all the 32 practices were considered to be important in manging the RDP and subsidy housing projects as they were in the band of 0.61 to 0.80. The findings are in line with the PMI, (2017) which infers that for projects to be successfully achieved the project management practices (tools and techniques) should be used.

Table 1: Important project management practices (Tools and techniques)

Project management Practices	N	Maximum	RII	Ranking
WBS Work breakdown structure	95	5	0.815	1
Progress report	95	5	0.815	1
Critical chain method and analysis	95	5	0.808	3
Gantt chart	95	5	0.802	4
Critical path method and analysis	95	5	0.798	5
Milestone List	95	5	0.789	6
Activity list	95	5	0.754	7
Resource histogram	95	5	0.739	8
Project Evaluation and Review Technique (PERT)	95	5	0.737	9
Resource plan	95	5	0.735	10
Earned value management (EVM)	95	5	0.733	11
Lifecycle costing	95	5	0.724	12
Cost breakdown structure (CBS)	95	5	0.722	13
Three Point Estimating	95	5	0.720	14
Tree diagrams	95	5	0.716	15
Change Request Form	95	5	0.712	16
Project plan	95	5	0.709	17
Cost benefit analysis	95	5	0.707	18
Baseline plan	95	5	0.705	19
Flow charts	95	5	0.699	20
Feasibility Study	95	4	0.695	21
Risk Register	95	5	0.693	22
Check sheets	95	5	0.691	23
Change control	95	5	0.684	24
Fishbone Cause and effect	95	5	0.678	25
Control charts	95	5	0.676	26
Requirements Analysis	95	5	0.672	27
Supplier list database	95	5	0.672	27
Bottom up estimating	95	5	0.669	29
Work authorization system	95	5	0.663	30
Pareto diagram	95	5	0.644	31
Variance Analysis	95	4	0.617	32

5. Conclusion

In conclusion, the findings provided critical information to the stakeholders involved in the development and construction of the RDP and subsidy houses. In order to attain the desired outcome of these projects, project management practices must be used. The findings under girds that work breakdown structure, progress report and critical chain method and analysis are very important project management practices. This suggests that the project management planning practices are vital for the success of the RDP and subsidy housing projects. Furthermore, it can be concluded that for contractors that are willing to tender for these housing projects the government should ensure that they provide evidence of these project management best practices during tendering, before they are awarded any RDP and subsidy housing tender. The evidence of these practices should be included in the selection criteria of the contractors.

5.1 Further study

The researchers suggest further study to determine the usage of these practices and their influence on the satisfactory delivery of the RDP and subsidy housing projects in South Africa.

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The Impact of Obsolescence on Public Private Partnership Projects

Brighton Mukuvari[1] and Nthatisi Khatleli[2]

Abstract

Public Private Partnerships (PPPs) are implemented by governments to tap into the private sector's technological innovativeness and management acumen. However due to the dynamism of technological developments, equipment that still serves a purpose for which it was designed, could be rendered obsolete within a very short space of time. PPPs have very rigid contractual arrangements that most of the times are designed to ensure compliance and to minimize contractual entropy. The hospital PPPs pose a special problem as the cutting edge equipment that is critical to save lives could unexpectedly be introduced into the market blind siding long standing plans into the management of the facility. Using three PPP Hospital projects in South Africa, the issue of equipment obsolescence management was investigated. Using mixed method approach where questionnaires were sent to professional consultants and government officials assessing their appreciation and knowledge of obsolescence management. Interviews were also conducted with 3 key personnel who had an intimate knowledge of the intricacies of the contract the information they gave was also augmented with the perusal of the availed documents. All the data was analysed using thematic analysis for interviews, content analysis for the documents and statics for the quantitative data. What transpired from the study was that there are a lot of challenges in PPPs, which makes competitiveness very difficult especially when it comes to managing obsolescence of equipment.

Keywords: Equipment, management, obsolescence, public private partnerships

1. Introduction

Governments around the world rank infrastructure policy among their greatest concerns. The modernisation of infrastructure is seen as being critical to future economic competitiveness and crucial to accommodating expanding populations due to urbanisation. Adequate physical infrastructure is a key element of a sound investment climate. Kateja (2012) states that historically, provision of infrastructure has been entrusted on government monopolies. However, with the increasing gap between infrastructure needs and resource availability, governments around the world can no longer meet the demand. According to Barrows, *et al*, (2012), the cost to deliver healthcare in both developed and developing nations has been rising exponentially. To narrow the infrastructure deficit governments have increasingly turned to PPPs,

[1] School of Construction Economics and Management, University of the Witwatersrand, 1 Jan Smuts Avenue, Braamfontein 2000, Johannesburg, South Africa

which in the past used to be rare and limited to a handful of countries and infrastructure sectors (Kateja, 2012).

Public Private Partnerships (PPPs) have over the years become the norm for infrastructure development in many countries, as they have emerged as a preferred mode of financing infrastructure (Kateja, 2012). PPPs are a long-term, contractually regulated co-operation between the public and private sector for the efficient fulfilment of public tasks in combining the necessary resources such as operational funds, capital and personnel of the partners and distributing existing project risks according to the risk management competence of the project partners. South Africa has been using this model to install critical infrastructure facilities, among them hospitals. However public hospitals have to be effectively competitive in an environment where the private health sector is very strong such as is the case in South Africa. The main challenge is that some of the most critical and expensive equipment could become obsolete within a very short space of time, rendering the sometimes specific investment very uncompetitive. The aim of this study is to understand the treatment and appreciation of obsolescence in the health sector PPPs. So the objectives in that vein were to assess the current appreciation of obsolescence as a relevant technical concept, to compare the awareness, treatment and appreciation with the international best practices. It was also deemed important to investigate the current challenges caused by obsolescence and identify remedies that could be provided to ameliorate its deleterious impacts on service delivery.

2. Literature Review

Obsolescence is a state of becoming old fashioned and no longer useful. The obsolete facility is not necessarily broken, worn out, or otherwise dysfunctional (Lemer & Iselin, 1993). Rather the facility simply does not measure up to current needs. Thomsen and Van de Flier (2011) went further and stated that obsolescence can have a wide range of causes, the available literature shows a confusing variety of categorisations like physical, economical, financial, functional, locational, environmental, political, market, style and control obsolescence. However Butt, Umeadi and Jones (2010) provided a diverse line of reasoning when they stated that factors that cause obsolescence are not only conventional such as aging, wear and tear, but rather contemporary factors including energy consumption efficiency, environmental pressures such as reduction of carbon or greenhouse gas emissions, legislations or regulations, change of use, clean and waste water management, water quality and resources, land use, land contamination, soil quality, changing occupier or end user demands, sustainable waste management, ecological concerns, health and safety, and climate change. Figure 1 illustrates conceptually, the progression of a facility's performance during its service life (following completion of construction). Through the passage of time the overall performance of a facility starts to diminish slowly due to factors like wear and tear, aging and functional change. After the minimum acceptable performance, the facility is deemed to be obsolete.

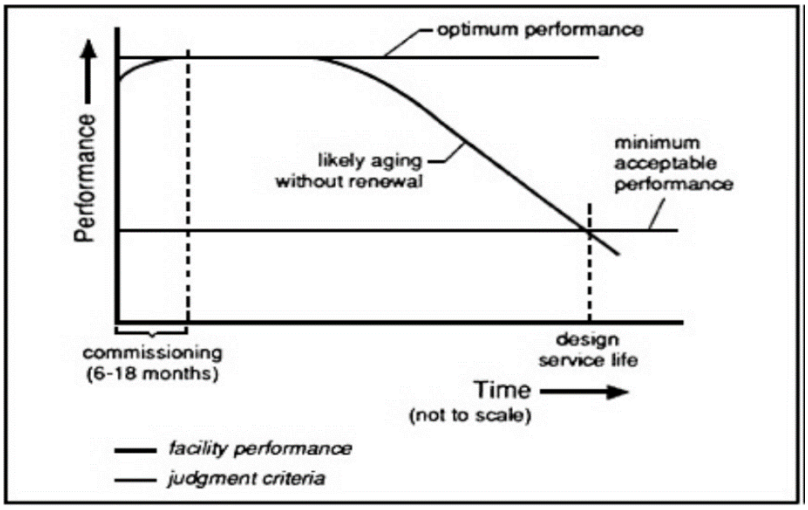

Figure 8: Facility/Equipment performance during economic lifespan (Iselin and Lemer 1993)

2.1 Types of obsolescence

According to Butt, Umeadi and Jones (2010) irrespective of whether obsolescence is in value or function or both, internal obsolescence in a component or built asset is due to factors that exist within the component or built asset.

2.1.1 Functional obsolescence

De La Mora and Reilly (2012) define functional obsolescence as being caused by the property's inability to perform the function for which it was originally designed or intended for. This type of obsolescence has two components which are:

- The functional component
- The technological component

However, Salway (1986) seems to differ and he defined functional obsolescence as the product of technological changes in occupiers' requirements impinging upon both layout and facilities offered implying that functional obsolescence is not caused by the functional component only. According to Voss (2012) there are 5 types of Functional Obsolescence and they are:

- Curable functional obsolescence caused by a deficiency requiring an addition (installation) of a new item.
- Curable functional obsolescence caused by a deficiency requiring the substitution (replacement) of an existing item.
- Curable functional obsolescence caused by a component of real property that is not necessary and therefore adds no value to the current of anticipated use (i.e super adequacy that is economically feasible to cure).
- Incurable functional obsolescence caused by a deficiency

- Incurable functional obsolescence caused by a super adequacy.

Each of these items contributes to the level and rate of Functional Obsolescence and will ultimately either directly or indirectly lower the utilization of the subject property.

2.1.2 Physical deterioration

This is as a result of wear and tear as well as the aging of the facility. De La Mora and Reilly, (2012) stated that the consequence of physical deterioration from a cost approach was that it results in a decrease in value due to the property's physical condition. Examples of physical deterioration are damage from termites or other wood destroying organisms, cracks in plaster or wallboard, deterioration of roof shingles causing leaks and discolouration of ceilings, cracks in concrete foundations due to uneven settling and a general wearing out mechanical systems in the house due to use over time (Voss, 2012).

According to Voss (2012) physical deterioration is either curable or incurable depending on the costs of repairing or replacing the deteriorating items in the structure. If the repair cost is less than or equal to the increase in the structure's value after the repairs, the physical deterioration is curable. Voss (2012) goes on to say that if the cost of repairing exceeds the increase in value consequent upon that repair then the physical deterioration is incurable. Under incurable physical deterioration it is advisable for the owner of the property to consider demolishing it and building a new structure. The same could be said to repairing or replacing an expensive piece of machinery as the same principles apply. Figure 2 below depicts a typical deterioration curve for a building, if there is little or no maintenance the building's useful life is significantly shortened. In order for a building to function optimally to its design parameters it needs to be regularly refurbished.

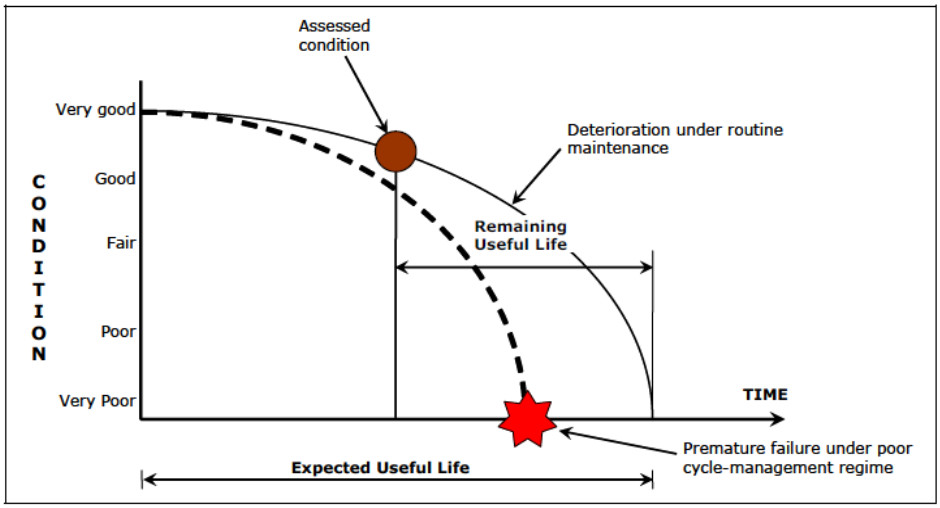

Figure 2: A Typical Deterioration curve (Iselin and Lemer 1993)

2.1.3 External Obsolescence

External Obsolescence means temporary or permanent impairment in value or usefulness of a built asset due to factors outside the system such as change in existing or advent of a new environmental legislation; social forces / pressure groups; arrival of new technology; fluctuation in demand; inflation of a currency etc.

The other types of obsolescence are Locational Obsolescence which relates to neighbourhood conditions related to the subject property site (Voss 2011 and Reilly 2002). The performance of the infrastructure is affected by the location in which it is found. Voss (2011) goes further to state that this type of obsolescence though from a property sector view assumes that the property is located in an inharmonious location such as an industrial area changing to a commercial development. On the other hand Economic Obsolescence according to Voss (2012) occurs when interest rates increase, at that point supply moves ahead of consumer demand therefore a property may suffer a decline in value due to the market's inability to cover construction costs. Lastly Climate Induced Obsolescence is caused by extreme weather conditions caused by global warming. Specifically for the United Kingdom , by the year 2050 the country is expected to experience increases in average summer mean temperatures (predicted to rise by the 3.5 degrees Celsius) and frequency of heat waves/ very hot days and increases in winter precipitation (of up to 20%) and possibly more severe storms. Finch (1996) suggests that the changing climate will accelerate the rate at which a built asset becomes obsolete requiring greater performance improvements from maintenance and refurbishment options and a foreshortening of maintenance and refurbishment cycles.

2.1.4 Obsolescence in PPPs

According to the European Union (2013) little attention is given to the very high risk of adaptability and flexibility. There is therefore a need for PPP projects to meet the ever changing needs of hospitals over their lifecycle. These needs are:

1. Elasticity to cover changes in volume and demand
2. Functionality to meet changes

In South Africa, this matter has not been discussed in literature and it is envisaged that this study is going to trigger a very important debate and quest to improve the performance of PPP projects.

3. Methodology

According to Naoum, (2013) research strategy can be defined as the way in which the research objectives can be questioned. This research used descriptive research. According to Leedy and Ormrod (2005) the term descriptive research involves identifying the distinctiveness of an observable fact or delving into possible parallels in the midst of two or more phenomena. Descriptive research does not fit neatly into the definition of either quantitative or qualitative research methodologies but instead it can utilize elements of both, often within the same study. Descriptive research can either be quantitative or qualitative, it can involve collections of qualitative information that can be tabulated along a continuum in numerical form, such as scores on a test or the number of times a person chooses to use a certain feature of multimedia program. It can describe categories of information such as gender or patterns of interaction when using technology in a group situation. The research conducted a pilot study consisting of a convenience sample of clients (government departments and municipalities), architects and project managers based in

Gauteng. The main advantage of carrying out a pilot study is that it gives an advance warning about where the main research project could fail (Van Teijlingen & Hundley, 2001). A total of 15 questionnaires were issued in the pilot study. The 15 respondents consisted of 5 project managers, 5 architects, 5 Facilities Managers and 5 clients. All the questionnaires were administered via emails. According to Fellows and Liu (1997) the objective of sampling is to provide a practical means of enabling the data collection and processing components of research to be carried out while ensuring the sample provides a good representation of the population as a whole. Snow balling was used to identify the professional consultants that were used on the selected PPP projects. The researcher contacted the consortiums that were/ are responsible for executing the project. They would in turn give the researcher the names and contacts of the rest of the professionals. This sampling technique came in handy as the respondents that were involved in PPP projects in South Africa are still very few.

Questionnaires that had open-ended questions and close-ended as well were issued. Close-ended questions were found to be useful they assist those respondents with limited knowledge on the subject matter, as it gives response hints and pointers. Interviews were also had with six professionals who are still working in PPPs 3 from the government and 3 from private companies. They were selected through a snow balling approach. All these sources of data together with the availed contractual documents were analysed to assist the enquiry. Thematic Analysis was used to analyse interviews and Content Analysis was used to analyse the documents. Statistical manipulations were deployed to make sense of the quantitative data. Thus a good thematic analysis interprets and makes sense of the data (Clarke & Braun, 2013). A six-phase guide provided by (Braun & Clarke, 2006) was used as a framework for this study and the steps are as follows: 1) Become familiar with the data, 2) General initial codes, 3) Search for themes, 4) Review themes, 5) Define themes and write-up. Inductive Content Analysis was used for analysing the documents. Content analysis is a research method for making replicable and valid inferences from data to their context, with the purpose of providing knowledge, new insights, a representation of facts and a practical guide to action (Krippendorff, 1980).

3.1 Paper Inkosi Albert Luthuli Hospital –case 1

According to the IALH, to attain a new level of excellence of service, the Kwazulu Natal Department of Health (DoH) specified a single source management solution for a newly constructed 846 bed hospital. The multi-billion rand contract which took effect in 2002 ran for 15 years. The IALH further states that the DoH contracted Impilo consortium to ensure that the public receives clinical services that achieve and maintain the highest standards. Impilo were therefore required to perform several functions. Chiefly to supply and replace medical equipment and information management and technology systems so that these remain state of the art throughout the contract period. They were also expected to provide integrated facilities management services including maintenance and replacement of fixed plant and equipment. Supply and replace non-medical equipment assets Provide all services necessary to manage the projects and assets in terms of best industry practice. Provide and procure consumable and surgical instruments and manage all utilities (Electricity, water, etc.).

3.2 Universitas and Pelonomi Hospitals Co-Location –Case 2

There were two academic hospitals in Bloemfontein and the Free State Department of Health (FSDOH) did not have enough funds to refurbish them as they were considered obsolete. The FSDOH contracted a private partner to refurbish the existing hospitals (Universitas and Pelonomi). The private partner was also required to maintain functional facilities at both hospitals for the duration of the contract. The parties signed a sixteen and half year contract in November 2002. When the contract expires, the private partner was required to return to the FSDH this also included the facilities that were upgraded for private use.

4. Data Analysis and Discussion

Across the board people did not appreciate the word 'obsolescence' but however they appeared to recognise 'wear and tear' and 'economic lifespan' of the buildings and equipment. This was highlighted during the pilot study and it became clear that the concept has to be defined and explained to respondents in order to get meaningful responses. Even in the second stage of the study following the pilot stage, only 18% of respondents could immediately identify the term without any assistance and 73% understood with a bit of assistance. On the second objective of causes of obsolescence in South African health facilities several reasons were given and they were. Changes in regulations by governments and municipalities; increased competition; changes in market conditions; improved efficiency of infrastructure; greater capacity of new infrastructure; physical deterioration (Wear and tear) and Social forces/ pressure groups.

The challenges that were caused by obsolescence were as follow as depicted by the questionnaire results in Table 1.

Table 1: Challenges caused by obsolescence

1	Description	Mean Score	Standard Deviation
1	Brain Drain- (professionals leaving the hospitals due to obsolete infrastructure)	4,60	1,96
2	Poor service delivery	3,40	1,85
3	Loss of production	5,00	1,90
4	Higher costs of alternative emergency measures needed during breakdowns	2,60	1,85
5	Higher costs of unbudgeted replacement of infrastructure	3,20	2,23
6	Job losses	4,80	1,83
7	Hospitals failing to meet health targets.	4,00	2,00
8	Unhealthy hospital environments that are not well managed, which end up spreading diseases.	3,00	2,19
9	Other (specify).....	2,10	2,40

The research established that to solve the occurrence of obsolescence in PPP particularly in the health sector, the powers that be need to make the designs flexible goal and demonstrate pro-activeness in operations and maintenance. This was in-line with findings from Lemer and Iselin (1993), where they concluded that buildings need to be flexible enough to allow for changes in the future. Hospitals are the most susceptible to obsolescence as they have to endure changing demographics and disease patterns. In the 21st century, flexibility in design has even become more important especially in the area of medical equipment where they are forever advancing in response to chronic disease patterns. This has not only challenged parties to PPP contracts to continuously change equipment but also change the layout of the hospitals to accommodate equipment whose sizes and design constantly changes.

On the issue of the comparability of the South African legislation vis-à-vis the international best practices. The study revealed that South Africa has legislation that is more or less similar to international best practices. In South Africa CIDB Maintenance and management standard is used which is comparable to the International Management Plan (PAS 55-1:2008). It is in light of this that the researcher deduced that the problem lay with the implementation of the legislation which is more of the contract management side of hospitals. This was in line with the findings from Bothma and Cloete (2000) though they were referring to hospitals procured through the traditional method, they asserted that there is a 'bad culture' of not maintaining hospitals in South Africa. Bothma and Cloete (2000) went further to state that there was a lack of vision especially on government officials regarding the maintenance of hospitals and its long term effects. However, interviewees decried a lack of robust monitoring regimen. Although they asserted that the 'situation is not bad at all' as there are penalties for non-performance. However, there are things that are encountered that perhaps should not be seen at a privately run facilities supported by public funds. A lot of this is attributed to the 'underestimating of the foot traffic' at the facilities which leads to some hospitals being overwhelmed.

However, PPPs are managed by private concessions that have their own maintenance systems different from Government run hospitals. Lack of maintenance of PPP facilities cannot be as a result of the concession's failure to maintain hospitals as their counterparts in the private sector seem to be providing a high quality of service. The major cause of lack of maintenance could be the issue of crowding which leads to intense utilisation of PPP facilities. This reason is in line with the findings from the State of Victoria (2005) though that study is specifically referring to medical equipment.

5. Conclusion

The study revealed that the majority of the professional and government employees are not immediately familiar with obsolescence as a contractual concept. It was also revealed that there is a need for design flexibility in PPP hospitals as changes are to be expected in the future. There is also a need to make contracts to be flexible in order to accommodate increased foot traffic at the facility as this is likely to improve the patient turnaround times. It was also observed that when properly maintained and in good working order PPP health facilities are not adversely affected by locational obsolescence. South Africa has to be commended for having legislation in place that could be compared with the international best practices. However, it is important that there is very strong monitoring of the equipment technical side of the contract to ensure that the tax payers get value for money. The issue of obsolescence has to be articulated properly and communicated to the design teams and government officials so that it understood across the board and properly planned for and managed properly.

6. Recommendations

It is recommended that the adaptable building concept is disseminated to all practitioners involved with PPPs. An Adaptable building is a building whose design and construction takes in to consideration how it can be altered to lengthen its lifecycle. The government should look at the experiences of the completed PPPs to enhance value for money to the general populace when it comes to obsolescence management.

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Transforming Infrastructure Development

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The Changing Climate from a Property Valuer's Perspective

André Kruger[1] and Richard Martin Hendrick[2]

Abstract

The global climate is changing and particularly the rising sea level poses a risk to the future benefits of residential coastal real estate. The purpose of this paper was to investigate property valuer's perspective regarding residential coastal real estate at-risk of being permanently inundated due to the rising sea level in the Southern Cape Coast of South Africa. Interviews were conducted with property valuers who practise along the Southern Cape coast. The results of the interviews were compared to two areas in Sedgefield, South Africa, one at risk of being permanently inundated by the rising sea sometime in the future and one not at risk. The results reflect the perspective of the property valuers working in the Southern Cape, regarding the changing climate. The results highlight the failure to act timeously by both property valuers and the residential coastal real estate market along the South African coastline. Their views regarding sea-level rise risk can have an effect on the coastal real estate market and the economies of coastal towns in South Africa. Although the research was restricted to residential coastal real estate on the Southern Cape Coast of South Africa, the results indicate that property valuers pay no attention to the risk postured by the rising sea level. It is the first study of this nature on the risk posed by rising sea levels on property market values and therefore the research lacks external validity. The research should be validated by a study, which covers the whole of the South African coastline.

Keywords: Climate change, risk, property valuation, property valuer's perspective, sea level rise.

1. Introduction

Global warming, anthropogenic global warming and climate change are terminology used in the debate about the changing climate (Small, 2009). The burning of fossil fuels (coal, oil and gas) and widespread deforestation are seen as the primary reason for the changing climate (Houghton, 2005). While other scientists like Morano (2010) attribute it natural weather patterns, altered data, the geologic time scale, deficient modelling, or simply that there is no evidence at all. According to Smith, Reynolds, Peterson & Lawrimore (2008) the observed increases in global surface temperature and in water temperature indicate a change in climate and a rise in the global average sea level. The rising sea level will impinge on coastal infrastructure (US EPA: 2016B). The rising sea level and coinciding events like coastal flooding and

[1] Lecturer; Department of Finance and Investment Management, Johannesburg Business School, University of Johannesburg, Johannesburg, South Africa; PO Box 524, Auckland Park, Johannesburg; akruger@uj.ac.za
[2] Professor; Department of Environmental Sciences and Geography, University of South Africa, Pretoria, South Africa; jimmyhendrick@outlook.com

extreme storms, are probably the most visible consequence of the changing climate. The rising sea level and how it influences property valuers in South Africa is the focus of this study.

1.1 Background

The changing climate has been investigated by scientists in South Africa since the 1940's. Kokot (1948) examined climatic changes in Southern Africa while Tyson (1987), investigated climatic changes and variability in Southern Africa. The South African scientific community started paying substantial attention to the different aspects of climate change since 1990. The different facets of climate change in South Africa has been researched by scientists such as Wigley (2011), Blake (2010) and, Breetzke, Parak, Celliers, Mather and Colenbrander (2008). Hughes (1992) investigated the influence of the rising sea levels on the South African coastline.

According to Goschen (2011) due to the continuous global warming the thermal expansion of the sea water is the primary cause of the rising sea level. The frequency and strength of storms increase due to the energy the warmer water provides. Theron and Rossouw (2008) identified an increase in sea level, storms, wind velocity, changing freshwater flows and erosion of the shoreline as some of the potential consequences of the changing climate on the coastal zone in southern Africa. Breetzke et al. (2008) documented the harmful effects of these occurrences on the South African coastline.

The researchers referred to above are in agreement that the rising sea level will have a detrimental influence on coastal infrastructure. Breetzke et al. (2008) refer to the economic loss owners of residential coastal property may endure in the near future as the result of the loss of land and damages to infrastructure. Mather and Stretch (2012), draw attention to the impact of the rising sea level on beachfronts. Wigley (2011) identified the inundation of coastal land as a result of the rising sea level and flooding by storm surges, and the erosion of coastal dunes by wave action as the most important geohazards in coastal areas. While, Midgley et al. (2005) argues that coastal areas will be affected by the increase in extreme events, raised groundwater tables due to saltwater inundation, tidal influences and wave action, flooding and coastal erosion.

Breetzke et al. (2008) suggest that the effect of coastal erosion will be seen in the "loss of land and damages to the built environment, destruction of natural sea defences such as dunes and undermining and failure of artificial sea defences". This type of damage was highlighted in a report by Smith et al. (2007) who investigated the March 2007 storm swell along the KwaZulu-Natal coast. The economic impact of the rising sea level on the South African coast was also investigated by Turpie, Winkler, Spalding-Fecher & Midgley (2002) They did not quantify the economic impact of the rising sea level apart from commenting that the rising sea level and linked increase in storm surges will have an impact on infrastructure (Turpie et al., 2002).

Although the impact of the changing climate is slowly becoming visible, the worst is still to come. Climate change risk will present itself as two different forms of risk to residential coastal property owners in future. Environmental risk like the rising sea level, storm surges, greater tides, flooding, erosion and groundwater contamination (Cartwright, 2008) and a consequential risk created by legislation to adapt to and mitigate climate change (South Africa, 2008). The South African Government promulgated the National Environmental Management: Integrated Coastal Management Act (ICM Act) in 2008. The ICM

Act attend to predicted effect of the rising sea level on coastal areas. In terms of the Act, a coastal management line must delineated. As amended the ICM Act contains three concerns which will influence investments in coastal property. The first is the position of the high-water mark and the movement thereof, the second is that coastal public property may not be used to prevent or promote erosion of the seashore and the third is the delineation of coastal management lines. The delineation of the new coastal management lines (CML) can have a positive and negative effect on the wider community in a specific area (Kavonic, 2013). She argues that once the coastal management lines are drawn, real estate below (seaward) the coastal management line will lose value, while real estate above (inland) the CML will become the new beachfront real estate and increase in value (Kavonic, 2013).

1.2 Problem statement

The promulgation of the ICM Act to adapt to and mitigate for the rising sea level create a risk, will diminish the future benefits of residential coastal real estate in South Africa. Property valuers do not have a suitable instrument to quantify the sea-level rise risk when they value residential coastal real estate. In order to find an instrument a phenomenological study was undertaken to determine property valuers' lived experience regarding the rising sea level and to develop an instrument property valuers could use when they value l residential coastal real estate.

1.3 Central research question

The following central research question was posed: 'How does the predicted rise in sea level and its ensuing risk affect property valuers' behaviour in the residential coastal real estate market in Sedgefield, South Africa and how can property valuers quantify the climate change risk?'

2. Literature Review

Owning a house is one of the biggest investments and an individual will ever make and this decision will have a substantial impact on the post-retirement financial wellbeing of such individual (Chen, Pryce & Mackay, 2011). Investing in real estate is normally seen as a long-term risk free investment (Salzman & Zwinkels, 2013), the rising sea level will have an adverse effect on especially residential coastal real estate (US EPA, 2016a). Residential real estate is an important source of security in the mortgage market and diminishing values can create disarray in the banking industry.

The risk of investing in residential coastal real estate was emphasised with the promulgation of the ICM Act (South Africa, 2008). The introduction of coastal management lines is see as a sustainable way to adapt to or mitigate for the future effect of the rising sea level (Theron et al., 2010). The delineation of coastal management lines will have a socio-economic impact on real estate within the coastal development zone. According to Kavonic (2013) the real estate values and the rights of property owners be affected (Kavonic, 2013). The introduction of coastal management lines may lead to a decline in revenue for local authorities and an increase in the maintenance of infrastructure (Cartwright, 2008).

Theron (2016:34), argues that '*the setback line [coastal management line] should be based on the actual coastal processes and dynamics thereby determining which areas are subject to the hazards or where the risks from the impacts due to coastal/marine hazards are unacceptably high'*. He believes that the current

process to delineate coastal setback lines is flawed because the CML's are positioned on the seaward side of improved coastal real estate. According to Theron (2016) this creates an impression that these properties are not at risk, which is false. Theron (2016) highlights that there will be socio-economic and legal implications if the CML's are not drawn in accordance the actual physical processes. However, he does not express an opinion on how to contend with the socio-economic and legal implications nor how to calculate the economic impact.

2.1 Economic impact of the changing climate and rising sea level

The Stern Review was the first major study which attempted to quantify the economic impact of climate change on the world (Stern, 2007). Stern (2007) based his findings on a cost benefit analysis and it was broadly criticised. According to Kirkpatrick (2011) a cost benefit analysis considers only the costs and benefits directly related to the return on an investment. He argues that all costs and benefits which affect the broader community and both positive and negative should be considered in environmental valuation (Kirkpatrick, 2007).

Climate change creates long term uncertainty, the potential economic impact of the changing climate can only be expressed in accordance with the current understanding of the primary uncertainties and should be should be expressed in terms of time and circumstances (Yohe, 1991). He emphasises that we respond to climate change in accordance with our current knowledge of the future.

The first investigation into the effects of the rising sea level on the South African coastal environment was conducted by Hughes (1992). The investigation aimed to identify the effects of the rising sea level and to suggest an appropriate instrument to display the influence of the rising sea level. Hughes (1992), developed a coastal vulnerability index. The index was tested in the southern Cape coast and the south coast of KwaZulu-Natal (Hughes (1992). According to the index the southern Cape coast – Mossel Bay to Nature's Valley – was identified as one of four areas highly vulnerable to the rising sea level. According to him private housing and coastal infrastructure had the highest risk. Although Hughes (1992), coastal vulnerability index indicated a quasi-economic risk rating, no rand value where attached to the risk rating. He argued that the selling price of at-risk real estate would be the best indicator of any economic loss.

In 2008, Cartwright (2008) used the City of Cape Town's valuation roll as a basis to attempt to quantify the economic impact of sea level rise. He used a rate per square metre for coastal land and assumed that the average value of affected real estate would decline. A coastal risk assessment study for the Eden District Municipality was conducted in 2010 (Umvoto Africa, 2010). According to Umvoto Africa (2010), the damage or economic vulnerability, could be as much as 50% of the annual budget of the Eden District Municipality and five coastal local municipalities combined if an extreme event occurs. They did not substantiate their assumption.

2.2 Valuation process

To remain objective, property valuers follows a systematic procedure when they develop an opinion of value. The eight step valuation process is described in the Appraisal of Real Estate (Appraisal Institute, 2008:113) is widely used in South Africa. Although the South African Council for the Property Valuers

Profession (SACPVP) adopted the International Valuation Standards (IVS) the process is still followed. The IVS just added addition requirement for property valuers to consider. The minimum standards require property valuers to include any adverse conditions, for example 'the impact of any events foreseeable at the valuation date on the probable future value of the security during the loan period' (IVSC, 2014:47). According to Bienert et al. (2008) climate change and the rising sea level is such an adverse event. The changing climate and the rising sea level will affect the future value of residential coastal real estate (Bienert et al., 2008). Kucharska-Stasiak (2013) argues that a valuation is foremost an estimation based on assumptions accepted by a property valuer. Since a property valuers cannot of at-risk real estate is based on a number of assumptions accepted by the property valuer identify all the future influences, risk and uncertainty are built into the valuation process (Aliyu, Bello, Kasim & Martin, 2014). According to Cradduck (2014) even though there is an awareness of climate risk, the risk is poorly understood. She argues that the market value is affected by environmental risk (Cradduck, 2014). Therefore, property valuers must identify any environmental risk and report such risk in their opinion of value.

2.3 The valuer's challenge

The nature of the environmental risk created by climate change and specifically the rising sea level does not necessarily challenge the valuation process but it creates a challenge for valuers, especially when valuing residential coastal real estate.

Property valuers will encounter risk and uncertainty in the valuation process if they fail to recognize current and future influences on a subject property (Aliyu et al., 2014). Residential coastal real estate have a number of distinctive characteristics that distinguish it from other residential real estate. Residential coastal real estate's proximity to the shoreline, height above sea level and location within the coastal protection zone exposes it to environmental risk or SLRR. These features and risks must be taken into account when property valuers develop an opinion of value for residential coastal real estate.

3. Research Methodology

The aim of the study was to determine how the predicted rise in sea level and the ICM Act influences the behaviour of property valuers in the residential coastal market of Sedgefield, South Africa. Property valuers interpret the behaviour of market participants in order to provide expert advice in real estate matters and to develop and opinion of the market value of immovable property on the valuation date (IVSC, 2013). The research was approached from the perspective of a property valuer in a residential coastal real estate market. According to Boyd (2014), property valuers are real-world practice-oriented pragmatists who are problem-centred and are observant and look for the consequences of events or actions that are influencing a specific property market.

3.1 Research design

The study explored property valuers' knowledge, attitudes and behaviour concerning sea-level rise risk using qualitative inquiry. Primary data was collected by the researcher through personal interviews with property valuers practicing in the southern Cape. A phenomenological research approach was followed to investigate the climate change phenomenon. Phenomenological research aim to explain the lived

experience of the participants in a study (Maypole & Davies, 2001). Although the broad phenomenon was the changing climate, the emphasis was on the knowledge and attitude of property valuers regarding the inherent risk in the rising sea level and the consequence of the ICM Act.

3.2 Data collection and analysis

During 1-hour long interviews, the researcher collected data from the property valuers who agreed to participate. All the interviews were recorded and transcribed, the data was analysed by the researcher. The population included all professional valuers and professional associated valuers registered with the SACPVP. According to the Registrar of the SACPVP there are approximately 800 valuers who may perform property valuations without restrictions in South Africa (Seota, 2016). Of the 800 valuers, 44 are located in the southern Cape and are expected to carry out valuations in Sedgefield. Through purposive sampling each one of the 44 located in the southern Cape was invited to participate in the research. Of the 44, 13 agreed to be interviewed.

In qualitative research the sample size is normally not predetermined and data will be collected until saturation is achieved. Data saturation is achieved when no more new information is coming to the fore, the number of participants are then accepted as sufficient (Sargeant, 2012) Kakulu (2008) and Hollinger (2016).

The interviews were guided by an interview schedule which consisted of open-ended and closed questions. The questions used were derived from the research objectives and were formulated around themes. The following themes were covered climate change, valuation practice and the participant's attitude towards the changing climate. The data was analysed in the sequence the questions appeared on the interview schedule.

4. Findings

The aim of the investigation was to establish if the predicted consequence and subsequent risk of the rising sea level affect the behaviour of property valuers in the residential coastal real estate market of Sedgefield, South Africa. Although researchers like Stern (2007), Bienert et al. (2008), Cartwright (2008) and Kirkpatrick (2011) drew attention to the economic impact of the changing climate on real estate values, this research was the first to consider the direct impact of the rising sea level on residential coastal real estate.

The property valuers who participated in the research indicated that although they were aware of the changing climate, there were different levels of awareness. The majority (ten) agreed that the changing climate would affect the southern Cape coast, "*Low lying areas will be affected more especially by flooding'.* Seven property valuers also agreed that the changing climate would affect how they conducted their profession while eight agreed that it would have an impact on residential property in Sedgefield, *"Be more careful and aware of low lying properties close to rising water levels and future costs involved"*. The majority of the participants were of the opinion that the changing climate would have an influence on how they conducted their profession from day to day in the future.

The awareness of the participants was based on personal observation and not scientific evidence. The participants anchored their decisions to past events and experiences to inform their current behaviour. One declared that climate change was something that would happen in the future and was of no concern now. The anchoring behaviour is evident in two of the property valuers responses, namely: '*at the end of the day we still have to look at what the market dictate'* and '*Yet, sales still remain the indicator of market value, the amount he should have obtained, comparable sales*' .

The majority of the property valuers indicated that they rely on the decisions made by financial institutions and insurers as a proxy to anchor their opinion of value when they conducted valuations of residential coastal real estate. One property valuer stated that, financial institutions *'will set more stringent loan requirements or just decline the application*'. Some of the property valuers had strong opinions regarding insurer's actions: '*The value is influenced by the insurance cover or no cover'* and '*it's got to marginalise the value of the property if no-one's willing to insure it'*.

Only two property valuers pointed out that they were not concerned with the actions of financial institutions or insurers because they determined the market value of a subject property by considering the specific market and not the actions of individuals or institutions: '*you value on comparative sales that is the only real way to value is comparative sales and take into account the market'* and '*No. For me it has nothing to do with market value*'. According to the majority of the property valuers, it was business as usual in that they did not consider the changing climate. Some even commented that they would not change unless something drastic happened. Their argument is based on the premise that market value is the basis of valuation and that they still depended on comparable sales to determine market value. However, some did admit that the changing climate would be important in the future. This affirms the latter part of the thesis statement, namely that the inhibited future benefits are not reflected in valuers' opinions of value.

It was concluded that although property valuers noticed changes in the environment, they did not necessarily attribute these changes to climate change or the rising sea level. The property valuers pointed out that the risks associated with the rising sea level would only have an influence on the value of residential coastal property in the distant future; "… yes, *absolutely in twenty years, but if we say near future that is two to three years, no*" and *"I think it will be medium to long term before you … realise the impact thereof and it becomes visible in values*". They clearly indicate that as long as they did not find evidence of SLRR in the real estate market, they would keep on ignoring the effect of climate change on value. This is illustrated by comments such as: '*at the end of the day we still have to look at what the market dictate'* and '*sales still remain the indicator of market value, the amount he should have obtained, comparable sales*'. Evidence shown that the property valuer's knowledge regarding the ICM Act 24 of 2008 and as amended in 2014 and the impact thereof is also limited.

5. Conclusion

The participants acknowledged that although they saw changes in the environment, the changes was not necessarily ascribed to climate change. They indicated that climate change is something that would happen in the future. The participants accepted that risks associated with climate would only have an influence on the value of residential coastal real estate in the distant future. The evidence clearly indicated

that the property valuer's knowledge concerning legislation and its impact on residential coastal real estate was limited. The property valuers indicated that they will disregard the effect of climate change on the value of residential coastal real estate as long as there are no evidence of climate change in the market. The researcher resolved that the participants were uninformed regarding the implications of the legislation promulgated to adapt to or mitigate for climate change.

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An Investigation into the Causes of Land Invasion in Zambian Cities: Evidence from the City of Lusaka

Anthony Mushinge[1], Ephraim Kabunda Munshifwa[2] and Chota Mimba Mwenya[3]

Abstract

The objective of this paper was to investigate the causes of land invasions in Zambian cities. It was set on the principle that a good urban land governance system is a prerequisite for effective infrastructure development. Using evidence from the city of Lusaka, the study used both primary and secondary data to conclude that invasion of land was occurring with greater frequency. Land invasion was caused by weak urban land governance system. This governance system was characterised by inequitable access to land, land speculation, provision of insufficient information to the public, inadequate supply of land, deficient monitoring of land use, corruption, opaque urban land allocation procedure, unclear selection process in land allocation and inefficient urban land acquisition procedure. Land invasion hindered infrastructure development and also led to problems such as tenure insecurity, evictions, riots, and land conflicts. In this regard, it is recommended that the Zambian government should work on preventing land invasion through among other things, ensuring equitable access to land, preventing land speculation, sufficient dissemination of land information, and zero tolerance to corruption.

Keywords: Land governance, land invasion, Lusaka, urban land, Zambia

1. Introduction

Land invasion has now become a frequent urban phenomenon in most cities in Africa today. For example, Mutero and Makwara (2018) show a growing trend in forceful occupation of land in urban areas, with a number of cases reported in major cities of South Africa such as Johannesburg and Cape Town. Evidence from some African countries reveal that one of the major causes of these land invasions is an inefficient land delivery system where a small number of the urban elite own the larger proportion of urban land (Bichi, 2010; Brown, 2015; Namandje, 2018; Obala, 2011; UN-Habitat, 2010).

Like many other African countries, the issue of urban land invasion is evident in Zambia. The National Assembly of Zambia and Civic Forum on Housing and Habitat (CFHH) reports show an escalation of cases of invasion of vacant public and private land in most cities (CFHH, 2015; Government of the Republic of Zambia [GRZ], 2017a). It is from this background that this study discusses invasion of vacant land in Zambian cities focusing on the causes, effects and possible solutions. This study is guided with the following objectives: Firstly, to investigate the causes of invasion of vacant land in Zambian cities;

[1,2&3] School of the Built Environment, Copperbelt University, P.O. Box 21692, Kitwe, Zambia
anthonymushinge@yahoo.com; kabunda.munshifwa@hotmail.com; chota.mimba@gmail.com

Secondly, to establish the effects of invasion of vacant urban land in Zambian cities, and finally, to recommend possible solutions towards the prevention of land invasion.

2. Literature Review

2.1 Land Invasion

Land invasion refers to the illegal occupation of land, with the intention of establishing dwellings / a settlement upon it (Westerncape, 2017). An invasion may be by one individual or by hundreds of households. Land invasion is twofold: public or private land invasion. Public land invasion involves people illegally occupying open land which has been reserved for government use. Not dissimilarly, private land invasion involves invasion of formally planned and allocated land by people who threaten and bar legal land owners from taking possession of their land (Chama, 2007). Literature review shows that one of the key dimensions of the urban land question is the struggle to access land among the urban poor (see for example, Chitonge and Mfune, 2015). As a result, many landless people in urban areas (who are usually in low income group) are inventing ways of accessing land. One of the ways is invasion of either vacant public or private land. So, compellingly, one is prompted to ask, why is land invasion occurring? Weak urban land governance is identified as one reason why land invasion is happening (Swazuri et al. 2017). Land invasion among other things adversely affects infrastructure development. For example, the invasion of land planned for constructing roads, railway, schools and hospitals will deprive an area of these infrastructure.

2.2 Urban land governance

The term land governance came into existence in the 1980s. Despite the concept being in existence for more than three decades, there is no agreed-upon definition for it. This article therefore refers to land governance as "the rules, structures and processes through which decisions regarding access to land and securing rights to that land are made and implemented" (Deininger et al., 2012). Rules for land governance include land laws while structures include the executive, parliament, the judiciary and public land agencies (institutions). Similarly, the process of land governance implies land allocation procedure.

In most African countries urban land governance is characterised by among other things; insufficient or inconsistent legal provisions, defective land institutions (characterised by inter alia corruption, insufficient dissemination of information to the public on land issues, and inadequate monitoring of land use), and defective land allocation procedure (Van Der Zwan, 2010; AU et al., 2010). These characteristics denote weak land governance. In view of the foregoing, pundits of land governance have been advocating for good governance in the land sector or good urban land governance (see for example, Deininger et al., 2012; Espinoza, 2012). Good governance in land sector implies equitable access to land, simple and transparent land allocation procedure, zero tolerance to corruption, sufficient monitoring of land use, sufficient supply of affordable land, sufficient provision of land information to the public, and averting land speculation (Mushinge, 2017). These in turn prevent land invasions and subsequently lead to effective infrastructure development.

2.3 Zambian land tenure system

The Lands Act of 1995 provides for two distinct categorisation of land namely state and customary land. State land is held under statutory tenure while customary land is held under customary tenure. In terms of land area, Zambia has a total surface area of 75, 261, 400 hectares. GRZ (2015), estimates that currently the area for state land may be as high as 10 percent (7, 526, 140 hectares). This implies that customary land is estimated at 90 per cent (67, 735, 260 hectares) of the country's land area. Although, there are two land tenure systems in Zambia, the focus of this article is state land. State land comprises land rights regulated by state policies, laws and institutions such as central and local governments (GRZ, 1995), and mainly covers urban localities (cities and towns). The granting of land rights on state land follows clearly stipulated processes which include land use planning, cadastral surveying, land servicing, land allocation, land registration, and land titling (Mushinge et al, 2018). These processes are guided by laws which include the Urban and Regional Planning Act, Land Survey Act, Lands Act, and the Lands and Deeds Registry Act.

3. Methodology

In this study both primary and secondary data were collected. Primary data was collected in two stages. The first stage of primary data collection was conducted during a bigger study between May and September, 2016. Primary data was collected from sixteen key informants who included three Ministry of Lands and Natural Resources employees, two Ministry of Local Government employees, two Lusaka City Council employees, one Zambia Land Alliance employee, one Civic Forum on Housing and Habitat employees, one People's Process on Housing and Poverty in Zambia employee; three lawyers from three law firms and three private land surveying surveyors from three private land surveying firms. Other respondents included two hundred (200) households of Chilenje South. Chilenje South had 10,330 households (GRZ, 2012a) and the sample of 200 households was arrived at using Taro Yamane's sampling formula with 95% confidence level and sampling error which was put at 7%. Chilenje South was selected because it is a hotspot for land invasions in Lusaka City.

Questionnaires were used to collect primary data from key respondents while semi- structured interviews were used to collect information from households. In terms of sampling, the study adopted both non-probability (purposive sampling) and probability (simple random sampling) techniques. Purposive sampling was used to select key respondents that were known beforehand that they had a role to play in land matters while simple random sampling (picking every other house) was used to select household respondents.

The second stage of primary data collection was conducted between October and November 2018. This was done to verify the information collected in 2016. Email questionnaires were used to collect information from selected employees from Ministry of Lands and Natural Resources, Ministry of Local Government, Lusaka City Council, Forum on Housing and Habitat, People's Process on Housing and Poverty in Zambia, and law and private land surveying firms. Secondary data was also gathered through an analysis of various documents such as peer-reviewed journal articles, books, theses, Zambian land laws, and technical reports published by the Zambian Government.

4. Results and Discussion

4.1 Causes of land invasion

Research findings show that invasion of land in Lusaka City was occurring with greater frequency. The invasion was caused by weak urban land governance system. The characteristics of this system of land governance include but not limited to:

4.1.1 Inequitable access to urban land

Evidence gathered from the questionnaires and interviews indicated overwhelmingly that the ordinary citizens did not easily access urban land. The inequitable access to urban land is evident in the cost of what Lusaka City Council call the application fee for land which is non refundable even if one has not been offered the land. Findings from Lusaka City Council revealed that application fee for a low cost parcel of land measuring 300 square metres is about ZMK 250 (US$23). However, for one to actually own the land after successful interviews, they need to pay a further amount of about ZMK13, 500 (US$1227) for council fees and service charges. This therefore means that an average citizen is disqualified from owning land even when it is advertised by the council. The prices of land on the open market are far higher than those of the council and as such poor people are left at a disadvantage.

The issue of inequitable access to land was further confirmed by the Government Republic of Zambia. According to GRZ (2017a: 6):

> The selection criteria used in the local authorities (councils) requires that applicants should either provide a bank statement or pay slip and should indicate ability to develop. This is inclined to favour those in formal employment who are able to provide pay slips and individuals that are able to provide bank statements. This tends to marginalise the less privileged as they are unable to provide the formal requirements, going against the objective of equitable access to land by an ordinary citizen.

In addition, Zambia Land Alliance (2016, para. 4, 7 and 8) stated that:

> Only people with money get urban land in Zambia, there is really no chance for people without money. That is why people end up going to political party cadres hoping that it will be faster and cheaper, but they end up being cheated as well. The Zambian government must consider the plight of the ordinary citizens when it comes to issues of access to urban land; it sad to note that even non-Zambians are given priority over Zambians when it comes to urban land allocation. Government must first look at its own people; many Zambians are already poor, if they lose their land where are they going to go? Is the country going back to colonial era?

Due to inequitable access to land, the ordinary citizens invaded any vacant public or private urban land. The government's continued failure to listen to the ordinary citizens had created anxiety among the citizens which had resulted in public protests and riots over land (Response from Ministry of Lands and Natural Resources Employee, 2018). The protests and riots were against the government's system of urban land delivery (*ibid*). All key respondents indicated that the government should take this as a warning of the brewing tension in the country.

4.1.2 Land speculation

Research findings show that a small minority of the urban elite had been acquiring urban land for speculative purposes. According to the respondent from Zambia Land Alliance, there were clear cases of greedy people acquiring land merely for speculative purposes. People acquired land and wait for the market price to go up to sell the land. As a result, the land remains vacant for a long period of time. This encouraged the ordinary citizens who had difficulties in acquiring land from the councils to invade urban public or private land.

4.1.3 Provision of insufficient land information to the public

According to research findings, land institutions (that is, Ministry of Lands and Natural Resources and Local Authorities) did not sufficiently disseminate information to the public on land issues (for example, land allocation procedures, land laws, and land rights). Table 1 shows that the majority of household respondents (164 respondents representing 82%) thought that the government is very inefficient and ineffective in the dissemination of land information.

Table 1: Dissemination of Information to the Public

Land Institutions Dissemination of Information to the Public	Frequency (f)	Percentage (%)
Very Efficient and Effective	0	0.0
Somehow Efficient and Effective	15	7.5
Very Ineffective and Inefficient	164	82.0
No Response	9	4.5
Do Not Know	12	6.0
Total	200	100.0

Source: Survey Data, 2016

The issue of provision of insufficient information on land issues to the public was also confirmed by Seventh National Development Plan 2017-2021 prepared by the GRZ and Zambia Land Alliance. On the one hand, according to GRZ (2017b), there was inadequate dissemination of information on land issues. On the other hand, Zambia Land Alliance stated that many residents do not have enough education on land laws, land allocation procedures, and land rights and responsibilities, a situation they credited as the cause of high levels of corruption in areas such as land allocation (Zambia Land Alliance, 2016).

In view of the foregoing, household respondents for example were asked whether or not they were familiar with the four main land laws namely the Lands Act 1995, Land Survey Act 1960, Lands and Deeds Registry Act 1994, and Urban and Regional Planning Act 2015. Table 2 shows that the majority of these households were not familiar with the legal instruments.

Table 2: Familiarity with Legal Instruments (n = 200)

Legislation	Familiar (%)	Frequency (f)	Not familiar (%)	Frequency (f)
Lands Act 1995	17	34	83	166
Land Survey Act 1960	9	18	91	182
Lands and Deeds Registry Act 1994	14.5	29	85.5	171
Urban and Regional Planning Act 2015	6.5	13	93.5	187

Source: Survey Data, 2016

4.1.4 Insufficient supply of affordable urban land

Findings show that the exhaustion of serviced state land coupled with the increase in demand for land had put pressure on the Ministry of Lands and Natural Resources and Local Authorities to find alternative land. The Ministry and Local Authorities were experiencing increased workloads arising from inability to cope with state land applications. For example, Chitengi (2015: 166) reported an instance when Lusaka City Council was only able to supply 200 plots against 3,000 applications. In the face of this problem, the government introduced land development fund through the Lands Act of 1995. The fund is meant for opening up new areas for development. Particularly, the fund is used for land use planning, cadastral surveying, and provision of services such as roads, electricity, water and sewerage. However, according to research findings, over time, the opening up of new areas had been adversely affected by unpredictable and inadequate funding from the Treasury (Ministry of Finance). An official from Lusaka City Council indicated that low funding had been the most prominent hindrance in trying to achieve the goals and objectives of the Land Development Fund. Thus, the Local Authorities were unable to sufficiently supply affordable urban land.

4.1.5 Insufficient monitoring of land use

Research findings show that land institutions - particularly Ministry of Lands and Natural Resources and Local Authorities - had not been monitoring land use through site inspections. Thus, these land institutions were unable to identify land problems early enough. In other words, land institutions were reactive and not proactive. For instance, Local Authorities waited until people have built and then demolished their properties on allegations that they built on illegal land. The first concern that arises is whether any person must be allowed to spend a lot of money developing a structure that the council later comes to demolish. The demolition of structures sometimes led to riots over land. Land institutions are unable to monitor land use due to lack of transport, insufficient staff and inadequate financial resources.

4.1.6 Corruption

According to GRZ (2012b; 2014), there was widespread corruption in state land allocation. For example, a person can start the application quite alright but next time he/she go the Ministry of Lands and Natural Resources, the file will be missing or the land which was on offer is suddenly unavailable unless a 'brown envelop' is produced. The whole state land delivery system was corrupt because just for one to have his/her land issue addressed they should part away with some money (Response from a Lawyer, 2018). The reason was that officials in public land institutions and politicians (for example councillors) had turned land as source of livelihood. Corruption in turn led to land institutions being inefficient and ineffective to deliver the equitable services that citizens require. Thus, the consequence of corruption was that it was very difficult for the great majority of the people, especially the poor, to acquire land. This was because the poor lack resources to compete with those able and willing to pay bribes.

4.1.7 Opaque and inefficient land allocation procedure

Research findings show that urban land allocation procedure was not transparent. Table 3 shows that the majority (140 respondents representing 70%) of household respondents believed that the local authorities were not transparent when it comes to the allocation of urban land. The intrasparent urban land allocation procedure was also confirmed by key respondents. According to them, land allocation was not transparent

because even if local authorities advertised land for allocation, sometimes the allocations were conducted way before the adverts and land was allocated to close associates.

Table 3: Transparency in land allocation

Transparency in Land Allocation	Frequency (f)	Percentage (%)
Very Transparent	0	0.0
Somehow Transparent	20	10
Not Transparent	140	70.0
No Response	12	6.0
Do Not Know	28	14.0
Total	200	100.0

Source: Survey Data, 2016

On the other hand, the Service Charter provided by the Ministry of Lands and Natural Resources web-site is quite clear on the time frame within which land activities should be achieved. For instance, offer letter is supposed to be issued within 30 working days after approval of application, and a lease is supposed to be prepared within 10 days after acceptance of offer, and submission of survey diagram. However, findings show that issuing of offer letters and preparation of leases involved long waiting periods, extending beyond several months or even years. The delay in generating letters of offer and preparation of leases by the Ministry of Lands and Natural Resources (that is, Lands Department) led to the congestion or pilling up of files and this had in one way encouraged corruption (Sikazwe, 2005). The delay in disposing of files at the Lands Department can be attributed to many factors inter alia shortage of staff and the available staff charged with the responsibility of dealing with files did not work on them with urgency and efficiency required.

4.1.8 Unclear selection process in land allocation

Before a person is allocated a parcel of land, the local authority has to interview this person. Local authorities use evaluation sheets to rate suitable candidates. The rating is based on the applicant's bank statement or pay slip and proof of capacity to develop. However, there was no clear basis of selecting one candidate over the other even when they all provided the necessary requirements (GRZ, 2017a). For example, how capacity to develop was assessed was not clear (*ibid*).

4.1.9 Lack of development in rural areas

Because of lack of basic infrastructure to support human livelihoods such as schools, clinics, and roads, people in the rural areas are migrating to the urban areas for better economic opportunities. This migration however causes pressure on the few available resources and services in the urban areas and in this case adequate and affordable housing is very hard to find. As a solution to this poor people are forced to invade private or public land to provide housing.

5. Consequences of Urban Land Invasions

Urban land invasion hindered infrastructure development such as roads, water and sewer lines, hospitals, and schools in planned areas; and led to tenure insecurity, evictions, riots, and land conflicts. In particular, areas planned to have roads, water and sewer lines, schools, and hospitals did not have infrastructure; land owners were prevented from enjoying their land rights; properties worth millions of kwacha were

destroyed during evictions; and conflicts between land invaders and private land owners as well as conflicts between invaders and government agencies were common. Moreover, during evictions some people had been injured or killed (GRZ, 2015).

6. Conclusion and Recommendations

The findings of this article show that invasion of urban land was widespread due to weak urban land governance system. This system was characterised by among other things inequitable access to land, land speculation, provision of insufficient information to the public, inadequate supply of land, deficient monitoring of land use, corruption, opaque and inefficient land allocation procedure, and unclear selection process in land allocation. Thus, infrastructure development in planned areas was hindered and there were other problems such as tenure insecurity, evictions, riots, and land conflicts.

In light of weak urban land governance system, the study suggests that the government should invest in land improving the system of urban land governance through:

- Ensuring land allocation which is based on the principle of equity as provided in the Constitution;
- Land institutions taking necessary actions to those who acquire land and leave it idle for speculation. Sanctions for obtaining land for speculation purposes should be disseminated through the media such as radio, television and newspapers so that people can be aware and take the right decision about it;
- Land institutions improving the dissemination of information on legal instruments, land rights, land allocation procedure and other land issues. This information should also be in a local language that people understand;
- Adequate and consistent disbursement of the land development fund by the government (Ministry of Finance). The Ministry of Lands and Natural Resources should ensure that this money is used for its intended purpose, that is, opening new areas for land development through land use planning, cadastral surveying as well as provision of services such as water, electricity, roads, and sewerage;
- Establishing a separate division responsible for monitoring land use through site inspections coupled with the use of google earth;
- Ensuring zero tolerance to corruption;
- Ensuring that land allocation is transparent and Improving the efficiency at the Ministry of Lands and Natural Resources through among other things employing more staff; and
- Ensuring that the selection process in land allocation is clear.
- Provision of basic infrastructure to support human livelihoods such as schools, clinics, and roads in rural areas.

Urban land governance system should be improved now and not later. Otherwise, the problem of urban land invasion and subsequently hindered infrastructure development in planned areas will remain unresolved or became worse.

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DII-2019-024

The Significance of Earthquakes in view of Infrastructure Development in Zambia

Innocent Mileji[1] and Michael Mulenga[2]

Abstract

Design and construction practices in Zambia have tended to neglect the risk posed by seismicity on structures, and no Zambian earthquake design and construction guide exists. The recent earthquake occurrences suggest that earthquake incidences can no longer be ignored. The research aimed at establishing the occurrence and significance of earthquakes on the design of structures in Zambia. It advanced the hypothesis that there was sufficient evidence to warrant factoring in the risk posed by seismicity in design and construction practices, and hence the need to develop an earthquake design and construction guide. While Zambia's location in the interior of the African plate may suggest low seismic risk, the influence of the East Africa rift valley cannot be underestimated. Even with limited history and records of earthquake activity in Zambia and the sub region, there are sufficient records of major earthquakes resulting in damage to structures and even loss of lives. The research methodology included literature review of works related to seismicity in Zambia and the sub-region, analysis of raw earthquake data obtained from earthquake monitoring agencies and review of available seismic reports on Zambia. Recorded earthquake events and their physical effects on structures were reviewed. The research established evidence of physical damage resulting from earthquakes and seismic hazard analysis indicated significant values of peak ground acceleration (PGA) in various earthquake source zones. In view of increased investments in infrastructure development, the sustainability of such investments can only be assured if effects of earthquakes are mitigated.

Keywords: Earthquake, seismicity, structural design, sustainability.

1. Background

Earthquakes and seismic activity are a vital consideration in the design of structures throughout the world. However, the limited design guidance to address seismic activity in Zambia suggests that structures are not consistently designed to resist the effects of earthquakes. The impact of earthquakes on structures may range from minor deformations of structural elements to complete catastrophic collapse of the entire structure. Although most earthquakes are moderate in size, a severe earthquake occasionally strikes a

[1] Engineer; Rankin Engineering Consultants; P.O Box 50566, Lusaka, Zambia; innocentmileji@gmail.com; imileji@rankinengineering.com
[2]Senior Lecturer; Department of Civil and Environmental Engineering; University of Zambia; P.O Box 30379, Lusaka, Zambia; mnmulzm@yahoo.com

community that is not adequately prepared and thousands of lives and billions of dollars in economic investment are lost (FEMA, 2010). One of the key ways a community protects itself from potential earthquake disasters is by adopting and enforcing a building code which has appropriate seismic design and construction standards (FEMA, 2010). It is therefore imperative that accurate local information and prediction of seismic activity is obtained and design codes made therefrom.

Seismic activity in eastern and southern Africa is controlled by the East Africa Rift System, an intraplate fault line on the Africa plate. The East Africa Rift System forms two main lines, the Eastern and Western Branches. The Eastern Branch extends from the Afar triangle in the north to Northern Tanzania in the south. The western branch extends from Lake Albert in the north to the south of Lake Malawi in the south, encompassing lakes Edward and Tanganyika. Zambia's seismic activity is mainly influenced by the Western branch which passes close to the northern and eastern region of the country. Given the remoteness of the region from the African plate boundaries, seismicity in southern Africa is largely attributed to intraplate tectonics that globally account for a very small percentage of annually recorded earthquakes. In spite of the very low frequency of occurrence, seismicity associated with intraplate tectonics is complex and will occasionally reach critical values. In Malawi, the Salima earthquake (Ms=6.1) of 10 May 1989 killed 9 people. In Tanzania, the Kasanga earthquake (Ms=7.3) of 13 December 1910 caused significant damage in southern Tanzania (Midzi et al 1999).

2. Regional Seismicity

Earthquake activity in the eastern and southern Africa region is characterised by the occurrence of destructive earthquakes which are controlled by the well-known regional tectonic feature, the East Africa Rift system (Midzi, et al., 1999). The East African Rift System (EARS) is a 3,000-km-long Cenozoic age continental rift extending from the Afar triple junction, between the horn of Africa and the Middle East, to western Mozambique. Sectors of active extension occur from the Indian Ocean, west to Botswana and the Democratic Republic of the Congo (DRC). It is the only rift system in the world that is active on a continent-wide scale, providing geologists with a view of how continental rifts develop over time into oceanic spreading centers like the Mid-Atlantic Ridge (Hayes, et al., 2014).

Traditionally, an Eastern (including the Ethiopian Rift) and a Western Branch are distinguished (Ring, 2014). The eastern branch runs over a distance of 2200 km, from the Afar triangle in the north, through the main Ethiopian rift, the Omo-Turkana lows, the Kenyan (Gregory) rifts, and ends in the basins of the North-Tanzanian divergence in the south (Chorowicz, 2005).

The western branch runs over a distance of 2100 km from Lake Albert (Mobutu) in the north, to Lake Malawi (Nyasa) in the south. It comprises several segments: the northern segment includes Lake Albert (Mobutu), Lake Edward (Idi Amin) and Lake Kivu basins, turning progressively in trend from NNE to N–S; the central segment trends NW–SE and includes the basins of lakes Tanganyika and Rukwa; the southern segment mainly corresponds to Lake Malawi (Nyasa) and small basins more to the south (Chorowicz, 2005). A third, south-eastern branch is in the Mozambique Channel. The south-eastern branch comprises N-striking undersea basins located west of the Davie ridge (Chorowicz, 2005). Figure 1 illustrates the East African Rift System.

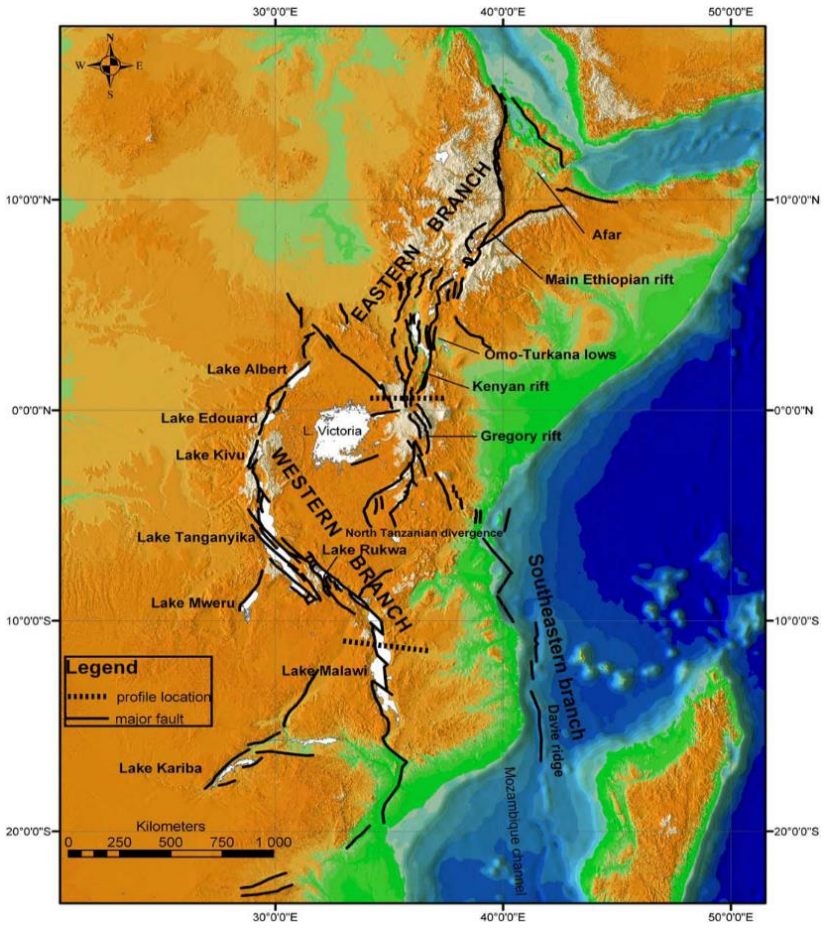

Figure 9: Ilustration of the East Africa Rift System (Chorowicz, 2005)

Seismicity in the East African Rift is widespread, but displays a distinct pattern. Seismicity is characterized by mainly shallow (<40 km) normal faults (earthquakes rupturing as a direct result of extension of the crust), and volcano-tectonic earthquakes. The majority of events occur in the 10–25-km depth range. This pattern is widespread throughout the EARS, and provides insight into the relationship between depth of earthquakes, the deformation of continental lithosphere, and magmatic processes in many sectors of the rift (Hayes, et al., 2014).

3. Earthquakes in Zambia

3.1 Physical evidence of Earthquake in Zambia

The Zambia Geological Survey Department conducts procedural onsite physical impact assessments after the occurrence of significant earthquakes. The study reviewed reports of three major earthquakes that occurred between January 2016 and June 2017. These were Chirundu (magnitude 4.6), Kaputa (magnitude 5.9) and Lundazi (magnitude 5.2).

The Chirundu Earthquake occurred on 9th January 2016 at 05:25AM at location 16.057°S, 28.56°E, 29km from Chirundu town. In the report by Mutamina and Kabele (2016), it was concluded that no physical damage was imposed on structures of the Kariba hydropower plant. However, physical damage was reported on some structures in close proximity to the earthquake epicenter. The damage manifested in cracks on walls of structures.

The Kaputa Earthquake occurred on the 24th of February, 2017, at location 30.0847º E, 8.4695ºS and hypo-central depth of 27km, about 47km east of Kaputa District Administrative Center. According to the report by Kasumba et al (2017), the seismic waves generated by the earthquake were felt in the nearby towns of Northern and Luapula provinces, extending further into the Democratic Republic of Congo and Tanzania, with reports of damage to infrastructure and homes (Figure 2a and b). Fatalities and injuries were also reported.

Figure 16a: Building collapse as a result of Kaputa Earthquake

Figure 2b: Structural Damage as a result of Kaputa Earthquake (Kasumba et al, 2017)

The Lundazi Earthquake occurred on 24th June 2017, 12km North East of Chief Kazembe headquarters at location 12.15°S, 36.65°E and hypo- central depth of 391km. It was one of three earthquakes of magnitude >5 that occurred in the southern African region within a period of two weeks. The other two occurred on 5th July, 2016, of magnitude 5.0, 256km North West of Gaborone and on 24th June, 2017, of magnitude 5.5, 10km North West of Beira in Mozambique. In the report by Matamina (2017), it was noted that some structures around the vicinity of the epicenter experienced physical damage.

3.2 Earthquake distribution

For the study, earthquakes occurring within the area bounded by **latitudes -7º to 19º** and **longitudes 21º to 35º** were considered. The study region extends beyond the boundaries of Zambia into the neighboring countries to account for seismic effects that extend beyond the vicinity of the epicenter. Figure 3 shows the distribution of earthquakes for the period **1910-2018** in the study area, based on data obtained from the International Seismological Center **(ISC)** database. The largest earthquake in the data set is a magnitude Mw 7.3 which occurred on December 13, 1910 in the Lake Tanganyika Region, about 250km from the border with Zambia. This is reported to have caused significant damage in that region. An Mw

7.2 earthquake occurred in Tanganyika region on July 8, 1919 at a depth of 15km. This was within 48km of the border with Zambia. The largest earthquake recorded within Zambia was a magnitude Mw 6.7 south of Chama District on May 1, 1919. Table 1 presents statistics on occurrence of earthquakes in the study region.

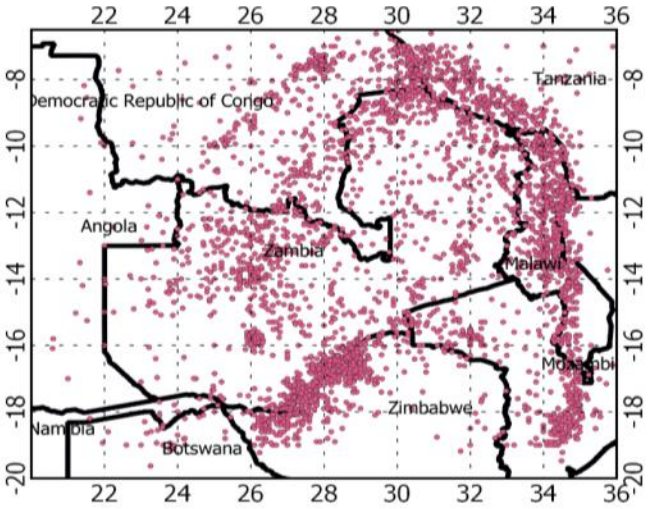

Figure 3: Distribution of Earthquakes in Study Region 1910-2018

Table 10: Earthquake Statistics in Study Area

Recorded events 1910-2018	5270
Recorded events 1910-1963	50
Recorded events 1963-2018	5220
Recorded events with magnitude > 4	851
Largest recorded event in study region	7.3Mw
Largest recorded event in within Zambia	6.7Mw

4. Seismic Hazard Assessment

Given the challenges in earthquake prediction, seismic hazard analysis is considered one of the practical solutions to cope with the complicated, random earthquake process (Geller et al. 1997). Seismic hazard assessment has a number of applications, among them, seismic micro-zonation studies, which are important for decision-making on land use, evaluation of the level of earthquake preparedness, economical consideration of earthquake-resistant design, retrofit strategy, economic loss estimation in the event of future earthquakes, and also for the design of ordinary structures where site-specific studies are not warranted (SamamYangmaei-Sabegh et al., 2010).

Two basic methods are widely used to carry out seismic hazard analysis, Deterministic Seismic Hazard Analysis **(DSHA)** and Probabilistic Seismic Hazard Analysis **(PSHA**). The strength of one over the other depends on the earthquake mitigation decisions to be made, on the seismic environment, and on the scope of the project. In general, more complex decisions and subtler, detailed seismic environments strongly suggest the probabilistic analysis, whereas simpler decisions and well understood seismicity and tectonics point toward deterministic representations (McGuire, 2001).

In the deterministic approach, the strong-motion parameters are estimated for the maximum credible earthquake, assumed to occur at the closest possible distance from the site of interest, without considering the likelihood of its occurrence during a specified exposure period (Gupta, 2002). Probabilistic seismic hazard analysis (PSHA) estimates the likelihood that various levels of earthquake caused ground motion will be exceeded at a given location in a given future time period, given all possible earthquake scenarios. The probabilistic approach integrates the effects of all the earthquakes expected to occur at different locations during a specified life period, with the associated uncertainties and randomness taken into account (Gupta, 2002). The most commonly used procedure for PSHA is referred to as the classic Cornell-McGuire approach (Cornell, 1968; McGuire, 1976).

4.1 Seismic Hazard assessment for Zambia

A probabilistic seismic hazard assessment (PSHA) was carried out using the Cornell-McGuire approach. The procedure included Catalogue clean up, Homogenization of catalogue, Catalogue de-clustering, Seismic source zone identification, Definition of earthquake parameters, Determination of ground motion prediction equations and Estimation of earthquake effects.

4.1.1 Catalogue clean up

The catalogue clean-up involved elimination of events with limited information such as events with no recorded magnitude. The result of the cleanup was a catalogue with 4409 events. The data was then homogenized before conducting a De-clustering procedure on the catalogue.

4.1.2 Homogenization of catalogue

The catalogue homogenization involved the conversion of all earthquake magnitudes into a single magnitude. In this study, all magnitudes were converted to Moment magnitude (M_w). ISC database is composed of events recorded by different agencies. Therefore, in converting the magnitudes to Mw, priority was given to events initially recorded in that magnitude scale by one of the agencies that captured the particular event. In cases where moment magnitude was not recorded, the Local Magnitude (M_L) was given priority. The following relations derived by Strasser and Mangongolo (2013) were used to convert M_L to M_w.

$Mw = 0.5631 M_L + 0.9265 \quad for\ M_L \leq 2.5$

$Mw = 0.1942\ M_L^2 - 0.1518 M_L + 1.5 \quad for\ 2.5 \leq M_L \leq 4.0$

$M_w = M_L \quad for\ M_L \geq 4.0$

4.1.3 Catalogue de-clustering

To remove dependent events such as aftershocks and foreshocks, the catalogue was de-clustered using ZMAP Catalogue analysis software package (Wiemer, 2001). ZMAP, a MATLAB code which was first published in 1994, is a set of tools driven by graphical user interface designed to analyse earthquake catalogues (Wiemer, 2001). The software uses the windows-based method of Gardner and Knopoff (1974). De-clustering resulted in 4124 events from an initial 4409 events.

4.1.4 Seismic source zone identification

A source zone is a configuration within which earthquakes are observed to occur at the same rate with respect to magnitude, irrespective of their location (Reiter, 1990). Nine seismic source zones where identified. The zones where delineated using QGIS software and saved as shapefiles. Only area source zones were considered in the delineation of source zone. Figure 4 show these zones.

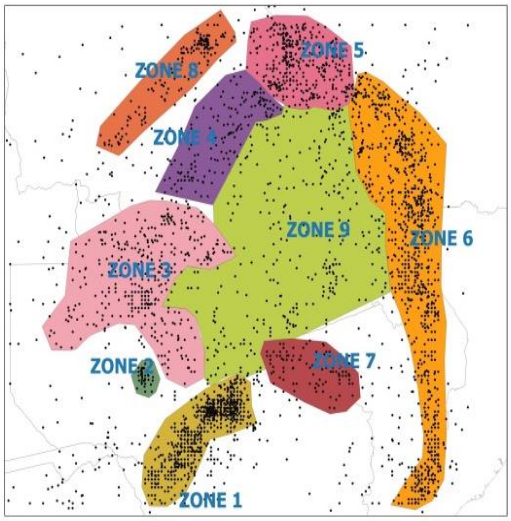

Figure 4: Seismic zone delineation

4.1.5 Definition of earthquake parameters

Recurrence parameters for each source zone were determined using ZMAP Catalogue analysis software package (Wiemer, 2001). These parameters (Table 2), are the a and b values of the Gutenberg-Richter (G-R) relation, the mean seismic activity rate (γ), the upper and lower bound magnitudes (M_{min} and M_{max}) and the β value calculated using the expression $\beta = bIn(10)$.

Table 11: Seismic zone parameters

Zone	a	b	γ	M_{min}	M_{max}	β
1	5.628	0.94	3.904	3	6.5	2.164
2	3.621	0.76	1.925	3.2	5	1.750
3	4.711	0.75	2.946	3.3	5.8	1.727
4	5.107	0.87	3.343	3.8	5.6	2.003
5	5.459	0.85	3.466	3.7	7.1	1.957
6	5.284	0.76	3.289	3.5	6.8	1.750
7	4.46	0.88	2.694	2.8	6.1	2.026
8	5.205	0.89	3.428	3.6	6.1	2.049
9	4.717	0.8	2.831	3.1	6	1.842

4.1.6 Estimation of earthquake effects

Seismic hazard computations were carried out using R-Crisis software. The main input parameters for the software included Seismic source geometry, Source seismic parameters and Attenuation data. Atkinson and Boore (2006) attenuation model was selected. This model was created for stable continental regions similar to the study region.

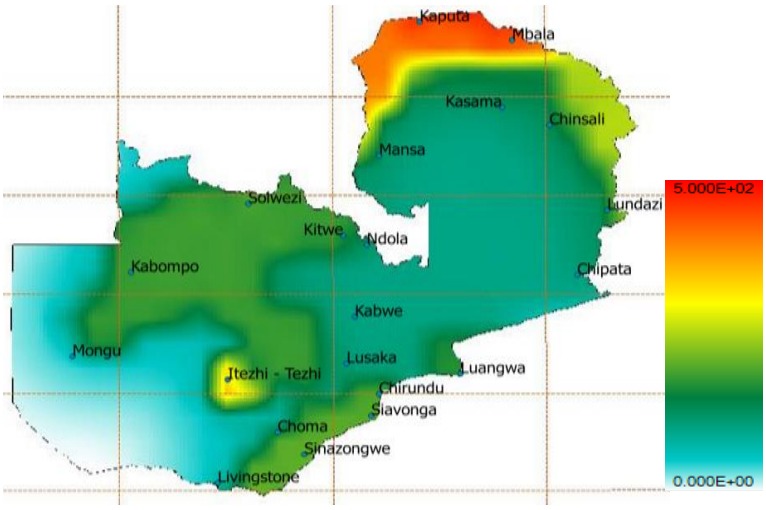

Figure 5: PGA map in cm/s^2 for 475 year return period

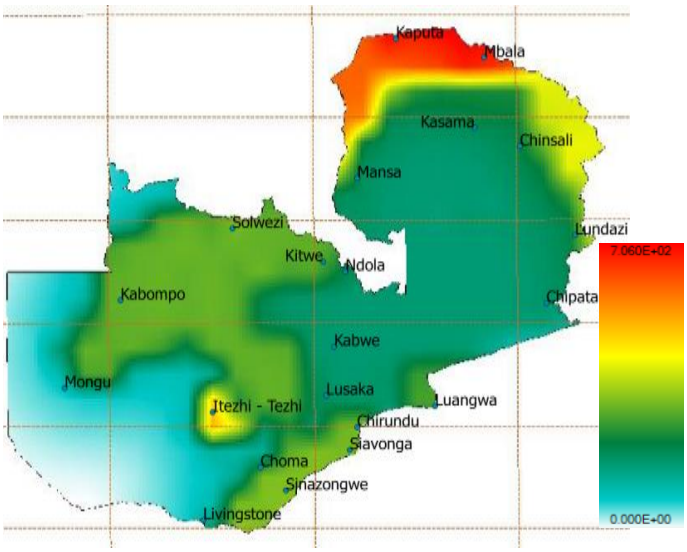

Figure 6: PGA map in cm/s^2 for 950 year return period

The hazard computations resulted in seismic hazard maps of different return periods. Figures 5 and 6 show the hazard maps for return periods of 475 years and 950 years. respectively. According to EN 1998-1, the design seismic action is generally expressed in terms of the seismic action associated with a 10% probability of excedance in 50 years or a reference return period of 475 years.

Table 3 shows PGA values for selected towns in Zambia. It was noted that the highest PGA values were recorded in seismic zone 5 of up to 0.5g and 0.7g for return periods 475 and 950years, respectively. Of the selected towns, Kaputa recorded the highest PGA values of 0.45g and 0.63g for return periods 475 and 950years, respectively.

5. Conclusion and Recommendations

The study highlighted the significance of seismicity on structural design in Zambia. Zambia lies in the interior of the African plate that is considered relatively aseismic. However, the presence of the East Africa Rift System with its various sectors influences seismic activity in the region.

The study revealed that Zambia experienced significant earthquake events that have caused serious damage to structures and even loss of lives as in the case of the 24th February, 2017 Magnitude 5.9 Kaputa Earthquake, as reported by Kasumba et al (2017). The study reviewed three major earthquake events that occurred within a space of one and a half years from January 2016 to June 2017. It is noted that the three earthquake events reviewed in the study occurred in areas that are relatively sparsely populated. It can be assumed that the effects of the magnitude 5.9 earthquake could have been more severe had it occurred in a populated and built up area such as the major urban centers of the Copperbelt and Lusaka. Other major events have also occurred in the study area in the past.

Table 12: PGA values for selected towns

Town	PGA (cm/s^2)		PGA (g)	
	475 Years	950 Years	475 Years	950 Years
Chinsali	140	193	0.140	0.193
Chipata	107	148	0.107	0.148
Chirundu	198	288	0.198	0.288
Choma	166	261	0.166	0.261
Itezhi-Tezhi	316	431	0.316	0.431
Kabompo	183	270	0.183	0.270
Kabwe	103	149	0.103	0.149
Kaputa	449	627	0.449	0.627
Kasama	126	175	0.126	0.175
Kitwe	154	239	0.154	0.239
Livingstone	94	120	0.094	0.120
Luangwa	167	248	0.167	0.248
Lundazi	183	267	0.183	0.267
Lusaka	112	164	0.112	0.164
Mansa	140	200	0.140	0.200
Mbala	434	620	0.434	0.620
Mongu	62	90	0.062	0.090
Ndola	123	177	0.123	0.177
Siavonga	200	289	0.200	0.289
Sinazongwe	205	295	0.205	0.295
Solwezi	190	280	0.190	0.280

It is evident from the study that there is sufficient level of earthquake activity to warrant consideration of earthquake effects in the design of structures in Zambia. Even with the limited history of earthquake event documentation, there are a number of events that should compel engineers to consider seismic loading in the design of structures. According to EN 1998-1, the design seismic action is generally expressed in terms of the seismic action associated with a 10% probability of excedance in 50 years or a reference return period of 475 years. The existing records of only around 100 years in Zambia cannot be relied upon to dismiss the occurrence of destructive earthquakes anywhere within Zambia.

The periodicities of large earthquakes can be in the hundreds of years. Investigations into the 1966 Koynanagan earthquake of magnitude 7.0 in the Deccan Plateau of India revealed periodicities of about 200 years for such earthquakes (Brandit, 2011). The particular earthquake occurred in an intraplate region similar to the study region in this study.

The results of the probabilistic seismic hazard analysis showed significant values of peak ground acceleration (PGA) in various zones as observed in the presented maps. The results showed PGA values of up to 0.5g for a return period of 475years associated with a 10% probability of excedance in 50 years and up to 0.7g for a return period of 950 years associated with a 10% probability of excedance in 100

years. According to Wium (2008), it is accepted practice internationally to design structures for seismic loads when the nominal peak ground acceleration values (1:475 years) exceed a value of 0.1g. The results of hazard analysis showed values of peak ground acceleration greater than 0.1g for a return period of 475 years in many zones around Zambia.

In view of increased investments in infrastructure development, the sustainability of such investments can only be assured if effects of natural events such as earthquakes are taken care of. The study revealed the potential effects of earthquakes in various parts of Zambia that could severely undermine the strides made in infrastructure development. It is therefore recommended that engineers take earthquake loading into consideration in the design of structures in Zambia.

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The Strategic Benefits of Innovation Adoption in Construction Consultancy Firms: The Role of Quantity Surveyors

De-Graft Owusu-Manu[1], Frank Ato Ghansah[2], Frank Boateng[3], George Asumadu[4] and David Junior Edwards[5]

Abstract

There is a need for consultancy firms to understand the worth of innovation adoption. The aim of this paper is to explore strategic benefits of innovation adoption in construction consultancy firms. The study adopted the census sampling technique via Quantitative Approach. Mean Score Ranking Analysis was employed to evaluate the benefits of the innovation adoption, and the level of agreement was established using Kendall's Coefficient of Concordance. Findings on the strategic benefits of adopting innovation in the construction services firms were: improvement of services and product quality, increase in technical capability, new processes, revenue growth, improvement of human resources, market penetration and growth, increase in organizational effectiveness, improvement of processes, improvement of client satisfaction, new services, improvement of organisational structure, intellectual property, short-term and long-term profitability as well as a better company image. The factor, "clients' satisfaction" was found to be the most important strategic benefit of adopting innovation in consultancy firms. The key contribution of the paper to the body of knowledge is manifested in the discovery that clients' satisfaction is the main concern of Quantity Surveying firms. Theoretically, the study Sought to provide a theoretical understanding of innovation adoption in construction consultancy firms by creating awareness on the clients' satisfaction.

Keywords: Construction, Ghana, innovation adoption, quantity surveying, strategic benefits.

[1] Lecturer; Department of Construction Technology and Management; Kwame Nkrumah University of Science and Technology, Ghana; d.owusumanu@gmail.com.
[2]Student; Department of Construction Technology and Management; Kwame Nkrumah University of Science and Technology, Ghana; phrankatos@gmail.com.
[3]Lecturer; School of Business and Management Studies, University of Mines and Technology, Ghana; fboateng28@gmail.com.
[4]Lecturer; Faculty of Business, Kumasi Technical University, Ghana; gasumadu@gmail.com.
[5]Lecturer; Faculty of Technology Environment and Engineering; Birmingham City University, UK; David.Edwards@bcu.ac.uk.

1. Introduction

Innovation helps organizations to overcome turbulent external environment, and therefore the key factor for business survival especially in dynamic markets (Baker and Sinkula, 2002; Darrch and McNaugton, 2002; and Jimenez-Jimenez, 2011). Yusof et al. (2010) suggested that, for innovation to be an effective strategy that sufficiently sustains organization within the challenging environment, it should not be treated as a one-time event. Cooper (1998) added to it that, firms must continuously be innovative to sustain competitive advantage. It has been noticed that a lot of the firms in the construction industry, especially Quantity Surveying firms face the problem of low performance, low levels of profitability, limited investment and poor organizational capabilities (Reichstein et al., 2005). Further studies explain that the major means of breaking free from this problem is by innovation (Reichstein et al., 2005). As a consequence of this, the Quantity Surveying firms have to develop the stamina to challenge the needless and unwanted (outdated) existing practices and implement innovative practices (Olatunji et al., 2010). In spite of this, the Ghanaian firms are reluctant in implementing innovation (Adow et al., 2013). Adow et al identified that Quantity Surveying firms are being reluctant to implement innovation, but failed to further identify what can drive innovation in Ghanaian Quantity Surveying firms. Construction industry consultants generally referred to as knowledge-based professionals are (person or organization) employed to provide expert analysis and advice that will enhance decision-making; provide specialized and one-of service(s); and, perform task(s) that are not ordinarily available within the departments or agencies of the Clients (Victorian Government Purchasing Board, 2004; Ijigah et al., 2012). Construction industry consultants are usually approached and commissioned by clients to provide services relating to the conceptualization, planning as well as the execution of the construction projects (Ibironke, 2004). Yusof et al. (2010) emphasized the need for construction organizations' innovation in the face of the continuously increasing technological capabilities, changing clients' requirements, tighter control over environmental regulations and quality standard, rising construction costs, increased competition and other challenges. Masidah and Khairuddin (2005) opined that the Quantity Surveying firms identified, that some of the professional services they render might be needless and unwanted by the client, and the only way the Quantity Surveying profession can be attractive is to meet the expected standard of the client. As a consequence of this, the Quantity Surveying firms have to develop the stamina to challenge the needless and unwanted (outdated) existing practices and implement innovative practices (Olatunji et al., 2010).

To date, scant research had been conducted in the area of innovation adoption by consultancy firms (Masidah and Khairuddin, 2005). In spite of this, the Ghanaian QS firms are reluctant in implementing innovation (Adow et al., 2013). Consequently, there is insufficient literature on the benefits of adopting innovative practices in construction consultancy firms. Quantity Surveying Firms need to adopt innovation in their practices so that they can be competitive in the execution of their services. The objective of this study was to explore strategic benefits of innovation adoption in Ghanaian Quantity Surveying firms. The findings of the paper are also to boost the understanding of undertaking innovations in the construction consultancy firms.

2. Literature Review

2.1 Concept of innovation

Barrett et al. (1998) explained innovation in construction as 'the act of introducing and using new ideas, technologies, products and/or processes aimed at solving problems, viewing things differently, improving efficiency and effectiveness, or enhancing standards of living. Innovation is an idea, practice, or project that is perceived as new by an individual or another unit of adoption (Sahin et al., 2014). Innovation is a complex and multidimensional process that has received the attention of researchers in all fields due to its contribution to economic growth, competitiveness and quality of life (Ozorhon et al., 2010). The process of generating new ideas is not the same as applying them in practice and calls for dealing with different critical incident, problems and tasks that require innovative thinking and response so as to overcome any difficulties that might arise (Berdrow and Evers, 2010). Construction is a very diverse sector and there is not one single way in which innovation occurs (Ozorhon et al., 2010). Innovation has a vital function to play in leveraging the competitiveness of firms within the construction industry; in particular, architectural and engineering design (AED) firms (Panuwatwanich and Stewart, 2012). The notion of sustainable competitive advantage is increasingly interwoven with the ability of nations and firms to successfully create, manage and exploit appropriate innovation (Barrett and Sexton, 2006). It is then important to also focus on the stages of innovation adoption.

2.2 Stages of innovation adoption

Stages of innovation which is also known as sequence or chain have been done and classified differently by different researchers in the industry. Wolfe (1994) suggested ten stages including idea conception, awareness, matching, appraisal, persuasion, adoption decision, implementation, confirmation, re-utilization, and infusion. Rogers (2010) came out a six-phase labyrinth of innovation, where the flow of successful innovation comprises need, creation, invention, innovation, diffusion, and adoption. Rogers (2010) again was able to offer five stages namely, knowledge, persuasion, decision, implementation and confirmation. Hansen and Birkinshaw (2007) suggested that innovation as a sequential, three-phase process that involves idea generation, idea development, and the diffusion of developed concepts that includes six critical tasks namely, internal sourcing, cross-unit sourcing, external sourcing, selection, development, and companywide spread of the idea. Based on these stages, Ozorhon et al. (2010) suggested that, the beginning stage is to form ideas that can happen inside a unit, across units in a company, or outside the firm; the second stage is to convert or select ideas for funding and developing them into products or practices, and the last stage is to diffuse those products and practices. Roper et al. (2008) similarly modelled Innovative Value Chain as a repetitive process that has three main links such as 'knowledge sourcing' to assemble knowledge necessary for innovation, 'knowledge transformation' to translate knowledge into physical innovation, and finally 'knowledge exploitation' to improve the enterprise performance. This goes to explain that, the innovation value chain depicts the stages of innovation that quantity surveying firms can adopt in order to achieve higher productivity and customer satisfaction. Ozorhon et al. (2010) said that it is possible to use the fundamentals of the Innovation Value Chain structure and investigate the innovation process and at the project level as well as the firm level.

2.3 Benefits of adopting innovative practices in quantity surveying firms

A lot of researches have been done the benefits of innovation adoption. This paper explored the available benefits of innovating in consultancy firms through literature review. The identified benefits were noted to be strategic in adopting innovation in consultancy firms because they exert a decisive influence on an organization's likelihood of future success of firms (Siano et al., 2009). According to Adow et al. (2013), the benefits of innovation adoption include an increase in the competitive edge of the market and a reduction in the staff strength needed for the execution of a project. The most significant impact of innovation adoption is improving the company's image, advancing the services and product rendered by the firm, improving and enhancing client satisfaction and improving the current processes adopted by the firm, as shown in Table 1 by (Ozorhon et al., 2010). Blayse and Manley (2004) furthered the research on benefits of innovation by Ozorhon et al. (2010) and suggested that the more the Quantity Surveying firms become creative and innovative, the higher their chances and opportunities of winning more projects and also advancing the financial results of these projects. Ozorhon et al. (2010) too continued the research by saying that, the other benefits that firms get from innovation adoption includes increase in organizational effectiveness, penetration of market and growth, introduction of new services and processes, increase in technical capability, growth in revenue due to new services, short-term and long-term profitability, advancement of organizational structure, and enhancement of human skills and resources. Ozorhon et al. (2010) add that, the most important outcome or impact of innovation is to be a better company image. Roper et al. (2008) also proposed that reputation is the most valuable asset for a construction organization or firm and is effective in sustaining long term competitive advantage.

Table 1: Benefits of Innovation Adoption

No.	Benefits
1	Improvement of services
2	Improvement of product quality
3	Increase in technical capability
4	New services
5	New processes
6	Revenue growth due to new products and services
7	Improvement of organizational structure
8	Intellectual property (patent, trademarks, design)
9	Improvement of human resources
10	Short- and long-term profitability
11	Market penetration and growth
12	New product
13	Increase in organizational effectiveness
14	Improvement of process
15	Improvement of client satisfaction
16	Better company image

Source: (Ozorhon et al., 2010)

3. Research Methodology

A quantitative research approach was adopted and primary data were collected from registered quantity surveying firms in the two major cities in Ghana were major construction and consultancy services take place. Literature was extensively reviewed to increase understanding of the topic and to accurately determine the data to be collected for the research (Walliman, 2011). A population and sampling size of

forty-three (43) Good standing Registered QS firms were targeted, and census sampling technique and a questionnaire were used to collect data from top management from each registered quantity surveying firms. A five-point Likert scale was adopted in this study to measure the response of each respondent. Scaling style was adopted because the data was primarily ordinal. Responded questionnaires were retrieved from the population of the Registered Quantity Surveying Firms in Accra and Kumasi at a response rate of 67.44%. The response rate became valid and adequate after comparing with 53.7%, believed to be valid and adequate for response rate by Owusu and Badu (2009). This was supported by Ahadzie (2007) when he had 45% as a valid an adequate response rate. The collected data from the questionnaire were coded and analysed using the simple statistical tools; the Statistical Package for Social Sciences (SPSS) version 20 or current version. Tables were used for Interpretation of data to get the valid meaning to the responses. Means score Ranking Analysis was used to rank the dependent variables obtained to establish how they are prioritized by the Ghanaian Registered Quantity Surveying (QS) Firms. Kendall's Coefficient of Concordance was then used to reveal the level of agreement between the variables.

4. Findings and Discussions

In order to make the data collected authentic and credible, it was deemed important to analyse critically the background of the respondent. One key importance of this section is to establish the trustworthiness or otherwise, and generate confidence in the data collected.

The purpose of the gender was to show the number of males and females who were able to respond to the questionnaires sent the Quantity Surveying Firms. This is illustrated in Table 2. The results in Table 2 indicates that, out of 29 respondents, 79.3% were males and 20.7% were females. This means that more males in the firm responded more than the females in the firm. This could be as a result of the high number of males in the construction Industry. Identifying the positions in the firms will make sure the targeted respondent actually answered the questionnaires. The validity of the information will depend on the information retrieved from this part. The result on Table 2 indicates that out of 29 responses, 13.8% were managers, 13.8% were senior executives, 10.3% were Executive directors and 62.1% were from other top management whose positions were not indicated in the questionnaire but upon the power of delegation were allowed to respond. According to the analysis, most of the top management was delegated to respond to the questionnaires.

The relevance of the status of the firm is to make us know how the Firm is operating and its stands. It also depicts the ownership of the Firm. The ownership type of the firm determines how it will operate and how it relates to clients, employees and other firms (Badu and Owusu-Manu, 2011). This can also make the result of the information received authentic and reliable.

Table 2: Background Analysis of respondents

Variables		Frequency	Percentage, %	Cumulative percentage, %
Gender	Male	23	79.3	96.2
	Female	6	20.7	100.0
	Total	29	100.0	
Positions in the Firm	Manager	4	13.8	13.8
	Senior Executive	4	13.8	27.6
	Executive Director	3	10.3	37.9
	Other	18	62.1	100.0
	Total	29	100.0	
Status of the Firm	Sole proprietorship	1	3.4	3.4
	Private Limited company	16	55.2	58.6
	Partnership	2	6.9	65.5
	Other	10	34.5	100.0
	Total	29	100.0	
Years of the existence of the Firm	Less than 5 years	2	6.9	6.9
	5 to 10 Years	7	24.1	31.0
	11 to15 Years	8	27.6	58.6
	16 to 20 years	1	3.4	62.1
	Above 20 years	11	37.9	100.0
	Total	29	100.0	
Years of Experience in the Firm	Less than 5 years	18	62.1	62.1
	5 to 10 years	7	24.1	86.2
	11 to 15 years	4	13.8	100.0
	16 to 20 years	0	0	
	Above 20 years	0	0	
	Total	29	100.0	
Types of services of the Firm	Building Services	11	38.0	38.0
	Civil Engineering services	1	3.4	41.4
	Both Building and Civil Engineering Services	16	55.2	96.6
	Research and Development	1	3.4	100.0
	Total	29	100	
Type of Client	Private	4	13.8	13.8
	Public/Government	11	37.9	51.7
	Both Private and Government	14	48.3	100.0
	Total	29	100	

(Source: Field Survey, 2017)

The results on Table 3 also indicate that out of 29 responses on the status of the firm, 3.4% is a sole proprietorship, 55.2% are a private limited company, 6.9% are Partnership and 34.5% are others which were indicated that they are managed by the government. This concludes that the majority of the Quantity Surveying Firms in Accra and Kumasi is a private limited company. The number of years of existence of the Firm will have a great impact on the authenticity and credibility of the information given out. Table 3 shows that, out of 29 responses from firms, 6.9% are less than 5years, 24.1% are 5 to 10 years, 27.6% are 11 to 15 years, 3.4% are 16 to 20 years and 37.9% are above 20 years. This concludes that majority of the responses were from Firms who have above 20 years of existence, thereby making the information more

authentic, credible and reliable whilst 16 to 20 years of experience had the least responses. The number of years in a firm also has a great impact on the credibility and reliability of the information given out. It also shows the experience of the respondent in the Firm. Table 3 shows that, out of 29 responses collected from the firms, 62.1% have experienced less than 5 years, 24.1% have 5 to 10 years of experience and 13.8% have 10 to 15 years. None of the respondents has experienced greater than 15 years, thereby 16 to 20 years and Above 20 years recording 0%. The table then concludes that the Majority of the respondents have less than 5 years of experience, thereby showing how reliable the information is.

The type of service also has a great impact on the reliability of the information collected. The results on Table 3 shows that, out of 29 responses from the Firms pertaining to the type of services, 37.9% are building services, 3.4% are civil engineering services,55.2% are both building and civil engineering services and 3.4% for Research and Development. Analysis of the data concludes that the Majority of the services from the respondents are both Building and Civil engineering services whilst research and development is the least service. This makes the information reliable when in comparison with building works and civil works. This is also a very important factor when considering the reliability and credibility of the data collected from the respondents. The results on Table 3 show that, out of 29 responses collected from the firms, 13.8% had private client, 37.9% had a client to be the government and 48.3% had both private and government as a client. The result goes further to conclude that, the majority of the firms who responded to the question have private and government as a client whilst the least percentage is from only the private client.

4.1 Discussion on the strategic benefits of innovation adoption

The paper established statistical evidence based on the result using the Means score ranking analysis by the use of SPSS tool, as well as determining the level of agreement on the strategic benefits variables.

Table 3 shows the various variables that fall under the strategic benefits of innovation adoption in Ghanaian Quantity Surveying Firms. These variables are ranked based on the means score analysis including: improvement of services (3.69), improvement of product quality (3.69), increase in technical capability (3.76), new processes(3.69), revenue growth due to new product and services(3.66), improvement of human resources(3.72), market penetration and growth(3.79), increase in organizational effectiveness(3.69), improvement of process(3.69), improvement of client satisfaction(3.93), new services (3.55), Improvement of organizational structure (3.34), Intellectual property (patent, trademarks, design) (3.48), Short-term and long-term profitability (3.48), New product (3.45) and Better company image (3.59). Improvement of client satisfaction (3.93) was ranked the highest among all the strategic benefit variables of innovation adoption and Improvement of organizational structure (3.34) having the least ranking. Furthermore, this concludes that improvement of client satisfaction (1st) is the most significant strategic benefit in innovation adoption that the Ghanaian Quantity surveying Firms look up to. The result is supported by Masidah and Khairuddin (2005) when they suggested that Quantity Surveying can be made attractive by meeting the expected standard of the client. With the same variable which was used by Ozorhon et al. (2010), they came out that better company image is the most significant benefit of innovation adoption. Roper et al. (2008) supported him by saying that, for a construction firm, reputation is the most valuable asset. Ozorhon et al. (2010) came out with intellectual property as the lowest significant to the respondents. The low significance of intellectual property reinforces the point made by Rogers (2010) and Reichstein et al. (2008), who suggested that construction companies tend to invest less in Research & Development and rarely create new patents. Ozorhon et al. (2010) again added

that "measurements that relate to outcomes based on traditional science-based indicators of innovation do not reflect the focus of activity of contractors and consequently will give a poor indication of actual innovative activity". Upon this research study, it was inconsistent with the later literature review because the environment and the population were different. The respondent chose the improvement of client satisfaction as the most important benefit because the client is their target and improvement of organizational structure as the least significant. This then proved Ozorhon et al. (2010) adding improvement of client satisfaction as benefits of innovation adoption.

Table 3: Benefits of innovation Adoption using the Mean score ranking

Strategic Benefits	Mean	Standard deviation	Rank
Improvement of client satisfaction	3.93	1.033	1st
Market penetration and growth	3.79	0.902	2nd
Increase in technical capability	3.76	0.872	3rd
Improvement of human resources	3.72	0.922	4th
Improvement of process	3.69	0.891	5th
New processes	3.69	0.891	6th
Increase in organizational effectiveness	3.69	0.967	7th
Improvement of product quality	3.69	1.039	8th
Improvement of services	3.69	1.072	9th
Revenue growth due to new products and services	3.66	0.974	10th
Better company image	3.59	0.983	11th
New services	3.55	0.948	12th
Intellectual property (patent, trademarks, design)	3.48	0.829	13th
Short-term and long-term profitability	3.48	0.911	14th
New product	3.45	0.985	15th
Improvement of organizational structure	3.34	0.936	16th

(Source: Field Survey, 2017)

Table 4 shows the level of agreement on the variables of strategic benefits of innovation adoption in Ghanaian Quantity Surveying Firms. Kendall's coefficient of concordance for the test is 0.769, which showed that there is a level of positive strong agreement by the respondents on the variables for the strategic benefits of innovation adoption. The findings portrayed that the variables on the table are statistically significant because the table has p(Sig) <0.05 with Kendall's coefficient of concordance of 0.769. It also shows that respondents agree with each other to a reasonable extent. This then contributed to the fact that all the variables are agreed fairly to be strategic benefits of adopting innovation in consultancy firms.

Table 4: Test of Concordance using Kendall's coefficient of concordance

Population, N	29
Kendall's W[a]	0.769
Chi-Square	318.128
Df	10
Asymp. Sig.	0.000

a = Kendall's Coefficient of Concordance

(Source: Field Survey, 2017)

5. Outcome

The findings of this research paper are significant to the construction consultancy firms and can be extended to other professionals in the construction industry. This study will aid the Quantity Surveying firms to identify and to also increase their levels of competitiveness since the ability to innovate can give rise to the likelihood for the firms to gain a competitive advantage over their industrial rivals. Hansen and Birkinshaw (2007) supported this by saying that innovation is considered as one of the essential ingredients of competitive advantage given that, it is an intangible component that is difficult for competitors to replicate. This paper revealed that the improvement of client satisfaction is the main strategic benefits of adopting innovation in construction consulting firms. Masidah and Khairuddin (2005) supported that the work of Quantity Surveyors can be made attractive by meeting the expected standard of the client. The discovery by this paper was that, the construction industry needs to concentrate on the needs to tackle the aspect of innovation performance which will then help to improve the aim of satisfying client in the construction industry, thereby the findings of the research being valuable to innovation policy makers, stakeholders and other professional bodies in the construction industry. Theoretically, the study sought to provide a theoretical understanding of innovation adoption in construction consultancy firms by making it aware that clients satisfaction is the ultimate objective for adopting innovation. It is also trusted that the result will act as a literature review for further studies in the construction industry. With the contribution of making client satisfaction as the ultimate aim, this paper then adds to the theoretical understanding of innovation adoption in construction consultancy firms.

6. Conclusion

The findings of this paper have pointed out the underlining strategic benefits of adopting innovation in the construction industry by the consultancy firms, including improvement of services, improvement of product quality, increase in technical capability, new processes, revenue growth due to new product and services, improvement of human resources, market penetration and growth, increase in organizational effectiveness, improvement of process, improvement of client satisfaction, new services, Improvement of organizational structure, Intellectual property (patent, trademarks, design), Short-term and long-term profitability, New product and Better company image. Improvement of client satisfaction. This was attained via extensive literature review on the innovation adoption. It was then established that the improvement of clients' satisfaction is to be the aim of adopting innovation in construction consultancy firms. This paper, therefore, contributes strongly to innovations in the construction industry. The study adopted a quantitative technique, henceforth, there is a need to have adopted the qualitative technique to reduce the errors found in the use of the quantitative technique. The data collected were limited to the Registered Ghanaian Quantity Surveying Firms with a census sample of 67.44% response rate from the registered Ghanaian Quantity Surveying Firms. In spite of these few limitations, the study results have not been compromised in any way and hence worthy for use. The results of this research paper could be used as a basis for further research in the construction industry. It is recommended that research with relevant issues regarding innovation policy in the construction industry can also be looked into.

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Factors Affecting Effective Infrastructure Service Delivery in Zambia's Local Authorities: A Case of Eastern Province

Moffat Tembo[1], Erastus Mwanaumo[2], Sampa Chisumbe[3] and Ayodeji Olatunji Aiyetan[4]

Abstract

The central way of bringing government closer to the people is through delivery of social services in a satisfactory, timely, effective and adequate manner by creating Local Authorities (LAs) at local level to bring governance closer to the people for transformation of lives. This study sought to determine the extent to which social infrastructure assets created under the LA deliver social services by establishing the factors that contribute to service delivery in Zambia's local authorities, and investigate the extent to which existing social infrastructure address the needs of the local people. The evaluation adopted a purposeful arranged selection of local government staff for structured discussions to determine the extent of their involvement in infrastructure service provision. The main discussion was conducted with planners, treasurers, procurement officers and directors of engineering or works form LA and their project teams responsible for implementing government projects in Eastern Province. This research adopted qualitative methods and techniques. The research contends that the constitutional mandate of Local Government in terms of service delivery had not been met due to inadequate resources, lack of capacity and sustainable models to promote service delivery. The study also revealed that problems affecting LAs in Zambia are both external (political interference, central government control and delays in disbursement of funding) and internal (lack of capital investment, inadequate qualified manpower and poor council management). It is by this study that the LAs can comprehend the extent of the challenges regarding infrastructure deficiencies and be positioned to offer social services in a timely and sustainable manner. The paper therefore recommends that public-private sector collaboration can be used to leverage public service delivery.

Keywords: Local authorities, service delivery, social infrastructure, social services.

1. Introduction

Local government is the most important sphere of central government as it is at the coalface of service delivery and the closest to the people. Thus, public relies significantly on local government to deliver services even though the delivery still remains a challenge in most African countries (Koma & Tshiyoyo,

[1]Student, Department of Civil and Environmental Engineering, School of Engineering, University of Zambia, Box 32379, Lusaka, Zambia.
[2]Assistant Dean Postgraduate, School of Engineering, University of Zambia, Box 32379, Lusaka, Zambia. Email: Erastus.mwanaumo@unza.zm
[3] Senior Lecturer, Durban University of Technology, Kwazulu-Natal, South Africa

2011). Egberi and Madubueze (2014) agree that in most countries, especially in the developing countries, delivery of primary education and healthcare services continue to be a major challenge to responsible and responsive local governments. According to the Organization for Economic Cooperation and Development (OECD) (2010), cities across the world face the most severe challenges of service delivery due to fast growing populations. Inadequate public services have been holding back the productivity of Sub-Saharan Africa and impose major costs on business. It is widely acknowledged that, infrastructure deficit is one of the key factors that prevent the Sub-Saharan African region from realising its full potential for economic growth, international trade and poverty reduction (Adetola et al, 2011).

The Government of the Republic of Zambia's (GRZ) development agenda is articulated in both the Sixth National Development Plan (SNDP) and the National Vision 2030 (ZDA, 2014). The aim is to ensure availability of reliable and affordable public infrastructure services for sustained economic development (SNDP, 2011). Zambia is a low-middle income with a population of 14.6 million (CIA, 2015) and a growth rate of three (3) percent per annum (CSO, 2012) whose increasing population has placed growing pressure on local government structures to scale-up the delivery of basic services for both residents and businesses, hence a sustained commitment to infrastructure development is the main focus. When delivery of public services is constrained or becomes ineffective, it affects the quality of life of the people and the nation's development agenda (Gathungu & Owanda, 2012).

In Zambia, LAs and the Government are implementing a number of infrastructure projects ranging from roads, health facilities (hospitals and clinics), water and sanitation, markets, bus station, and housing. These are aimed at ensuring improved and better service delivery which ultimately will mean better health, education, transportation, accommodation, trading places so on and so forth (SNDP, 2011).

The Zambia Development Agency (ZDA) (2014) agrees that infrastructure service delivery remains a major challenge to growth, economic diversification and human development in Zambia. This statement recognizes the presence of challenges being faced in infrastructure service delivery. Further, basic determinants of better health to citizens, such as access to decent housing, clean water, and sanitation are still in a critical state according to the Zambia Demographic and Health Survey (ZDHS) (2015).
Additionally, most LAs are non-functional and have largely been ineffective and inefficient in meeting their core mandate. The provision of social infrastructure services is a critical factor for economic growth and service delivery but the public sector has traditionally financed and operated infrastructure projects using resources from taxes and various levies which clearly has not been adequate. Currently the technical quantity of infrastructure can easily be tabulated. However, it cannot easily be established whether it is adequate or sustainable for the provision of infrastructure development to the people. Adetola et al (2011) postulates that in many cases, the Government and LAs could be issuing half-measure solutions to challenges faced by the general public mainly due to insufficient financing, poor project and technical specifications, poor practices against generic engineering norms, insufficient planning and budgeting processes as well as monitoring and evaluation processes

The study aimed at determining the extent to which infrastructure assets have been created by evaluating service delivery capabilities to enhance the economy, efficiency and effectiveness in service delivery under the LAs in Eastern Province. One of the outcome of the study is to develop the service delivery framework that addresses the challenges faced by the LAs in order to improve and strengthen

responsibility and accountability through service delivery stakeholder involvement. This study was conducted on both donor and Government funding to finance the implementation of various infrastructure projects in the LA in Eastern Province.

2. Research Methodology

The research adopted a purely qualitative study design and techniques to answer the research questions. The study used Case Studies in selected LAs to examine the elements of the service delivery evaluation. The case studies were crucial in understanding the project quality and quantity delivered such as the physical quality of constructed buildings, roads, bridges and drainage facilities. These quality checks were benchmarked by the architectural and engineering designs, project specifications against best practices obtained in generic civil and building engineering practices. Purposive sampling was used because the study required respondents who were adequately vested with social service provision and had knowledge in the engineering aspect of construction with regard to infrastructure service provision.

In each case study location, a series of in-depth interviews, brain storming questions and use of questionnaire were used as data collection instruments. The number of interviews varied depending on the availability of and presence of key personnel in the respective local authority in form of descriptions. Structured interviews were administered on specific individuals within the fields of procurement, finance, engineering, planning and administration. The information gathered through the interviews and discussions was used to validate the responses and findings of the survey tool. Literature review of published materials in the area of public service delivery and local government was undertaken. This mainly involved desk study that helped in guiding and developing the discussions and survey tools used in the research. Data collected was analysed through critical thinking using qualitative analysis.

It was recognized that the extent to which a single respondent could accurately report on the organisation's ability to handle funded projects taking into consideration the infrastructure project technical knowledge levels may be questioned. The study was designed to invite frank responses and suggestions. Therefore, the outcome of the study is developing the service delivery framework that addresses the challenges faced by the LAs in order to improve and strengthen responsibility and accountability through service delivery stakeholder involvement

3. Findings

The respondents of the LAs included directors of planning, district planning officers, directors of engineering services, directors of works, and directors of finance, council treasurers, procurement officers and directors of administration. A total of 58 employees were considered for this study and only 52 were available for interviews from the 9 LAs in Eastern Province. The response rate was 90% and thus acceptable.

3.1 Infrastructure service provision

During the course of this study, numerous infrastructure projects were underway in all the districts of Eastern Province as shown in table 1.

Table 1: Projects being undertaken in Eastern Province

Name of Council	Project Being Undertaken	Source of Funding
Chipata	Construction of urban roads, CDF projects e.g. community schools, bridges and boreholes, Construction of Chipata District Hospital	Government
Katete	Construction of a dam, Building schools under CDF, Construction of teachers' houses, Drilling of community boreholes	Government/ KfW & UNICEF
Sinda	Establishment of an abattoir, Construction of Civic Center administration block/District administration block, Establishment of police station, Erection of housing units for civil servants, Construction of Sinda Day Secondary School	Government
Petauke	Construction of mothers' shelter at Chikuse, Building of Recreation Hall, CDF projects including feeder roads, boreholes, bridges	Government
Nyimba	Building of a library, Prison ablution block, Rehabilitation of bus station, Establishment of Nyimba District Hospital, Houses for civil servants	Government
Lundazi	10km Urban roads, 3x(27km) feeder roads, Lundazi District Hospital, Lundazi Trades College, Rehabilitation of Mwase Dam	Government
Mambwe	Rehabilitation of council guest house, Construction of houses for civil servants, Rehabilitation of dysfunctional boreholes	Government & KfW
Chadiza	Upgrading of 18 km urban roads, Construction of bridges, Rehabilitation of boreholes	Government
Vubwi	Hospital (Vubwi District Hospital), Post Office, Civic center (administration block), House for District Commissioner, Ablution block for Civic Center	Government

Concerning quality of workmanship on these projects, it was learnt in Chipata district that those projects spearheaded by central government and international cooperating partners tend to be of good quality while those under Community Development Funds (CDF) were generally of poor quality. Katete submitted that the quality of projects was average and echoing that CDF projects were the worst in terms of quality. For Sinda, Katete and Nyimba respectively, the different respondents said, "Good." The findings revealed that the quality on feeder roads and hospital construction in Lundazi was good nonetheless, urban roads were slow and poorly done. Lundazi further submitted that CDF projects were too many yet little money was allocated, for instance, at the time of this study, Lundazi had 269 on-going projects in 3 constituencies but only ZMW4.3m was allocated. In Mambwe, the study learnt that the quality of workmanship was excellent. In Vubwi, it was found out that the undertaken projects were of good quality but that implementation was slow

3.2 Las' Ability to Technically Review Project Documents

The study revealed that councils in Eastern Province had varied capacities to technically review project documents as showed by table 2.

Table 2: **Councils Capacity to Technically Review Project Documents**

Project Document	**Name Of Council And Strength Of Capacity**			
	Very Strong	**Strong**	**Medium**	**Weak**
Tender documents	Petauke, Mambwe	Vubwi, Chadiza, Nyimba, Sinda, Chipata, Lundazi, Katete	-	-
Bid documents	Petauke, Mambwe	Chadiza, Nyimba, Sinda, Chipata, Lundazi, Katete	Vubwi	
Technical designs	Petauke, Chipata	Nyimba, Sinda, Mambwe	Vubwi & Chadiza	Lundazi, Katete
Evaluation Reports	Sinda, Petauke Mambwe & Katete	Chadiza Nyimba, Chipata, Lundazi	Vubwi	
Interim Payments Certificate	Nyimba Sinda, Petauke Chipata, Mambwe, Katete	Vubwi & Chadiza	-	Lundazi
Contractors' claims	Vubwi, Sinda, Chipata, Katete	Nyimba Petauke, Mambwe	Chadiza,	Lundazi
Variation claims	Vubwi, Sinda, Chipata, Katete	Nyimba Petauke, Mambwe	Chadiza,	Lundazi
Extension of time claims	Vubwi, Sinda, Katete	Nyimba, Petauke, Chipata, Mambwe	Chadiza	Lundazi
Instruction from Clients' delay	Vubwi, Mambwe, Katete	Chadiza Petauke, Nyimba, Sinda, Chipata	-	Lundazi
Govt. contract copies	Vubwi, Chadiza, Petauke, Mambwe, Katete	Nyimba, Sinda, Chipata, Lundazi	-	-

3.3 Possession of key project reports

Almost all the councils in Eastern Province were at the time of this study without key project reports in their possession namely Preliminary Design Reports, Detailed Design Reports and As-Built Reports. Only Petauke district council had all the detailed design and some of the preliminary design reports.

3.4 Extent of design changes between reports and actual projects executed

With regard to the extent to which the actual implementation of projects differs from initial plans in design reports in Eastern Province, the study observed significant deviations among the districts as showed by Figure 1. Lundazi District Council submitted extreme major changes while Vubwi maintained no changes between planned and actual projects.

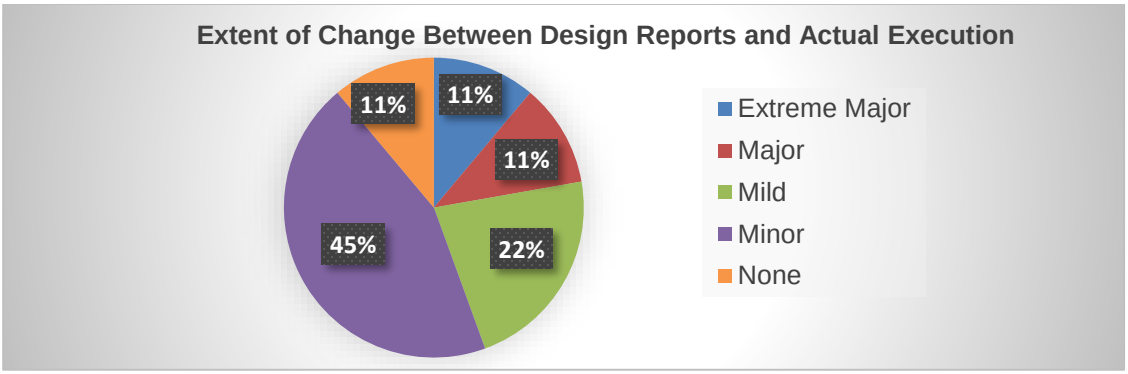

Figure 1: Extent of Design Changes Between Design Reports and Actual Execution Projects

3.5 Major factors influencing project implementation

The study revealed that the districts of Eastern Province are influenced mostly by the financial factor (31%) regards how projects are implemented, followed by the political (25%) and personnel factors (23%). The technical factors (21%) were found to be the least in influencing the implementation of the project.

3.6 Major problems faced by the las in service provision

The study found that there were numerous problems in the provision of services categorised as internal and external. Table 3 summarises these challenges and the effects.

Table 3: Problems Faced by Councils in the Provision of Services

Type of Problem	Description of Problem	General Effects on Service Delivery
Internal	-Lack of capital investment	-Poor access to services
	-Poor work-culture	-Poor Quality of services
	-Inadequate qualified manpower	-Poor Quality of services
	-Poor council management	-Poor Quality of services
External	-Political interference	-Poor access to services
	-Central government interference and bureaucratic delays	-Inequity or marginalisation of some areas
	-Poor attitude by local people towards wellbeing of districts (Collective action)	-Poor Quality of service

3.7 Factors that influence the selection and location of a project

The study revealed that population size of a locality was one of the major factors influencing selection and location of the project. Where there are more people, there is likelihood for a project. Community demand was also found to be a factor for the LA to undertake the project demanded. Other factors include financial resources available for the project and political influence due to imposed projects from central government.

3.8 Challenges in Infrastructure Service Provision

The study findings indicated numerous challenges in Eastern Province inadequate basic infrastructure to facilitate affordable public service delivery such as clean portable water, sewerage reticulation, power supply, garbage collection and disposal. Table 4 indicates the major needs by district as per study findings.

Table 4: Major Community Needs by District

District	Major Community Needs in the District
Chipata	Water and Sanitation Facilities (the district has piped water and sewer network in urban areas only); Roads; Boreholes; Markets and Bus Stations; Land fill; and Library.
Katete	Roads; Water & Sanitation Facilities (only urban areas have access to piped water with only 10% coverage. The district has no sewer network); Hospital; Markets and Bus Stations Infrastructure; Secondary Schools (there are only 2 in the district – Chisale and Katete Day Sec. School).
Sinda	Housing; Roads; Piped Water(the district has no piped water and no sewer network); Burial Sites; Engineered land fill.
Petauke	Water and Sanitation Amenities (only urban areas have access to piped water with only 100% coverage. The district has no sewer network); Health facilities; Primary Schools; Stadium; Garbage Collection; and Fire Services
Nyimba	Township Roads; Sewer ponds and network; Stadium/community hall/library, Street lighting; and Trades school
Lundazi	Water (only urban areas have access to piped water with only 80% coverage. The district has no sewer network); Roads; Housing; Hospital; Garbage collection; Play parks.
Mambwe	Piped Water (only urban areas have access to piped water with only 5% coverage. The district has no sewer network). Most boreholes are yielding salt water; Food Security; Bridge on Msoro Road.
Chadiza	Water and Sanitation Facilities (only urban areas have access to piped water with only 100% coverage. The district has no sewer network); Roads and Bridges; Health Facilities; Sporting Facilities; Markets Infrastructure; Sewer treatment plant/ponds.
Vubwi	Roads; Primary Schools; Bridges; Water –the district has no piped water or sewer network.

From political interference of the higher levels of government to inadequacy of well-trained and qualified personnel are some of the impediments that have been infringing on local government performance and functions in recent times. The study also disclosed that budget formulation process is spearheaded by the Finance and General Purposes Committee of a given council and does not include ordinary people representation for consultation. Lack of revenue or failure to expand the revenue base was found to compromise the final incomes of LAs resulting in inadequate, ineffective and inefficient responses to public demands or needed investments.

3.9 Factors affecting effective infrastructure service delivery

Generally, councils in Eastern Province face numerous problems in the provision of services. These can be categorised as internal and external. Internal problems are those which emanate from within the council while external ones stem from outside the organisation. All nine districts identified lack of capital investment and inadequate qualification of workers as major challenges faced by the Councils. Chipata,

Mambwe, Vubwi, Lundazi and Nyimba identified poor work culture and poor council management as problems in the Councils. Chipata, Lundazi, Katete and Mambwe indicated that Political and central government interference were major challenges in the running of Councils, while all Councils identified poor attitude by the locals towards wellbeing of the districts as a challenge.

3.10 Proposed framework for infrastructure service delivery

One of the outcomes of the study was developing the service delivery framework that addresses the challenges faced by the LAs in order to improve and strengthen responsibility and accountability through service delivery stakeholder involvement. The proposed model suggests involvement of private sector in public infrastructure service delivery to quell over reliance on government funding as indicated in Figure 2. It is important that this model of infrastructure service delivery is transparent to the community and all other stakeholders such as private sector participation.

Private sector involvement allows for the creation of Public-Private-Partnership (PPP) arrangements between public and private sectors on shared objectives for the delivery of public infrastructure and/or public services by the private sector that would otherwise have been provided through public sector financing. The PPP signifies reliance upon the private sector for financing capital investment projects to benefit on revenue streams to be generated by the future facility; and, incorporating the use of private skills, expertise and culture in operating public service projects more efficiently, effectively and sustainably (Cankar & Petkovšek).

Major roles faced by the LA in this framework is to; determine the service needs of the communities; ensure community participation in decision making; securing government funding for infrastructure projects; minimizing the overall cost of delivery;
ensure availability of skills and relevant experienced qualified personnel; and meet different service level target requirements. While crucial objectives of the Central Government is to provide the necessary political will, timely and adequate financing of projects and monitoring performance of LAs for continuous process improvement, besides many others. While cooperating partners: provide technical and financial support; delegate programme implementation to Central and Local Government; support sound governance and leadership systems; support Capacity Building Programmes; develop partnerships with communities and Government; support in designing strategies and policies; and provide Budget Support.

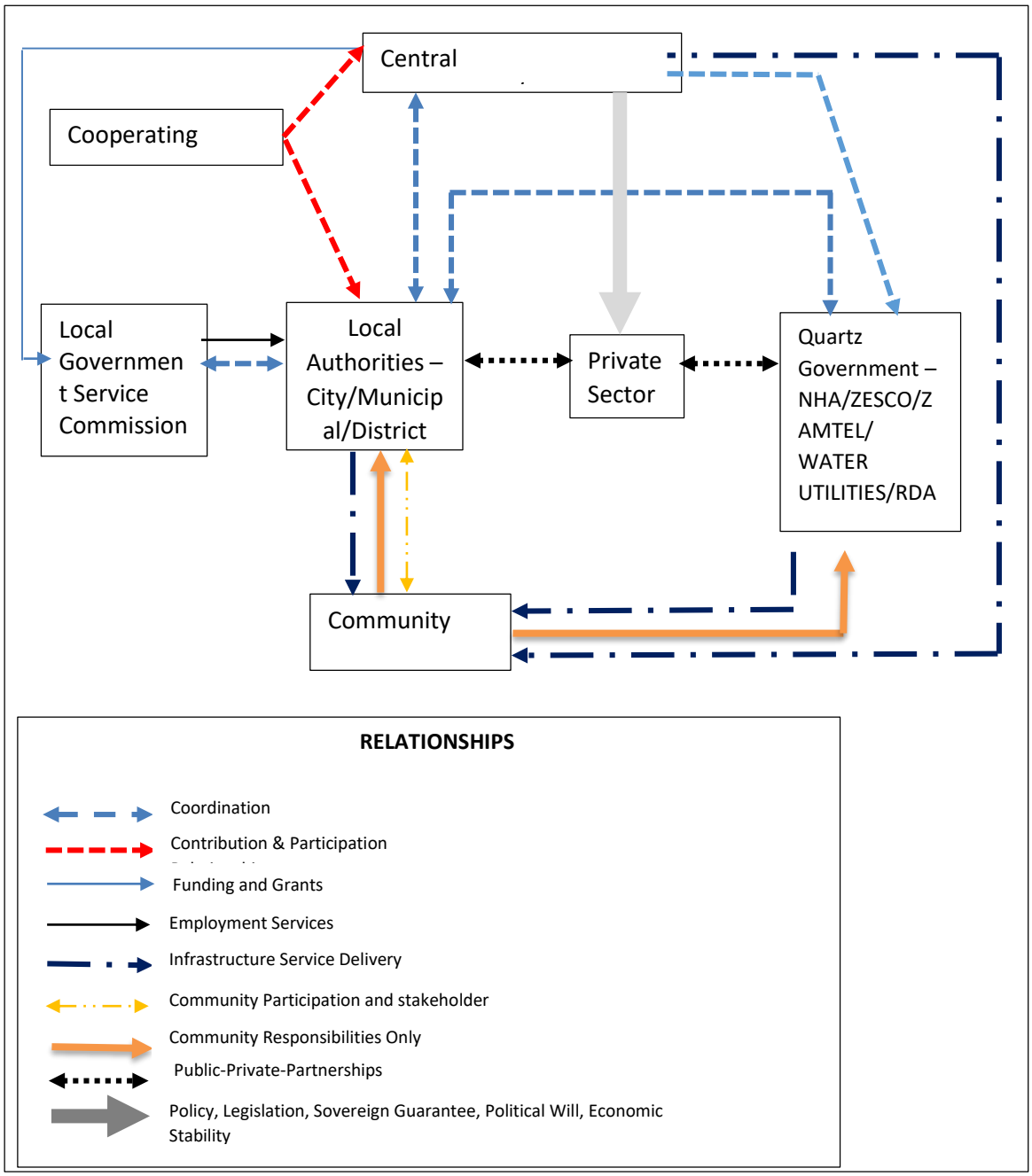

Figure 2: Proposed Relationships that exist in the Developed Service Delivery Framework

4. Discussion

Lack of capital investment was one key internal factor in service delivery. As a general conclusion, public service provision has been and will most probably remain the core issue of the operations in both in rural and urban public service organisations. This view is in fact noted by Chazovachii et al, (2012) who argue that inadequate government grants and poor budget performance contribute to financial constraints that hinder the delivery of services. It is worth emphasising that it is practically impossible for councils in Eastern Province in particular and Zambia in general to perform effectively in view of their weak financial muscle.

There is generally poor work-culture in the councils coupled with delay in the provision of information. Inadequately qualified manpower constitutes another problem. The continual engagement and or involvement of non-professionals in LAs to perform strategic functions does not add any significant value to the system in terms of efficiency and effectiveness (Inyang & Akaegbu, 2014). There is also a need to introduce principles of good governance which should be integrated into the training programs of these individuals (Baron & Ochojski, 2015). Particular issues of Council Administration such as the personnel system, organisation structure and the administrative decision-making procedures were beyond the scope of this study. Effective financial administration is imperative in any local government authority. The ways in which elected and appointed officials ensure that financial respect is maintained, for example, in the keeping of accounts, preparation of financial reports and avoiding dishonest have a direct bearing on a LA's ability and capacity to deliver services.

Central government and political interference and bureaucratic delays; and poor attitude of the local people towards the wellbeing of the city are some of the major exterior difficulties faced in LAs as indicated in the findings. There is a need to comprehend that poor governance of public sector is related to ineffectiveness and inefficiency of service delivery (Mohamad et al, 2014). In many other words, the bottom line of governance is the ability to respond to the needs, aspirations and yearnings of majority of the citizenry. a mandate which calls for relentless dynamic processes which identifies problems, challenges and development of new creative ideas, and the selection and implementation of new solutions (Cankar & Petkovšek, 2013).

The study resolved that at the local level, institutions and participatory development mechanisms are often weak, resulting in poor service delivery. The Second Schedule, Section 61 of the Local Government Act, outlines a total of 63 specific functions which local authorities in Zambia are expected to perform). In practice, however, most if not all the local authorities in Eastern Province, including those in the rest of the country, do not adequately perform these functions. It is worth emphasising that it is practically impossible for councils in Eastern Province in particular and Zambia in general to perform effectively all the devolved functions as stipulated by the Act in view of their weak financial muscle. If they tried, service provision would be marginal, unreliable and dismal, and this actually is the case in the province. Meanwhile, the general public is yearning for accurately and timely administered social services which bear significant and positive effect in their lives.

The findings of the study noted that infrastructure service provision in the province is largely uncoordinated and there is none or inadequate provision of enough funds hence hindering the effective performance by the LAs. While almost all the councils in Eastern Province were found to have a weak revenue base. Other issues noted from the findings of the study are that there was strong tendency to up-hazardly implement projects; and most of the projects did not adhere to tenets of good project management (such as adherence to timeframe, proper budgeting, timely supply of materials to project sites, adequate consultation with the local people who are the ultimate project beneficiaries).

From the foregoing, an infrastructure service delivery framework was proposed to provide for involvement of the private sector in public infrastructure service delivery that is predominantly dependent on central government funding. The framework also highlighted challenges that could be faced by various critical stakeholders in implementing is. The study has proposed the inclusion in the framework of the PPPs to lessen the financing burden the central government is embroiled in thereby permitting room for the central government to concentrate on other areas of governance and leadership.

5. Conclusion and Recommendations

The study objectives were met and based on the findings it can be concluded that problems affecting LAs in Zambia are not only external but that there are internal ones too leading to weak institutional and participatory development mechanisms that results in poor service delivery. It can also be concluded that local services such as the supply of drinking water, waste management and basic health care which have a huge impact on people's daily lives and well-being are not fully provided. Social services such as infrastructure facilities are important so this study concludes that tangibility is both a need and a must in providing quality service.

The paper recommends that for LAs to adequately deliver services to communities, government should consider transferring sufficient funds (intergovernmental transfers) to the councils or let go of some of the sources of revenue which are under the command of central government for the councils to enable them generate enough revenue. The Government of the Republic of Zambia, being the designer of the local government system in the country, must see to it that some of the national revenues are made available LAs through the process of intergovernmental transfer to fill the gap between national and local needs. The study recommends the inclusion in the framework of the PPPs to lessen the financing burden the central government is embroiled in thereby permitting room for the central government to concentrate on other areas of governance and leadership.

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An Empirical Analysis of Transportation Infrastructure Feasibility Study Considerations

Chioma Sylvia Okoro[1], Innocent Musonda[2] and Justus Ngala Agumba[3]

Abstract

Feasibility studies inform decision-making regarding proposed infrastructure investments. However, there is no consensus on the factors that should be incorporated in feasibility studies to ensure that comprehensive and thus reliable decisions are made. This is especially important for transportation infrastructure projects given that they are fraught with a cornucopia of uncertainties and impacts, which threaten its sustainability in the long run. The objective of the current study was therefore to identify critical factors that should be incorporated in feasibility studies. A total of 132 Built Environment professionals responded to a field questionnaire survey. Empirical data were analysed using SPSS to output descriptive scores based on mean, standard deviation, median and interquartile range analyses. Findings revealed that traffic data and infrastructure development master plans were the most sources of data referred to during feasibility studies. The criteria factors considered include user safety, local conditions and physical condition of infrastructure. Further, design and scope requirements, environmental impact assessments and cost-benefit analysis were the most appraisal methods employed in feasibility studies. By identifying the factors that are critical in feasibility studies, more comprehensive feasibility studies will be realised, which will in turn contribute to informed decision-making regarding the worthwhileness of proposed transportation projects.

Keywords: feasibility studies, infrastructure, sustainability, transportation projects

1. Introduction

Transportation infrastructure impacts on the growth of an economy through employment creation and therefore enhances economic development and provision of social services (Chen and Cruz, 2012). Achieving successful and sustainable operations throughout the life span of transport infrastructure should therefore be the focus in transport project planning and development (Glaister *et al.*, 2010). However, transportation infrastructure is fraught with uncertainties, which if not taken cognizance pf at the time of planning, may threaten the sustainability of the projects. According to Merrow (2011) and Mišic and

[1] Lecturer, Finance and Investment Management Department, University of Johannesburg, South Africa, chiomao@uj.ac.za; chiomasokoro@gmail.com
[2]Associate Professor, Construction Management and Quantity Surveying Department, University of Johannesburg, South Africa; imusonda@uj.ac.za
[3]Senior Lecturer, Department of Building Sciences, Tshwane University of Technology, Pretoria, South Africa; agumbajn@tut.ac.za

Radujković (2015), the proportion of mega infrastructure project failure, globally, is as high as 66%, with cost overruns of over 50%, and a significant proportion of these projects fail to meet the objectives for which they were constructed in the first instance. This suggests that the factors considered at the initiation and conception of projects influences its performance during the operational stage. Therefore, if huge discrepancies between expected and actual outcomes occur, the magnitude of inherent risks and uncertainties which materialise at the operational stage is unplanned for, and the result can be a project failure. The quality of feasibility studies therefore appears to be a critical factor to the sustainability of transportation infrastructure projects.

However, although studies had been conducted on the factors which should be considered in feasibility studies to ensure good quality outcomes (Hyari and Kandil, 2009; Nicolaisen *et al.,* 2012; Flyvberg *et al.,* 2014), the relative importance of these factors have not been determined. It is therefore not clear which factors are most critical to the outcome of feasibility studies. Understanding the critical factors will assist in developing a comprehensive feasibility study. The objective of the current study was therefore to establish critical factors that should be considered in feasibility studies.

2. Transportation Infrastructure Feasibility Study Considerations

Feasibility studies include all elements that may impact on a project's performance. These include finance availability and procurement strategies (Glaister *et al.*, 2010), local environment (Rudžianskaitė-Kvaraciejienė *et al.,* 2015), institutional support (Quium, 2014), and users' needs (Erlich, 2015; Mišic and Radujković, 2015). Therefore, good feasibility studies should consider a wide variety of project performance-influencers.

In addition, the people involved may affect feasibility studies and the procedures followed during the feasibility studies. Nicolaisen *et al.* (2012) and Flyvberg *et al.* (2014) indicated that inadequate or incorrect feasibility assessments are the result of delusions (psychological biases) or honest mistakes and deceptions or strategic manipulations of information by the people involved. On their part, Hyari and Kandil (2009) contend that a lack of understanding of the basic underlying processes involved in feasibility studies results in unreliable outcomes. The procedures followed, which require designating time and effort into conducting feasibility studies, are important because errors could be introduced and some critical aspects may be omitted (Rosenthal *et al.,* 2015).

Based on the above discourse, the factors identified were categorised into data used, procedures followed and criteria factors considered. These were used to collect empirical data for further analysis.

3. Methods

A quantitative approach was adopted to conduct the study. A pilot-tested field questionnaire survey was used to collect data regarding factors considered in feasibility studies, on a five-point Likert scale, with responses ranging from 1=strongly disagree to 5=strongly agree. Prior to data collection, ethical clearance was granted by the university authorities. Consent was also obtained from some of the participants' superiors as and where required. The questionnaire was distributed by hand, as well as online via email and google forms. Out of over 400 questionnaires distributed, a total of 132 questionnaires were returned

and used for analysis. The respondents were selected through purposive and snowball sampling techniques. They comprised built environment professionals in the nine provinces of South Africa, who had been involved in transportation infrastructure projects, either at the feasibility stage or during operations or both. Responses were obtained on various types of projects, as projects were the units of analysis.

Data were analysed to output descriptive scores based on mean, standard deviation, median and interquartile range analyses. Preliminary analysis included assessment of missing data, normality and outliers. The results of the analysis are presented in the succeeding section. Cronbach alpha test was also undertaken to check the internal consistency reliability of the scale. The alpha values ranging from 0.72 to 0.93 indicated good internal consistency reliability (Pallant, 2013). Mean inter-item correlations were also reported to further demonstrate internal consistency reliability, with values exceeding 0.20 as recommended by Pallant (2013). The internal consistency reliability results are presented in Table 1.

Table 1: Internal Consistency Reliability Results

Constructs		Cronbach's alpha	Mean inter-item correlations	Number of items
Transportation infrastructure feasibility study (TIFS)	Data used	0.72	0.25	8
	Criteria factors considered	0.93	0.39	21
	Methods used	0.89	0.51	9

4. Findings

Descriptive analysis was used to establish the predominant transportation infrastructure feasibility study elements. The findings included the data used, criteria factors considered and methods adopted for the feasibility studies. The results displayed were the mean (M), standard deviation (SD), median (MD), 25% and 75% quartiles (Q1 and Q3), and interquartile range (IQR) values from the responses on each of the variables.

4.1 Data used

Respondents were asked to indicate the extent to which they agreed or disagreed with statements regarding the data used during the feasibility study of the projects they were involved in. Table 2 showed that participants indicated most agreement (including strong agreements) with *traffic data*, which recorded the highest mean (M=4.13), with SD = 0.826; MD= 4.00 (4.00 – 5.00). The median value (4.00) indicated that 50% of the respondents were in agreement regarding the statement. The SD values were less than 1, indicating that the responses were closer to the mean. The interquartile range values of between 4.00 and 5.00 (IQR of 1) also supported that responses were not far from the median. These values seemed to suggest that the respondents had similar opinions regarding the statement that traffic data were used in the feasibility studies for the projects.

Infrastructure development master plans followed with M=4.04; SD=0.801; and MD = 4.00 (4.00 – 5.00). Similarly, the SD values less than 1 indicated unified opinions from respondents. The IQR of 1 indicated that the respondents were in agreement regarding the statement as the answers were mostly concentrated around the median.

On the other hand, *international projects as examples* (M=3.34; SD=1.197; MD=3.00 (2.00 – 4.00) and *household income survey data* (M=2.82; SD=1.195; MD=3.00 (2.00 – 4.00) ranked the least among the statements, suggesting that participants indicated most disagreements with these statements. Both the SD and MD values also indicated that the respondents tended to disagree on a wider range, with an IQR of 2 respectively.

Table 2: Findings on planning data used

Factor	Measures	Mean	SD	Median	Q1	Q3	IQR
Planning data	Traffic data	4.13	0.826	4.00	4.00	5.00	1.00
	Infrastructure development master plans	4.04	0.801	4.00	4.00	5.00	1.00
	Existing design and structural reports, for upgrade projects	3.98	0.818	4.00	4.00	5.00	1.00
	Audit observations and performance reports, for upgrade projects	3.82	0.840	4.00	3.00	4.00	1.00
	Existing financial and tender records	3.68	0.863	4.00	3.00	4.00	1.00
	Public records and manufacturers	3.67	0.905	4.00	3.00	4.00	1.00
	International projects as examples	3.34	1.197	3.00	2.00	4.00	2.00
	Household income survey data	2.82	1.195	3.00	2.00	4.00	2.00

4.2 Feasibility criteria factors

Respondents were asked to indicate the extent to which they agreed or disagreed with statements regarding factors on which assessments were based (criteria) during the feasibility studies. Table 3 indicated that respondents were in agreement with statements regarding *user safety, local conditions, condition of infrastructure, speed and travel time, stakeholders' interests and needs, land use integration, structural capacity of existing infrastructure, for upgrade projects, convenience to users, and management capacity.* These statements had mean scores of 4.00 and above, indicating that responses were mostly on the "agree" category. Further, all the median values for the above statements were also 4.0 indicating that 50% of the respondents were agreed to the statements. Al the IQR values for these nine statements also indicated that the respondents had similar opinions as the answers were within the range of agree (Q1=4.00) to strongly agree (Q3=5.00).

Table 3: Findings on feasibility criteria factors

Factor	Measures	Mean	SD	Median	Q1	Q3	IQR
Feasibility criteria factors	User safety	4.24	0.926	4	4	5	1
	Local conditions	4.15	0.805	4	4	5	1
	Condition of existing infrastructure, for upgrade projects	4.09	0.890	4	4	5	1
	Speed and travel time	4.08	0.913	4	4	5	1
	Stakeholders' interests and needs	4.08	0.768	4	4	5	1
	Land use integration	4.03	0.941	4	4	5	1
	Structural capacity of existing infrastructure, for upgrade projects	4.02	0.877	4	3	5	2
	Convenience to users	4.01	0.878	4	4	5	1
	Management capacity	4.00	0.865	4	4	5	1
	Central Government's support of the project from start to finish	3.98	0.935	4	4	5	1
	Life cycle cost of the system	3.97	0.980	4	3	5	2
	Accessibility to all, including the disabled	3.95	0.864	4	3	5	2
	User comfort during travel	3.92	0.978	4	3	5	2
	Sources of project finance	3.88	0.996	4	3	5	2
	Preservation of cultural heritage	3.85	0.912	4	3	4.75	1.75
	Proximity to user daily needs	3.82	0.998	4	3	4	1
	Travel costs for commuters	3.77	1.138	4	3	5	2
	Existing businesses/vendors	3.77	1.081	4	3	5	2
	Competing transportation modes within the locality	3.54	1.125	4	3	4	1
	Financial self-sustenance of the system	3.48	1.176	4	3	4	1
	Financial input from private investors	3.15	1.308	3	2	4	2

4.3 Investment appraisal methods used

Table 4 presents findings with regard to the methods used in feasibility studies. Respondents were asked to indicate the extent to which they agreed or disagreed with the statements. The table evinced that methods used mostly entailed design and scope requirements (M=4.21; SD=0.691; MD=4 (4 - 5), environmental impact assessments (M=4.15; SD=0.842; MD=4 (4 - 5), as well as cost and benefits analysis (M=4.13; SD=0.795; MD=4 (4 - 5). The least used methods or approaches appeared to be *financing alternatives relative to costs (financial)* (M=3.61; SD=1.068; MD=4 (3 – 4) and *rate of return on investment* (M=3.42; SD=1.185; MD=3 (3 – 4). The median value of 3 for the *rate of return on*

investment statement indicated that responses were mostly concentrated on the "neutral" category, and the IQR value of 1 suggested common views among the respondents.

Table 4: Findings on investment appraisal methods used

Factor	Measures	Mean	SD	Median	Q1	Q3	IQR
Investment appraisal methods	Design and scope requirements	4.21	0.691	4	4	5	1
	An environmental impact assessment	4.15	0.842	4	4	5	1
	Costs and benefits analysis	4.13	0.795	4	4	5	1
	Site/location characteristics	4.11	0.774	4	4	5	1
	Best scenario outcome	4.02	0.804	4	4	5	1
	Traffic growth analysis	4.01	0.887	4	4	5	1
	Multi-criteria analysis	3.84	0.907	4	3	5	2
	Financing alternatives relative to costs (financial)	3.61	1.068	4	3	4	1
	Rate of return on investment	3.42	1.185	3	3	4	1

5. Discussion

Findings from the descriptive analysis revealed that available planning data used in the feasibility studies of the sampled projects were mostly traffic counts, infrastructure master plans and international projects for benchmarking. Traffic data obtained from counts and surveys reflect the frequency and distribution, which are the bases of forecasts and determination of infrastructure size (Beria, 2007; Serero *et al.*, 2015). Further, reference to infrastructure master plans was considered important for a comprehensive feasibility study. This is because integration of proposed networks with existing ones will be possible as was the case with the Addis Ababa light rail transit in Ethiopia (Nallet, 2018). However, household income survey data was not considered important. This was not consistent with an extant view that feasibility studies should reflect income earning opportunities and ability to pay the set travel charges (World Bank, 2005; Maunganidze and Del Mistro, 2012; Nallet, 2018).

With regard to feasibility study criteria factors considered on the sampled projects, the descriptive analyses indicated that safety, local conditions, existing infrastructure condition (for upgrade projects), as well as speed and travel time were considered the most prevalent factors. Due to the wide array of impacts that may materialise from transportation infrastructure projects, feasibility studies should unambiguously account for and accurately incorporate local conditions and environment, stakeholder interests as well as related factors including traffic fatality rates, value of personal time and safety benefits to users, which manifest either as infrastructure and user costs (Schutte and Brits, 2012). On the other hand, financial aspects were deemed to be the least important aspects. This finding was surprising since sufficient financial leverage is needed to implement investments with higher returns and benefits (Crescenzi *et al.*, 2016).

Further, the descriptive analyses revealed that the methods considered in a comprehensive feasibility study entail design and scope requirements, environmental impact assessment and cost-benefit analysis as well as site and locational characteristics (Beria, 2007; Cervero, 2011; Jones *et al.*, 2014). Conversely, the *rate of return on investment* and *the financial alternatives relative to costs* were not considered

important appraisal methods among the respondents. These findings may have resulted because some projects (public and government funded) are provided for the benefit of the community. However, these appraisal approaches are needed to evaluate projects and make decisions on more acceptable and beneficial investments for financial and economic status as was the case with the feasibility study of Metro Rail projects in Madurai in India (Subash *et al.*, 2013).

6. Conclusion

Empirical data were analysed using SPSS to output descriptive scores based on mean, standard deviation, median and interquartile range. The study found that traffic data and infrastructure development master plans were the most sources of data referred to. The criteria factors considered include user safety, local conditions and physical condition of infrastructure. Further, design and scope requirements, environmental impact assessment, and cost-benefit analysis were the most appraisal methods employed in feasibility studies.

Further studies are recommended with more robust analytical techniques to validate or refute these findings. Nevertheless, by identifying the factors that are critical in feasibility studies, more comprehensive feasibility studies will be undertaken and delivered in order to make more reliable decisions of proposed transportation infrastructure projects.

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Adoption level of FAO's Valuation Guidelines in Nigeria

Israel Okechukwu Ogbonna[1] and Godfrey Okon Udo[2]

Abstract

In 2012, world governments, international NGOs, civil societies and private companies endorsed the Food and Agriculture Organisation's Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests (VGRGTLFF) in the Context of National Food Security. What this recommendation of VGRGTLFF entails is that, for every compensation valuation for land rights, the basis of valuation should be Total Economic Value while the applicable methods of valuation should be non-market valuation approaches such as contingent method, travel cost, benefit transfer, and choice modelling. Though adoption of the guidelines is voluntary, nations that adopt them put themselves in higher pedestal as responsible members of the world community. How far valuation international best practices recommended in VGRGTLFF are observed in individual countries of the world therefore becomes a pertinent question that needs to be asked and answered. This work, through cross-sectional research type of design, content analysis and document review, sought to ask and answer such a question for Nigeria. Using simple percentages and t-test, the work analysed structured questionnaires administered on practising valuers in Nigeria as well as owners of environmental goods whose land rights were compulsorily acquired by government. The finding was that in land rights acquisition compensation valuation within Nigeria, there is low adoption of the Guidelines in the area of inclusion of social, cultural, religious, spiritual and environmental values. Nigerian Valuers were found unresponsive in the adoption of Total Economic Value as the basis of valuation as well as slow in the use of applicable non-market valuation approaches such as contingent method, travel cost and benefit transfer. Unless this level of valuation practice is changed to the international standard stipulated in VGRGTLFF, restiveness associated with land rights compensation for infrastructure projects in parts of Nigeria, will continue.

1. Introduction

In 2012, world governments, international NGOs, civil societies, and private companies endorsed the Food and Agriculture Organization's Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests (VGRGTLFF) in the Context of National Food Security (Food and Agriculture Organization of the United Nations, 2012). According to Article 18 of VGRGTLFF, nation-states, among others, should ensure that valuation systems include non-market valuation to capture social, cultural, religious, spiritual and environmental values, where applicable. Though adoption of the Guidelines is voluntary, nations that adopt them put themselves in higher pedestal as responsible members of the world community. Furthermore, specific benefits accruable from adherence to international

[1&2] Department of Estate Management, University of Uyo, Nigeria, godfreyudo@uniuyo.edu.ng; okeyogbonna2@yahoo.com

valuation standards are reaped globally. It is in this regard that nations must be monitored to see how far they are complying with the recommendations of VGRGTLFF and this work is set to do so for Nigeria, by considering an aspect, namely, the level Nigerian valuation system includes non-market valuation which captures social, cultural, religious, spiritual and environmental values.

From technical point of view, what the recommendations of VGRGTLFF on inclusion of non-market valuation that captures social, cultural, religious, spiritual and environmental values, entails is that for every compensation valuation for land rights, the basis of valuation should be Total Economic Value while the applicable methods of valuation should be non-market valuation approaches such as contingent method, travel cost, benefit transfer, etc. Therefore, to assess how far Nigeria is implementing VGRGTLFF recommendations on this aspect, the questions should be: To what extent are Nigerian Valuers adopting Total Economic Value as the basis of valuation and to what extent are Nigerian Valuers using non-market valuation approaches such as contingent method, travel cost and benefit transfer. The answer to these questions are captured in the Objective of this study which is to determine the extent to which VGRGTLFF best practices of Compensation Valuation are adopted in Nigerian Valuation practice.

2. Literature Review

Valuation of environmental assets in the form of crops, trees as well as aquatic/fishing rights and infrastructure are recognised in Nigerian law. Section 29 (4c) of the Land Use Act, Cap 202 LFN 1990 of Nigeria, provides that where a right of occupancy over any portion of land is revoked for overriding public interest, compensation would be paid for crops on land apart from any building, installations or improvement thereon, for an amount equal to the value as prescribed and determined by "the appropriate officer" - "the appropriate officer" is defined in Section 50 (1) to mean the Chief Lands Officer of a State and in the case of the Federal Capital Territory, means the Chief Federal Lands officer. As crops are only a part of biodiversity (ecosystem) on land, the import is that when government revokes right of occupancy of the private owner, the only environmental assets - out of the entire biodiversity on the land - which should be valued for purpose of compensation are crops and the implication of this Nigerian practice is that Total Economic Value is not adopted as the basis of valuation. The restriction in the scope of biodiversity to be valued in Nigeria however, appears to be relaxed a bit for compulsory acquisitions of land for minerals and mineral oils as there is provision for payment of compensation for, not only crops, but also for "profitable trees".

Non-tangible environmental assets are also not compensated for in Nigeria, except in the area of compensation for damages resulting from oil pollution - see The Oil Pipelines Act 1956 as modified by the 1965 Act as well as The Petroleum Decree, 1969. The methods of assessing this aspect of compensation are however, another problem, as presently, contemporary environmental valuation methods such as contingency method, travel cost method, benefit transfer, and so forth, which have the advantage of ability to capture non-use (passive) values, are not yet entrenched in Nigeria (Otegbulu, 2013; Akujuru, 2014).

3. Research Method

3.1 Research design

This work adopted the survey method. Questionnaires were administered in Nigeria on practising Valuers as well as owners of environmental goods whose land rights were compulsorily acquired by government. The data obtained were analysed using simple percentages and t-test. However, as the best study design usually adopts more than one research method, this study also included content analysis and document review.

3.2 Units of data

The Primary Data Units and their bases of measurement are shown in Table 1.

Table 1: Data Units and their Bases of Measurement – To examine the extent to which VGRGTLFF practices are observed in Nigerian environmental valuation practice

Data Unit	Basis of Measurement
Adoption of TEV as Basis of valuation	No. of Nigerian practising valuers that have used TEV as basis of valuation in their compensation valuation assignments
	No. of owners of land rights that their assets were valued using TEV as basis of valuation
Adoption of non-market methods of valuation	No. of valuation reports that used TEV as basis of valuation
	Provisions of the Land Use Act on basis of valuation
	No. of Nigerian practising valuers that have used non-market methods of valuation in their compensation valuation practice
	No. of owners of environmental goods that their assets were valued with non-market methods of Valuation
	No. of valuation reports in which non-market methods of valuation were used
	Provisions of the Land Use Act on methods of compensation valuation

Source: Compiled by the Researchers (2017)

3.3 Research population and sampling design

Three clusters of population were identified and used:

a. Owners of farmlands and forests whose goods have at one time or the other been valued
b. Owners of assets in oil spill damage assessment
c. Practising Valuers in Nigeria

Regarding Owners of farmlands/forests in ordinary Government revocation of occupancy as well as Owners of environmental goods in oil spill damage, this work has limited the survey to one of the Niger Delta States out of ten (Abia, Akwa-lbom, Bayelsa, Cross River, Delta, Edo, Imo, Ondo and Rivers). Rivers State was selected for the research because the Ogoni UNEP Report has made the State the most notorious for environmental degradation among the Niger Delta States of Nigeria and hence a ready choice for environmental studies among the States in the region. For owners of farmlands/forests, respondents (Population) got by reference to practising valuers, were 1,293 claimants and a sample of 306 (23.67% of population) was chosen. Regarding Owners of environmental assets in oil spill damage assessments, the population consists of Rivers State claimants for damages that resulted from May 1, 2010 rupture of Exxon Mobil pipeline in Akwa Ibom State which spilled more than a million gallons into the Niger Delta region States. Respondents (Population) got for this cluster, also by reference to practising valuers, were 1,448 claimants and a sample of 314 (21.69% of population) was chosen.

For Practising Valuers, the Population (846) is the total number of Valuation firms operating their Head Offices in parts of the country as per the 2017 Directory of the Nigerian Institution of Estate Surveyors and Valuers (NIESV). A sample of 272 (32.15% of population) was chosen out of this. To ensure that firms from all parts of Nigeria are given equal chance of participating in the Survey, the sample 272 firms were distributed among the six geo-political zones of the country based on the proportion of each zone's number of firms in relation to the total population of firms throughout the country. South South – 135, South East – 75, South West – 405, North Central – 169, North East – 7, and North West – 54.

A large proportion of the respondent firms of Valuation Practitioners are from South West Nigeria. This is accounted for by the fact that one of the cities of the region, Lagos, was at one time the capital city of the country and home to Head Offices of the 846 firms of Valuation Practitioners in Nigeria. The relative high number representing the South-South is attributable to locating at the centre of the lucrative Oil producing City of Port Harcourt, Rivers State. The relative high number from North Central is accounted for by Abuja (the Federal Capital Territory) which also hosts a relatively high number of Head Offices of Nigerian Valuation Firms.

The respondents responded at different rates. Out of the 306 Owners of Environmental goods (Farmlands/Forests) sampled, 215 (70.26% of the Sample) responded while out of the 314 Owners of Environmental goods (Assets in Oil Spill Damages) sampled, 196 (62.42% of the Sample) responded. For Practising Valuers, out of the 272 sample, 177 (65.07% of the Sample) responded. We consider these response rates as good enough considering the high level of difficulty in tracking down such busy respondents for questionnaire administration.

3.4 Research variables

The research variables of this work are (1) Adoption of TEV as Basis of Valuation and (2) Adoption of non-market valuation methods of valuation. Their sources are Analysis of Questionnaire on Nigerian Practising Valuers; Analysis of Questionnaire on Owners of Environmental goods; Content Analysis of some Valuation Reports; as well as a Review of the Provisions of the Land Use Act on Compensation Valuation.

3.5 Techniques of data analysis

Field data were analysed with simple percentages and t-test. Furthermore, Content analysis of some Valuation Reports and document review were used to validate the research hypothesis.

4. Results

All 196 of the respondents used Market Value as the Basis of valuation while none adopted the internationally-recommended Total Economic Value. On the method of valuation adopted, 80 (40.8%) used Direct comparison market-based method; 196 (100%) used Depreciated replacement cost market-based method; 196 (100%) used Investment market-based method. No respondent adopted any of the following methods: Contingent non-market-based method, Choice modelling non-market-based method, Travel cost non-market-based method, Benefit transfer non-market-based method and Land Use Act Stipulations.

A Content analysis of some Oil Spill Valuation Reports for nine communities in Rivers State of Nigeria also showed that Market Value was the basis of valuation and the method of valuation adopted were Market-based methods. These are indications that Nigerian Environmental Valuation practice is low in adoption of VGRGTLFF best practices.

For Farmlands/Forests valued for general compensation purpose, there was no need asking the owners about the Basis and Method of Valuation adopted as most of them may not have the information, given that they are not usually given copies of the Valuation Reports by the government-appointed Valuers. However, as the valuations are statutory valuations which are usually carried out based on the stipulations of the Land Use Act, the researchers only had to analyse the said stipulations to come up with the Basis and Methods adopted.

The stipulations are in Ss.29 and 50 of the Act which recognizes crops and improvements in terms of plantations of long-lived crops or trees as the only environmental assets that can be valued for and compensated for in revocations of rights of occupancy. By the Act, only a part of biodiversity on the land (the variety of all forms of life on Earth, comprising plants, animals and microorganisms, their genes and their habitats) are taken into cognizance when government revokes right of occupancy. This means that Total Economic Value Basis of Valuation is not adopted in the valuation for general compensation purpose in Nigeria.

Also, the Act stipulates in S.29(3) that the Method of Valuation and value for the recognized items are as prescribed and determined by the "Appropriate Officer" – the "Appropriate Officer" is defined in S.50 to mean the Chief Lands Officer of the State in question and for the Federal Capital Territory, the Federal Chief Lands Officer. One should think that in order to satisfy the Claimants, the various Appropriate Officers will be adopting VGRGTLFF standard basis (Total Economic Value) and non-market methods of valuation such as Contingent method, Choice Modelling method, Travel Cost method and Benefit Transfer method which usually throw up values that are in tandem with the actual value of losses sustained by claimants. Consequently, the researchers feel that a way to know whether the said VGRGTLFF standard basis and methods of valuation are being adopted in compensation valuation of goods in ordinary government revocation of occupancy on land in Nigeria is to test how satisfied the Claimants are with compensation values computed and paid to them. To this end, question was posed to the Claimants on their satisfaction level with the outcomes of the valuation of their assets. All the 215 responses from

owners of goods (farmlands/forests) in ordinary government revocation of rights of occupancy claimed that their properties were highly under-valued.

By this, one can infer that the valuations are not normally based on the VGRGTLFF Total Economic Value basis of valuation and that non-market methods (Contingent method, Choice modelling method, Travel cost method and Benefit transfer method) are not yet being adopted by Valuers in Nigeria. The frequency of their carrying out valuation adopting VGRGTLFF-recognized basis and methods of valuation in their assignments indicates that a very high proportion (95.5%) of the Valuers never carried out valuation, adopting the VGRGTLFF-recognized Total Economic Value (TEV) as basis of valuation. None of the Valuers has adopted the VGRGTLFF-recognized non-market valuation methods (Contingent, Travel Cost, Choice Modelling, Benefit Transfer and Hedonic Pricing) *Always, Very Often* and *Sometimes.* These indications of low adoption of VGRGTLFF best practices in Nigerian environmental valuation practice have satisfied the Objective which is to determine the extent to which VGRGTLFF best practices are adopted in Nigerian Compensation Valuation practice. We also sought to confirm if the adoption level of VGRGTLFF best practices in Nigerian Compensation Valuation practice was low through the one sample t-test and the result is shown in Table 3.

Table 3: One-Sample T-Test

	Test Value = 5					
	t	**df**	**Sig. (2-tailed)**	**Mean Difference**	**95% Confidence Interval of the Difference**	
					Lower	**Upper**
L1	1.077	14	0.300	11.73333	-11.6405	35.1072
L2	0.533	14	0.602	2.06667	-6.2518	10.3852
L3	1.025	14	0.323	4.13333	-4.5141	12.7808
L4	1.691	14	0.113	5.06667	-1.3591	11.4924
L5	8.142	14	0.000	129.00000	95.0183	162.9817

Source: Researchers' Statistical Analysis

For this analysis, the following were used: L1- Always adopted; L2 - Very often adopted; L3 - Sometimes adopted; L4 - Rarely adopted; L5 - Never adopted.

The results reveal that the t-statistic was (L1 = t 1.077; p = 0.300); (L2 = t.533; p = 0.602); (L3 = t1.025; p = 0.323); (L4 = 1.691; p = 0.113) and (L5 = t8.142; p= 0.000). The values indicate that four of the t-statistics (L1 – L4) were insignificant. Only L5 was significant at t =8.142; p=0.000 at 95% confidence interval. Based on these results, we confirmed that there was low level adoption of VGRGTLFF best practices in Nigerian Compensation Valuation practice.

5. Discussion of Results

The conclusion of this study is that the internationally-recognized basis of valuation, namely, Total Economic Value, is not being adopted in Nigeria. This finding corroborates Otegbulu and Koleoso (2009) and Otegbulu (2013) who advocated adoption of Total Economic Value as a panacea to environmental resource valuation and related conflicts in Nigeria. It also agrees with Ukabam (2015) who recommended Environmental Valuation for equitable valuation of real estate damages arising from contamination from mineral and hydrocarbon exploitation, landfills and cellphone towers. As regards methods of valuation,

this work found that the Direct comparison method, Depreciated replacement cost method and Investment method are still the preponderant methods of valuation in Nigeria.

The implication of these findings on basis and methods of Environmental Valuation in Nigeria is that for government land acquisition compensation, the valuation system in Nigeria is not yet capturing social, cultural, religious, spiritual and environmental values in line with the 2012 recommendations of Food and Agriculture Organization's Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests (VGRGTLFF) in the Context of National Food Security. So long as this situation persists, a major hindrance to infrastructure provision in Nigeria, namely, restiveness associated with land rights, will continue.

6. Conclusion and Recommendations

This work has found the adoption of VGRGTLFF in Nigeria's land acquisition compensation valuation practice to be low in terms of non-adoption of Total Economic Value as Basis of Valuation as well as low use of the internationally-recognized contemporary methods of Environmental Valuation such as contingent, travel cost, choice modelling, benefit transfer and hedonic pricing. The persistence of this situation is with great consequences to the country and the Nigerian environmental valuation professionals. Therefore, solution ought to be found to reverse the situation. We recommend training of Nigerian practising valuers on VGRGTLFF valuation standards through Continuing Professional Development (CPD) Programmes as well as curriculum review for inclusion of VGRGTLFF valuation standards in the various Nigerian Valuation Schools.

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Africa 4.0 as a Perspective Scenario for Neo-Industrialisation in the 21st Century: Global Competitiveness and Sustainable Development

Elena Popkova[1], Lubinda Haabazoka[2] and Yulia Ragulina[3]

Abstract

The article reports the perspectives of involvement of African countries in the global Fourth industrial revolution based on breakthrough technologies of Industry 4.0. The methods of imitation modeling, trend analysis, regression, correlation analysis, variation analysis, and scenario analysis were used for determining the future scenarios of development of African countries for periods of up to 2030. The sources of statistical data for the research included secondary data from the IMF and the World Bank. It is substantiated that the most perspective scenario is neo-industrialisation, which has been conducted in recent years by the most progressive countries of the European, American, and Asia-Pacific regions of the world. This scenario will ensure global competitiveness and sustainable development of African countries in the long-term. As a result, the authors develop a conceptual model of Africa 4.0 and offer the algorithm of neo-industrialization of African countries based on breakthrough technologies of Industry 4.0. The article opens a wide field for further scientific research, which should be devoted to adapting the conceptual model of Africa 4.0 to the national specifics of certain African countries for maximisation of effectiveness of its practical application.

Keywords: Africa 4.0, breakthrough technologies, Fourth industrial revolution, neo-industrialisation.

1. Introduction

Modern Africa entered a new age of globalization, in which its integration into the global economic system as a perspective participant that seeks its own interests and possesses the unique opportunities for growth and development takes place. The most important priorities in this process are increase of global competitiveness and provision of sustainable development. Globalization of modern Africa takes place against the background of the Fourth industrial revolution, which covered most countries of the world.

According to the latest (as a result of 2018) rating of global digital competitiveness ("World Digital Competitiveness Ranking"), the African region remains untouched by the Fourth industrial revolution. The only country of the region that is present in the rating is South Africa - 49th position among 63 countries,

[1]President, Institute of Scientific Communications, Volgograd, Russia
[2]Director, University of Zambia Graduate School of Business, Zambia; lhabazoka@yahoo.com;
[3]Head of compliance and controlling Department, Center of Management of the Department of Industry of Economics, RUDN University, Moscow, Russia

with 56.876 points out of 100 (IMD, 2019). In the course of globalization, countries of Africa won't be able to remain aside from the global tendency. The current scientific and practical problem of the modern economics is selecting the optimal method of Africa's accession to the Fourth industrial revolution.

The most progressive countries of the European, American, and Asia-Pacific regions of the world (firstly, countries of the OECD – Germany, the USA, and Japan) have been implementing the model of neo-industrialization in recent years (2012-2018). This envisages transition to Industry 4.0, connected to ubiquitous dissemination of the breakthrough technologies of the Fourth technological mode. It is expected that they will be able to start production of hi-tech products in all spheres of economy and develop and use it as a growth pole (a source of acceleration of economic growth).

At the same time, a lot of developing countries (e.g., BRICS) have more restrained models of participation in the Fourth industrial revolution, which envisage digital modernization of economy. Within this model, the breakthrough technologies (e.g., AI and the Internet of Thins), which belong to the Fourth technological mode, are implemented in certain – hi-tech – spheres that are unified into Industry 4.0. Digital modernization of other spheres envisages implementation of technologies of the Third technological mode (e.g., cloud technologies, RFID-technologies, and broadband Internet).

Thus, implementation of the models of participation in the Fourth industrial revolution is inadmissible, as instead of growth of global competitiveness and provision of its sustainable development it may lead to opposite results – depletion of national resources with impossibility of development of effective production of hi-tech products, absence of sale in domestic market, and crisis of overproduction. Countries of Africa have to develop their own model, which take into account the current needs and specific features of the economy. The purpose of this paper is to study the perspectives of involvement of African countries in the global Fourth industrial revolution based on breakthrough technologies of Industry 4.0.

2. Materials and Methods

The perspectives of development of African countries in the modern economic conditions for provision of their global competitiveness and sustainable development are discussed in multiple works of the modern authors: Batuo et al. (2018), Efremenko et al. (2017), Ndaguba and Hanyane (2019), Tiruneh et al. (2017), and Wamboye and Sergi (2019). The conceptual foundations and practical experience of various countries in the sphere of implementing the breakthrough technologies of Industry 4.0 are studied in detail in the works Bogoviz (2019), Popkova (2019), Popkova and Sergi (2019), Popkova et al., (2019), and Rajput and Singh (2019).

At the same time, it should be noted that the objects of the research in these works are primarily countries of the European, American, and Asia-Pacific regions of the world. The issues of participation of African countries in the Fourth industrial revolution are poorly studied in the existing publications and remain unsolved.

In this paper, the authors use the methods of imitation modeling, trend, regression, and correlation analysis, variation analysis, and scenario analysis for determining the future scenarios of development of African countries until 2030. The selection of data includes information for all countries of Africa. The analyzed indicators are as follows:

- global competitiveness index (the World Economic Forum);
- sustainable development index (the International Institute for Sustainable Development);
- growth rate of GDP in constant prices according to the IMF;
- GDP per capita according to the IMF;
- total volume of investments according to the IMF;
- innovations index according to the WIPO;
- sectorial structure of gross added value according to the World Bank.

All indicators are analyzed based on the 2018 data; certain indicators (with available information) are analyzed based on the data of their dynamics for 2000-2022 (the data for 2019-2022 are forecasted data). The initial statistical data are given in Tables 1 and 2.

Table 1: Indicators of socio-economic development of African countries in 2018.

Country	Global competitiveness index, 1-7	Sustainable development index, points 1-100	Growth rate of GDP in constant prices, %	GDP per capita, USD	Total volume of investments, % GDP	Innovations index, points 1-100
	y_1	y_2	x_1	x_2	x_3	x_4
Angola	n/a	49.6	1.528	4,627.096	7.308	n/a
Benin	n/a	49.0	6.032	813.496	27.354	n/a
Botswana	4.30	n/a	4.188	7,543.525	31.863	n/a
Burkina Faso	n/a	50.9	6.339	681.47	17.654	18.95
Burundi	3.21	49.8	n/a	n/a	n/a	n/a
Cabo Verde	3.76	n/a	n/a	n/a	n/a	n/a
Cameroon	3.65	55.8	4.297	1,250.993	20.578	n/a
Central African Republic		37.7	5.03	439.516	17.894	n/a
Chad	2.99	42.8	2.418	802.156	20.872	n/a
Democratic Republic of the Congo	3.27	43.4	3.451	473.991	13.076	n/a
Republic of Congo	n/a	52.4	8.826	1,980.551	18.724	n/a
Cote d'Ivoire	n/a	55.2	n/a	n/a	n.a	19.96
Equatorial Guinea	n/a	n/a	-5.098	13,258.96	42.724	n/a
Eritrea	n/a	n/a	3.646	988.471	6.672	n/a
Eswatini	n/a	n/a	n/a	n/a	n/a	n/a
Ethiopia	n/a	53.2	7.51	889.181	35.274	n/a
Gabon	n/a	n/a	2.661	7,559.919	36.495	n/a
Gambia	3.61	51.6	3.497	503.361	16.537	n/a
Ghana	3.72	n/a	9.164	1,617.693	25.738	24.52
Guinea	3.47	52.1	4.896	553.961	17.02	20.71
Guinea-Bissau	n/a	n/a	5	711.75	12.361	n/a

Kenya	3.98	56.8	5.753	1,681.247	19.916	31.07
Lesotho	3.20	51.5	2.359	1,308.384	15.342	n/a
Liberia	n/a	48.3	5.345	508.919	n/a	n/a
Madagascar	3.40	45.6	4.814	418.647	18.169	24.75
Malawi	n/a	50.0	5	338.202	12.147	n/a
Mali	n/a	n/a	4.73	848.597	19.451	n/a
Mauritius	n/a	64.5	4.014	10,054.75	22.562	n/a
Mozambique	2.89	50.7	5.5	406.191	70.736	23.06
Namibia	3.99	n/a	4.846	5,355.723	23.426	28.03
Niger	n/a	n/a	5.528	426.473	43.003	20.57
Nigeria	3.30	47.5	1.893	2,434.924	12.807	22.37
Rwanda	4.35	56.1	6.8	776.223	24.752	26.54
Sao Tome and Principe	n/a	n/a	5.5	1,743.059	28.028	n/a
Senegal	n/a	57.2	7.005	1,027.718	26.962	33.19
Seychelles	3.80	n/a	3.407	16,332.05	33.495	n/a
Sierra Leone	3.20	49.1	6.633	668.833	18.79	n/a
South Africa	4.32	n/a	1.569	5,662.045	19.271	35.13
South Sudan	n/a	49.6	-1.085	342.02	17.701	n/a
Tanzania	3.71	55.1	6.924	1,100.183	27.915	28.07
Togo	n/a	52.0	5.3	615.193	24.632	n/a
Uganda	3.70	54.9	5.753	666.621	30.045	25.32
Zambia	3.52	53.1	4.023	1,385.797	38.159	20.66
Zimbabwe	3.32	58.8	-1.509	1,054.339	15.284	23.15
Direct average	3.59	51.48	4.34	2,496.31	23.87	25.06
Standard deviation	0.41	5.21	2.71	3,672.90	11.77	4.75
Coefficient of variation, %	11.35	10.11	62.38	147.13	49.34	18.95

Source: compiled by the authors based on International Institute for Sustainable Development (2019), International Monetary Fund (2019), WIPO (2019), World Economic Forum (2019).

Table 1 shows that each statistical indicator lack information for a lot of countries of Africa. The average level of global competitiveness of the economies of African countries in 2018 is rather low – 3.59 points out of 7. The coefficient of variation constitutes 11.35%, which shows rather high homogeneity of the selection. The average value of the index of sustainable development in African countries in 2018 is also low – 51.48 points out of 100. The coefficient of variation constitutes 10.11%, which shows rather high homogeneity of the selection. Average growth rate of GDP in constant prices in African countries in 2018 is moderate, constituting 4.34%. The coefficient of variation constitutes 62.38%, which shows heterogeneity of selection of data for this indicator.

Average level of GDP per capita in African countries in 2018 is low – USD 2,496.31. The coefficient of variation constitutes 147.13%, which shows heterogeneity of selection of data for this indicator. Average total volume of investments into economies of African countries in 2018 is rather high – 23.87% of GDP. The coefficient of variation constitutes 49.34%, which shows heterogeneity of selection of data for this indicator. Average value of the innovations index in African countries in 2018 constitutes 25.06 points out of 100, which allows characterizing the innovative activity of these countries as low. The coefficient of

variation constitutes 18.95%, which shows rather high homogeneity of the selection of data for this indicator.

Table 2. Sectorial structure gross added value that is created in African countries in 2018, %.

Country	Agriculture	Industry	Manufacturing	Services
	x_5	x_6	x_7	x_8
Angola	n/a	n/a	n/a	n/a
Benin	22	21	12	46.9
Botswana	2	30	5	58.7
Burkina Faso	28	21	6	42.0
Burundi	36	15	9	n/a
Cabo Verde	6	19	8	61.3
Cameroon	15	24	15	52.7
Central African Republic	40	15	7	39.3
Chad	49	15	3	33.5
Democratic Republic of the Congo	20	42	20	34.1
Republic of Congo	7	54	8	38.5
Cote d'Ivoire	20	27	13	41.6
Equatorial Guinea	2	56	25	40.7
Eritrea	n/a	n/a	n/a	n/a
Eswatini	n/a	n/a	n/a	n/a
Ethiopia	2	24	13	60.4
Gabon	6	45	7	43.0
Gambia	17	12	5	65.8
Ghana	17	24	6	52.2
Guinea	16	33	11	40.7
Guinea-Bissau	49	13	11	32.3
Kenya	32	17	48.1	45.4
Lesotho	5	33	16	52.6
Liberia	34	12	3	53.6
Madagascar	21	17	n/a	48.4
Malawi	26	14	9	52.4
Mali	38	23	n/a	36.7
Mauritius	3	18	12	66.9
Mozambique	22	18	9	54.2
Namibia	7	28	11	58.4
Niger	40	16	6	39.0
Nigeria	21	22	9	55.8
Rwanda	31	16	6	46.4
Sao Tome and Principe	11	15	7	71.4
Senegal	15	21	11	53.8
Seychelles	2	11	6	71.0
Sierra Leone	60	5	2	32.4

South Africa	2	26	12	61.5
South Sudan	n/a	n/a	n/a	n/a
Tanzania	30	26	6	37.5
Togo	41	17	4	29.8
Uganda	25	20	8	47.1
Zambia	7	36	8	52.7
Zimbabwe	10	22	8	56.3
Direct average	20.93	23.08	10.13	48.90
Standard deviation	15.24	11.11	7.83	11.14
Coefficient of variation, %	72.85	48.16	77.22	22.79

Source: compiled by the authors based on World Bank (2019).

Table 2 shows that statistical data for certain countries are absent. The average share of agriculture in the structure of gross value that is created in African countries in 2018 constitutes 20.93%. The coefficient of variation constitutes 72.85%, which shows heterogeneity of selection of data for this indicator. The average share of Industry in the structure of gross value that is created in African countries in 2018 constituted 23.08%. The coefficient of variation constitutes 48.16%, which shows heterogeneity of selection of data for this indicator.

The average share of Manufacturing в structure of gross value that is created in African countries in 2018 constituted 10.13%. The coefficient of variation constitutes 77.22%, which shows heterogeneity of selection of data for this indicator. The average share of the service sphere in the structure of gross value that is created in African countries in 2018 constitutes 48.90%. The coefficient of variation constitutes 22.79%, which shows heterogeneity of selection of data for this indicator.

3. Results

3.1 The current tendencies of development of the African countries

Let us study the tendencies of development of African countries in 2000-2022 (the data for 2019-2022 are forecast of the IMF specialists) (Figures 1-3). Figure 1 shows that average growth rate of GDP in constant prices in African countries in 2000-2022 is peculiar for high volatility. The general trend of this indicator is downward – decrease of its value in 2018 (4.34%) as compared to 2000 (4.92%) constituted 11.78%. Its slight (4.96%) increase is expected by 2022.

Figure 2 shows that average GDP per capita in African countries in 2000-2022 is peculiar for vivid upward trend. Its value in 2018 (USD 2,496) grew by 1.5 times as compared to 2000 (USD 1,001). Its further growth by 16% is expected by 2022.

Figure 3 shows that average aggregate volume of investments into economies of African countries in 2000-2022 is peculiar for slight upward trend. Its growth in 2018 (23.9% of GDP), as compared to 2000 (19% of GDP), constituted 25.78%. Its slight growth by 7.53% is expected by 2022 (25.7% of GDP).

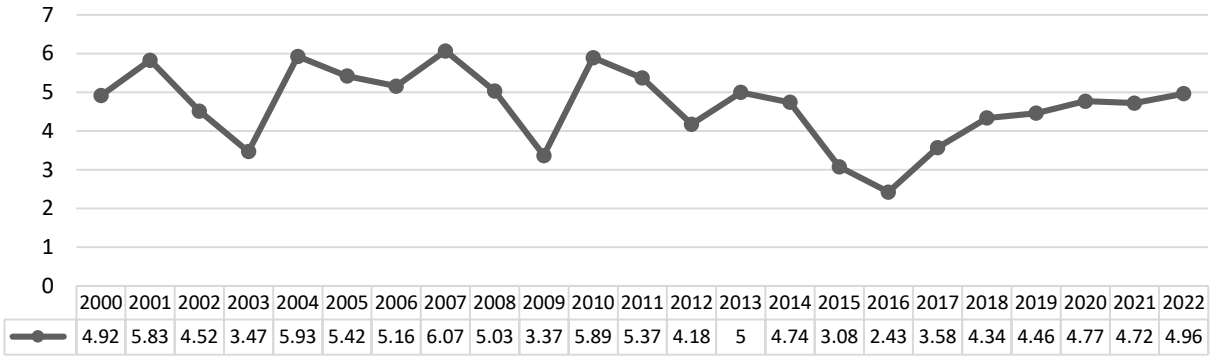

Figure 1. Dynamics of average growth rate of GDP in constant prices in African countries in 2000-2022 (Source: calculated and compiled by the authors based on International Monetary Fund (2019).

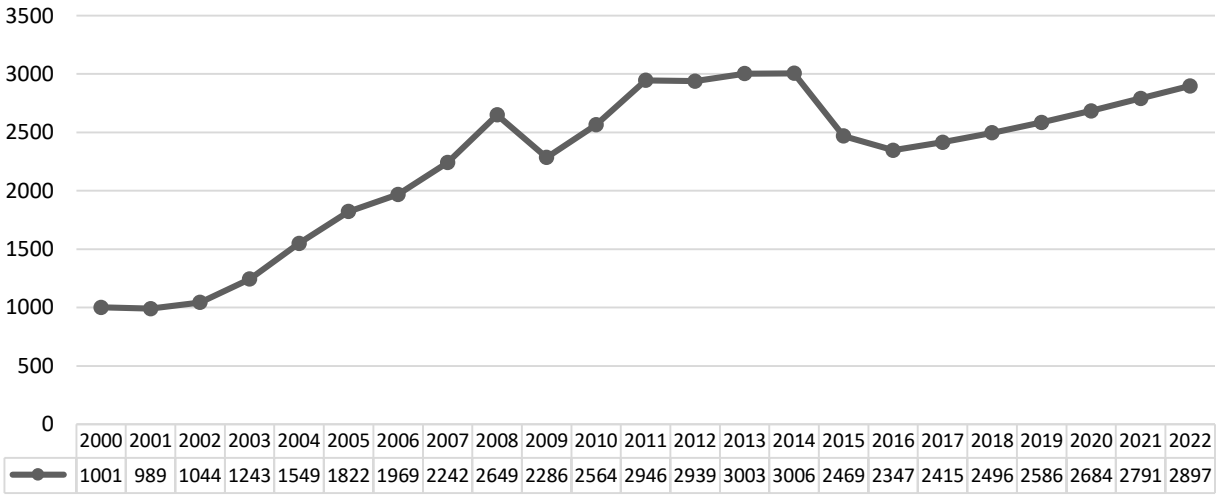

Figure 2. Dynamics of average GDP per capita in African countries in 2000-2022, USD Source: calculated and compiled by the authors based on International Monetary Fund (2019).

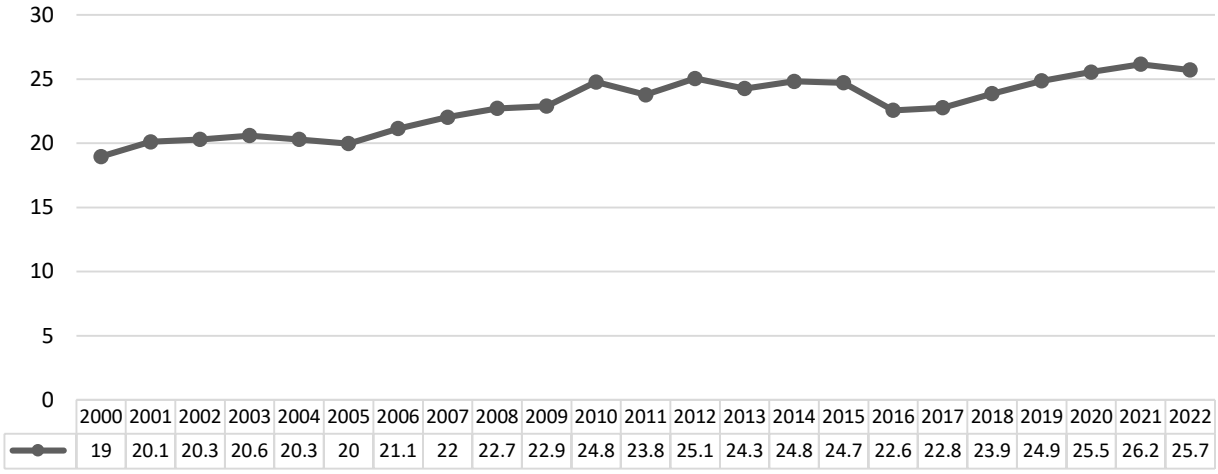

Figure 3. Dynamics of average aggregate volume of investments into economies of African countries in 2000-2022, % of GDP.
Source: calculated and compiled by the authors based on International Monetary Fund (2019).

Average sectorial structure of gross added value that is created in African countries in 2018, is presented in Figure 4. Figure 4 shows that African countries were peculiar for post-industrial direction in 2018 – specialization in the service sphere, which share in the structure of created gross added value constituted 48.90%. The share of industry constituted 23.08%, the share of manufacturing – 10.13% (aggregate share of industry constituted 33.21%). The share of agriculture constituted 20.93%. On the whole, the sectorial structure of gross added value that is created in African countries in 2018 could be called well-balanced, as there's no vivid domination of the service sphere. This allows developing the production specialization in any direction, including in industry.

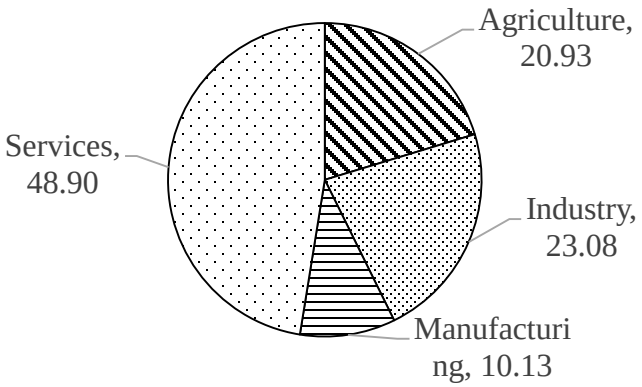

Figure 4. Average sectorial structure of gross added value that is created in African countries in 2018.
Source: calculated and compiled by the authors based on World Bank (2019).

For determining the position of African countries in the modern global economic system and determining their specifics, we find the ratio of average values of the indicators of socio-economic development of African countries in 2018 to average values of the indicators of developed countries (OECD) (Figure 5).

Figure 5 shows that countries of Africa are behind the developed countries (OECD) as to the level of GDP per capita (0.06), the level of sustainable development (0.64), global competitiveness (0.66); the difference as to the level of innovative activity (0.86%) is lowed. At the same time, countries of Africa show higher growth rate of GDP in constant prices (2.05) and total volume of investments into economy (1.11). The share of agriculture in the structure of gross added value that is created in African countries is higher than in developed countries (2.99); the share of industry is similar (0.89); and the share of the service sphere (0.79) and manufacturing (0.53) is lower.

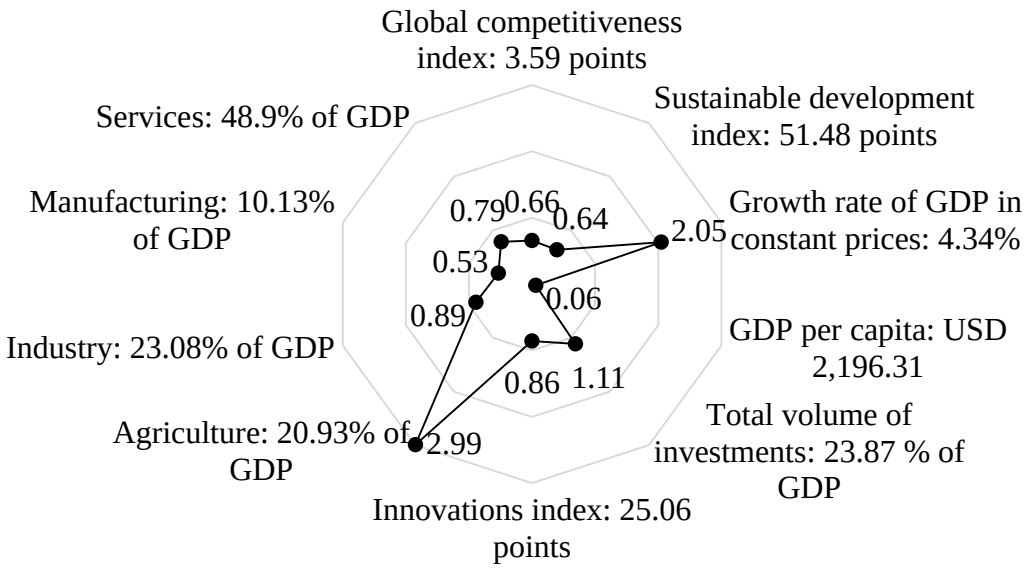

Figure 5. Ratio of average values of the indicators of socio-economic development of African countries in 2018 to average values of the indicators of developed countries (OECD).
Source: calculated and compiled by the authors based on International Institute for Sustainable Development (2019), International Monetary Fund (2019), WIPO (2019), World Bank (2019), World Economic Forum (2019).

3.2 Future scenarios of development of the African countries until 2030

Determining the most significant factors of global competitiveness and sustainability of development of African countries in 2018, the coefficients of auto-correlation of dependent variables (y_1, y_2) with independent variables (x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8) based on the data of Tables 1 and 2 was undertaken. The obtained results are given in Table 3.

Table 3: Autocorrelation of the indicators of socio-economic development of African countries in 2018.

	x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8
y_1	0.0447	0.0933	0.1423	0.3441	-0.1520	0.1891	0.0699	0.2121
y_2	0.1779	-0.3775	-0.0738	0.1563	0.2075	-0.0333	0.1555	-0.0059

Source: Calculated by the authors

Table 3 shows that growth rate of GDP in constant prices performs slight positive influence on the level of global competitiveness and sustainability of development of African countries. The influence of GDP per capita is contradictory – its growth slightly increases global competitiveness but decreases sustainability of development of African countries a lot. The influence of the volume of investments, agriculture, the service sphere, and industry is also substantial. Increase of the volume of manufacturing stimulates slight growth of global competitiveness and vivid sustainable development of African countries. The most significant factor that shows the largest connection with global competitiveness of African countries in 2018 is innovative activity – coefficient of autocorrelation ry2x4=0.3441. Let us perform the regression and dispersion analysis of dependence of global competitiveness of African countries on their innovative activity in 2018 and compile a model of paired linear regression of the type $y_1=£+\beta*x_4$ (Table 4).

Table 4: Regression and dispersion analysis of dependence of global competitiveness of African countries on their innovative activity in 2018.

Regression statistics						
Multiple R	0.3441					
R^2	0.1184					
Adjusted R-square	0.0974					
Standard error	7.4334					
Observations	44					
Dispersion analysis						
	df	SS	MS	F	Significance F	
Regression	1	311.7368	311.7368	5.6417	0.0222	
Residue	42	2320.7252	55.2554			
Total	43	2632.4620				
	Coefficients	Standard error	t-statistics	P-Value	Lower 95%	Upper 95%
£	1.3472	1.4161	0.9514	0.3469	-1.5105	4.2049
β	0.2124	0.0894	2.3752	0.0222	0.0319	0.3928

Source: Calculated by the authors.

According to the results of the regression analysis (Table 4), we have the following regression model: $y_1=1.3472+0.2124*x_4$. The compiled model allows stating that growth of innovative activity of African countries by 1 point leads to increase of the level of their global competitiveness by 0.2124 points in 2018. However, the obtained value $R^2=0.1184$ shows weak connection between the studied indicators – the change of the level of global competitiveness of African countries in 2018 only by 11.84% is explained by the change of the level of their innovative activity. The observed value of f-criterion (5.6417) does not exceed the table value, which, with $\alpha=0.05$, $k_1=m=1$ and $k_2=n–m–1=44–1–1=42$, constitutes 4.08 – which shows statistical significance of the obtained regression equation. This is confirmed by verification with the help of t-criterion, which observed value (2.3752) does not exceed the table value, which, with p=0,05 and n-2=44-1=42, constitutes 2.018. The obtained results show the necessity for increasing the level of innovative activity of African countries for growth of their global competitiveness.

For determining the most preferable scenario of innovative development of African countries let us analyze the dependence of the level of their innovative activity on the volume of hi-tech export in 2018. The initial data for this are given in Table 5, and the results of regression and dispersion analysis in Table 6.

Table 5. Volume of hi-tech export in African countries in 2018.

Country	Volume of hi-tech export, USD thousand	Country	Volume of hi-tech export, USD thousand
	x_9		x_9
Angola	n/a	Lesotho	n/a
Benin	n/a	Liberia	n/a
Botswana	49,682.76	Madagascar	4,754.27
Burkina Faso	n/a	Malawi	n/a
Burundi	237.96	Mali	2,164.48
Cabo Verde	n/a	Mauritius	26,573.5
Cameroon	28,690.44	Mozambique	32,059.25
Central African Republic	n/a	Namibia	14,734.53
Chad	n/a	Niger	n/a
Democratic Republic of the Congo	n/a	Nigeria	18,192.6
Republic of Congo	84,282.67	Rwanda	n/a
Cote d'Ivoire	n/a	Sao Tome and Principe	321.24
Equatorial Guinea	n/a	Senegal	9,468.67
Eritrea	n/a	Seychelles	62,598.41
Eswatini	n/a	Sierra Leone	1.35
Ethiopia	n/a	South Africa	1,817,259.05
Gabon	n/a	South Sudan	n/a
Gambia	n/a	Tanzania	15,651.17
Ghana	39,603.96	Togo	557.55
Guinea	n/a	Uganda	7,081.46
Guinea-Bissau	n/a	Zambia	35,952.67
Kenya	45,768.89	Zimbabwe	n/a

Source: Compiled by the authors based on World Bank (2019).

Table 6: Regression and dispersion analysis of dependence of innovative activity of African countries on the volume of their hi-tech export in 2018.

Regression statistics						
Multiple R	0.3182					
R-square	0.1012					
Normed R-square	0.0798					
Standard error	12.1627					
Observations	44					
Dispersion analysis						
	df	*SS*	*MS*	*F*	*Significance F*	
Regression	1	699.8430	699.8430	4.7309	0.0353	
Residue	42	6213.1165	147.9313			
Total	43	6912.9595				
	Coefficients	*Standard error*	*t-Stat*	*P-Value*	*Lower 95%*	*Upper 95%*
£	8.9119	1.8675	4.7720	0.0000	5.1431	12.6808
β	0.000015	0.0000	2.1751	0.0353	0.0000	0.0000

Source: Calculated by the authors.

The data from Table 4 show weak connection between the studied indicators – innovative activity of African countries growth by 0.000015 points with growth of the volume of their hi-tech export by USD 1,000. Deep regression analysis is not required in this case, as connection between the indicators is very weak, and their close connection is logical. Therefore, the scenario of digital modernization that is connected to innovative development of only hi-tech spheres of economies of African countries, will not allow ensuring the systemic effect, connected to growth of their global competitiveness and sustainable development.

The most preferable scenario of participation of African countries in the Fourth industrial revolution is the alternative scenario, which envisages neo-industrialization (transition to Industry 4.0 of all spheres of economy). For quantitative characteristics of scenarios with the help of statistical indicators we use regression dependencies of indicators y_1,y_2,x_1,x_2,x_3,x_5,x_6,x_7,x_8 on indicator x_4. Though these dependencies are not statistically significant at the level α=0.05 they allow for assessment of the change of the statistical indicators in case of increase of the level of innovative development of African countries (Figure 6).

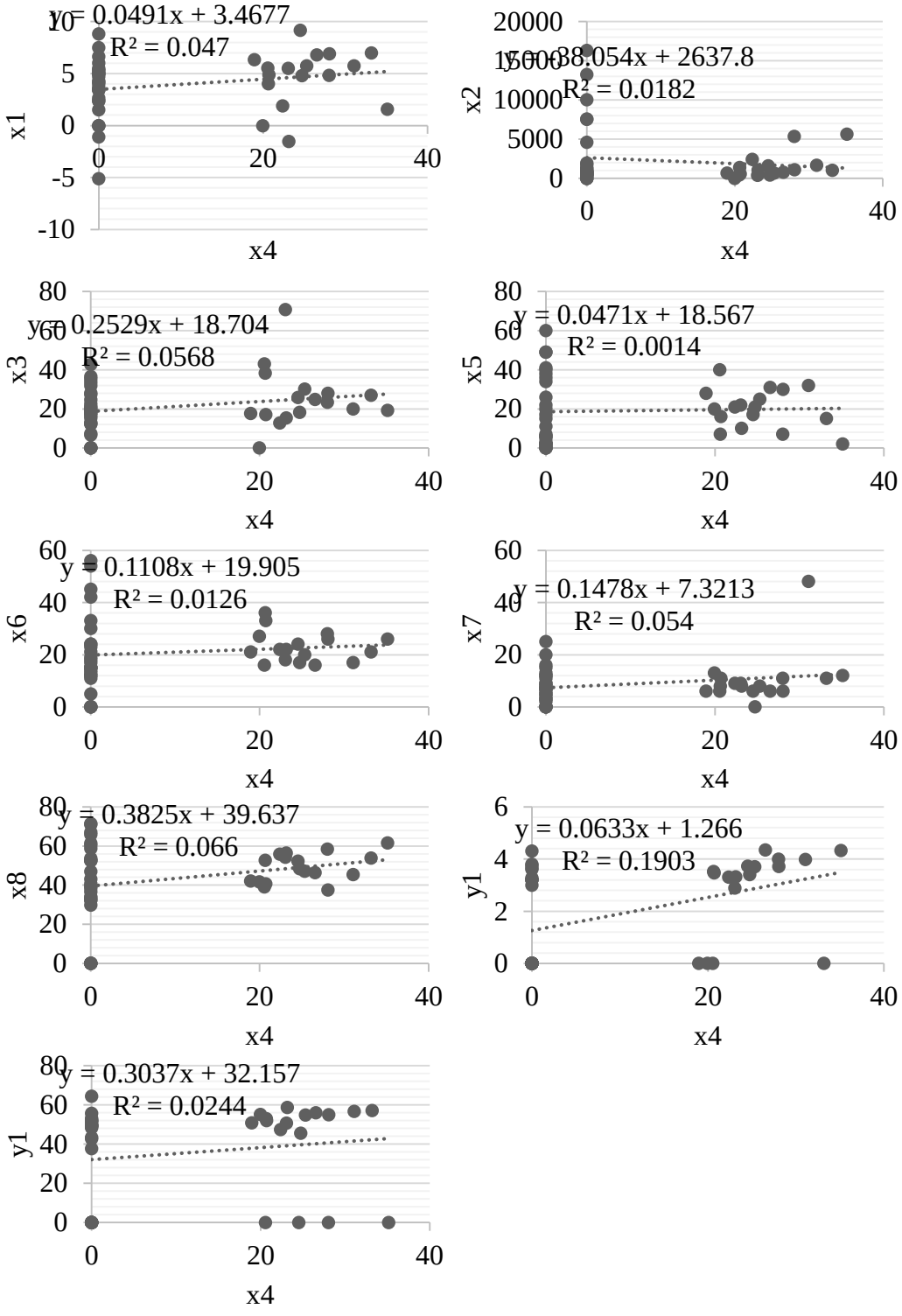

Figure 6: Regression curves that reflect dependence of the statistical indicators on the level of innovative development of African countries in 2018 (Source: calculated and compiled by the authors).

Let us put the values of the indices of innovations into the obtained models of paired linear regression. Within the scenario of digital modernization the value of this index will be close to the level of developing countries (33.16 points), and within the scenario of neo-industrialization to the level of developed countries (59.86 points). The following characteristics of the alternative scenarios of African countries' participation in the Fourth industrial revolution were obtained (Table 7).

Table 7: Characteristics of the alternative scenarios of African countries' participation in the Fourth industrial revolution until 2030.

Indicators	**Value in 2018**	**Values of the indicators within the alternative scenarios of African countries' participation in the Fourth industrial revolution**					
		Scenario of digital modernization			Scenario of neo-industrialization		
		value	growth (absolute)	growth, %	value	growth (absolute)	growth, %
Innovations index points	25.06	33.16	8.10	32.32	59.86	34.80	138.87
Growth rate of GDP in constant prices, %	4.34	5.10	0.76	17.42	6.41	2.07	47.62
Share of agriculture, %	20.93	20.13	-0.80	-3.83	21.39	0.46	2.18
Share of industry, %	23.08	23.58	0.50	2.16	26.54	3.46	14.98
Share of manufacturing, %	10.13	12.22	2.09	20.65	16.17	6.04	59.61
Share of service sphere, %	48.90	52.32	3.42	7.00	62.53	13.63	27.88
Total volume of investments, % of GDP	23.87	27.09	27.09	113.49	33.84	33.84	141.78
GDP per capita, USD	2,496.31	1,375.93	-1,120.38	-44.88	359.89	-2,136.42	-85.58
Global competitiveness index, points	3.59	3.37	-0.22	-6.27	5.06	1.47	40.81
Sustainable development index, points	51.48	42.23	-9.25	-17.97	50.34	-1.14	-2.22
Essence of the scenario	-	selective innovative development, limited by hi-tech spheres of industry			systemic innovative development of economy with the infrastructure-building role of industry		
Existing experience of scenario realization	-	developing countries			developed countries		

Source: Calculated and compiled by the authors.

The data from Table 7 show that within the scenario of digital modernization the value of the global competitiveness index of African countries reduces as compared to the 2018 level, and within the scenario of neo-industrialization increases by 40.81%. However, GDP per capita reduces within both scenarios – as well as the sustainable development index – as forecasting was conducted with all other conditions being equal. For preventing the reduction of the values of these indicators it is necessary to take special measures within the model of neo-industrialisation.

3.3 Africa 4.0 as the optimal scenario: policy implications

The following conceptual model of Africa 4.0 was developed (Figure 7). It takes into account the specifics of African countries that are connected to contradictory influence of innovative development of their economies on global competitiveness (positive, direct influence) and on sustainability of their development (negative, reverse influence) (Figure 7). As is seen from Figure 7, the offered model is aimed at well-balanced development of African countries, which ensures growth of their global competitiveness, and increase of sustainability of their economies. The tool of implementing the set goal is state management of economy on the basis of AI. The basis of economy is Industry 4.0 – production, distribution, and consumption with the usage of new digital technologies. It is based on specialized infrastructure – R&D that is aimed at creation and adaptation of new digital technologies to various economic operations, digital education, which allows developing digital competencies and ensures high level of qualification of the employees of Industry 4.0, and digital security, which ensures loyalty (trust) of business and society to digital technologies.

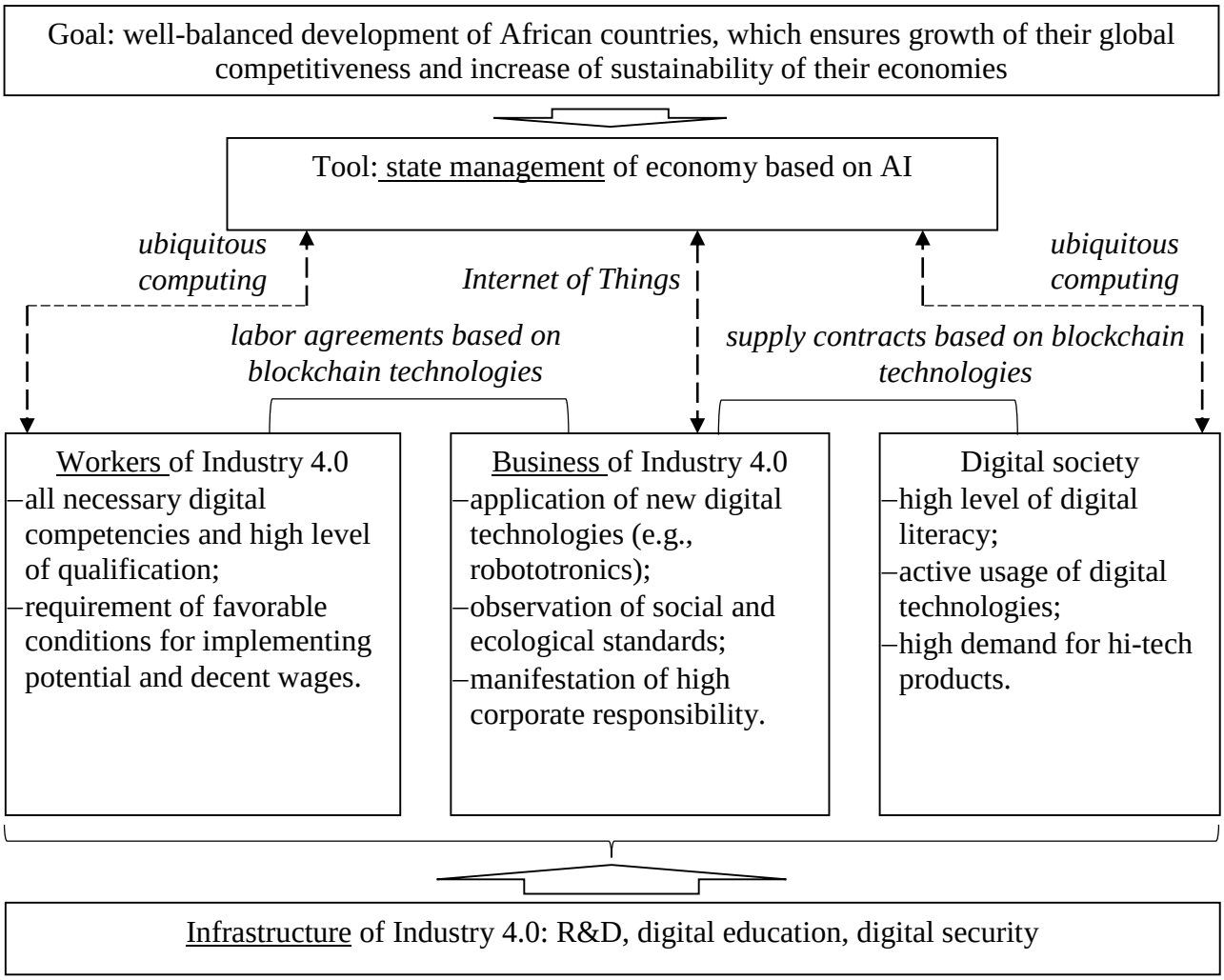

Figure 7. The conceptual model of Africa 4.0 (Source: compiled by the authors)

The central subject of economy is business of Industry 4.0, which specific features are application of new digital technologies (e.g., robototronics), observation of social and ecological standards, and manifestation of high corporate responsibility. State management of business is automatized on the basis of the Internet of Things. Another subject of economy is employees of Industry 4.0, who possess all necessary digital competencies and high level of qualification and set requirements of favorable conditions for implementing the potential and decent wages. Their labor relations with business have the contractual basis with the help of blockchain technologies, which allow preventing the development of the shadow economy.

A subject of economy is also the digital society (consumers), which specific features are high level of digital literacy, active usage of digital technologies, and high demand for hi-tech products. Their relations with business (connected to products supply) also have the contractual basis with the help of blockchain technologies, which allow preventing the development of the shadow economy. State management by the employees and society (consumers) is automatized on the basis of ubiquitous computing.

The following algorithm has been developed for successful and crisis-free neo-industrialization of African countries based on breakthrough technologies of Industry 4.0 (Figure 8). As is seen from Figure 8, the offered algorithm is implemented in four consecutive stages. The first stage envisages formation of the infrastructure of Industry 4.0 via modernization of the system of science and education and development of the system of provision of digital security. The second stage envisages internal and external (global) marketing of Industry 4.0 of African countries for formation of demand for their hi-tech products.

The third stage envisages standardization (adoption of social and ecological standards) and stimulation (e.g., tax) of business of Industry 4.0, which value should depend on the level of corporate social and ecological responsibility. The fourth stage envisages monitoring and control of achievement of the set goals. It is offered to use the estimate (planned) values of the indicators of socio-economic development of African countries until 2030 within this scenario.

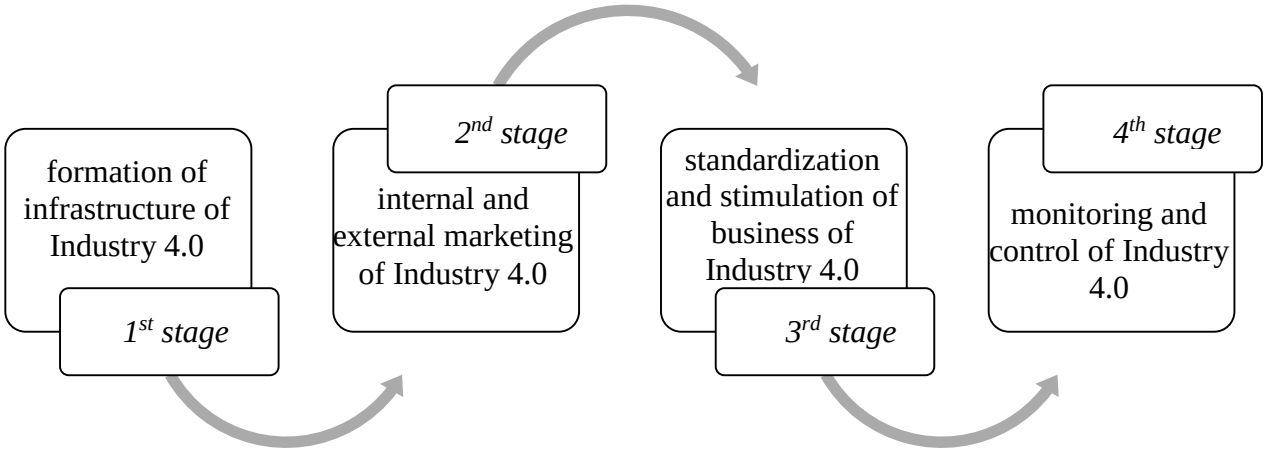

Figure 8. Algorithm of neo-industrialization of African countries based on breakthrough technologies of Industry 4.0 (Source: compiled by the authors).

4. Conclusion

Thus, as a result of the research it is determined that the perspectives of involvement of African countries in the global Fourth industrial revolution based on breakthrough technologies of Industry 4.0 are connected to their neo-industrialization. This scenario envisages full-scale transition to economies of African countries to Industry 4.0 and is preferable (as compared to selective digital modernization in the sphere of hi-tech spheres of industry), as only it allows increasing the level of innovative development of economies of African countries, which is necessary for growth of their global competitiveness.

An important specific feature of African countries, which differentiates them from developed and developing countries in other regions of the modern global economy, is contradictory influence of innovative development on their economies, which stimulates the growth of its global competitiveness with simultaneous reduction of sustainability of development. That's why in this work the model of neo-industrialization, which is implemented by the modern developed countries, is adapted to the determined specifics of African countries.

This model envisages standardization and stimulation of corporate social and ecological responsibility of business of Industry 4.0. This will allow achieving growth of global competitiveness and increase of sustainability of development of economies of African countries until 2030. The offered model is to be implemented in stages according to the specially developed algorithm, which allows preventing a crisis of production and social and ecological crisis in African countries in the process of their neo-industrialization.

It should be concluded that the level of differentiation of socio-economic development of African countries is rather high. That's why the model neo-industrialization of these countries is inexpedient. It is recommended to adapt the offered conceptual model of Africa 4.0 to the national specifics of separate African countries for maximization of the effectiveness of its practical application.

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Smart Tourism for Enhancing Tourism Experience: Prospects and Challenges for Africa

Randhir Roopchund[1]

Abstract

The research paper provides an overview of how technology is shaping the pathway for African countries to emerge as a Smart tourism destination. The total contribution of Tourism to GDP for Africa was USD 177.6 billion (8.1% of GDP) in 2017 and this is expected to increase in the years to come. Mauritius a small island economy recently hosted an international conference entitled 'Digitalisation and Sustainability' in the tourism sector. The conference emphasised on the need for enhancing competitiveness of African countries as a tourism destination through the use of technology and innovation. African countries are investing on Smart Cities and smart tourism to boost up the economic growth and development. Nairobi and Cape Town rank among the most advanced cities on the African continent on the smart city front. Nairobi, capital of Kenya and home to over three million people, won the title of Most Intelligent City in Africa for two years in a row. Mauritius has also invested on Smart Cities to provide technology driven facilities to businesses and customers. The present research showcases the prospects and challenges of smart tourism through the use of African case studies to enhance tourists experience and boost up the growth in the tourism sector. A qualitative research approach was adopted based on content analysis, literature review and references were made to the challenges for the country to emerge as a Smart tourist destination. The research findings will help African economies to bring a paradigm shift in terms of improving customer satisfaction and overall competitiveness. Smart tourism may enhance the country's visibility and provide customised offerings to customers using appropriate ICT tools that are discussed in this research paper.

Keywords: Competitiveness, destination management, digitalisation, e-tourism, smart tourism, technology.

1. Introduction

Tourism is one of the biggest and rapidly growing and promising sectors in the world that is triggering growth, creating jobs and also helping to reduce global poverty. According to the UNWTO (2017), the tourism sector accounts for 10% of global GDP, 10% of total employment worldwide and 7% of the world's exports equivalent to USD 1.4 trillion. However, the tourism industry is currently dealing with a number of challenges such as climate change, sustainability and digitalisation which will shape the future of the industry. Digitalisation and tourism success are inherently and intrinsically linked (Tralac, 2018). The

[1] Aberystwyth University, Wales, United Kingdom

rapid progress in Information and Communication Technology (ICT) is fast developing the tourism sector creating both opportunities and challenges.

Tourism arrival in Africa has increased by 8% (63 M USD) for the year 2017 and tourism receipts increased by 8% (USD 37 billion dollars). This shows that the tourism sector represents huge opportunities for growth. There is sign of recovery in Northern Africa and very good performance from countries such as Kenya, Cote D'Ivoire, Mauritius and Zimbabwe (UNWTO, 2018). Matema (2018) is of the view that limited use of technology by the tourism sector within Africa presents various business technology opportunities for tourism in Africa. He further claims that investing in smart technology innovations is said to be the solution that will take the African tourism industry to world-class tourism. The current use of technology in tourism is mostly in the use of static websites but does now allow for improving customer engagement and interaction (Matema, 2018). It should be noted that Africa has more than 1.1 billion internet users which represent a great potential for growth.

2. Smart Tourism Concept

The Smart Tourism destination (SD) idea that is attracting a lot of interest from researchers and may be considered as a significant development in the tourism field (Jovicic, 2016). The hypothetical development is still limited and the 'destination concept' is complex, evolving, socially-developed and multi-layered, as reflected in literature (e.g. Pearce, 2014; Saarinen, 2004; Saraniemi and Kylänen, 2011, and so on.). Smart destinations have been largely influence by some earlier conceptualisations, for example, 'e-Destinations'. E-Destinations stress the usage of ICTs to give data and to end up an instrumental part of all transactions along the value chain (Buhalis, 2003), in smart destinations technology is centrally embedded in all elements thanks to new developments, such as the Internet of Things (Koo et al., 2015).

Many countries are feeling increasing pressure to realise smart tourism to influence economic growth and development. In Asia, there are more collaborative efforts to drive the smart tourism agenda forward. Governments in China and South Korea are supporting initiatives in developing the technological infrastructure that supports smart tourism (Hwang et al. 2015). In Europe, many of the smart tourism initiatives were born out of smart city projects and, as a consequence, smart tourism destinations are increasingly making an appearance in the European tourism landscape. The focus in Europe is about developing smart end-user applications that support enriched tourism experiences using already existing data combined and processed in new ways based on innovative approaches (Lamsfus et al. 2015; Boes et al. 2015a, b). In the Mauritian context, the government is encourage Smart city schemes for building intelligent buildings for improving the sustainability of the economy. There are a number of Smart City projects that have been developed across the island- Medine Smart City, Moka Smart City and that of Beau Plan amongst others. In 2015, the Finance Minister proposed the creation of eight smart cities and five "technopoles", with an overall investment of Rs 120 billion and requiring 7,000 acres of land. In Australia, the emphasis has shifted to smart governance and use of open and big dat. Based on the discussion, transformative power of smart technologies is being universally accepted not only in terms of the economic potential but also the social and experiential dimensions.

2.1 African smart tourism

The East African Magazine (2016) outlines that Africa may reap a lot of benefits from smart tourism. Estelle (2016) who is the co-founder of Jovago.com explains that technology has reduced the costs for the industry. The site is an on-line platform with over 200,000 bookings and offers customers to avail of significant discounts. African tourists are also making increasing use of Trip Advisor for reviewing customers feedback for making decisions. Jackson (2016) reports that smart and innovation cities such as Hope City in Ghana and Kenya's Konza Technology City heralds good potential for hotel developments. "The travel industry is likely to reap the benefits of technology startups with increased domestic, regional and international business travel to a variety of countries in Africa," the report said.Business air arrivals are expected to post a compound annual growth rate (CAGR) of five per cent for South Africa and six per cent for Kenya over 2014-2019, according to Euromonitor International.

The Mauritian government ambitions to position the country as one of the leading ICT destination, being a model in Africa, which supports the new e-Global age (MICT, 2018). There are 600 ICT companies operating in Mauritius in different business activities ranging from software development to business process outsourcing. There are some major players such as Microsoft, IBM and Accenture amongst others. The drive to emerge as an ICT-BPO Hub has resulted from a plethora of factors such as the changing global economic environment, changing government policies and the Mauritian bilingual population.

Figure 1: Key Digital Statistical Indicators

Source: Hootsuite (2018)

Mauritius is a small island with around 1,280, 000 population. However, we have an internet penetration rate of 63% (highest in Africa). Some 720,000 people use different social media such as Facebook, Instagram and Twitter. There are 1.74 million of subscribers to mobile services indicating that we have more mobile phones are Sim cards than the actual population size. In addition, around 48% of mobile users are active mobile social users. These statistics clearly demonstrate that Mauritius is poised to emerge as Smart economy where technology plays a key role in the economic growth and development. The government has also adopted the e-government initiative where it plans to digitalise different Ministries for improving effectiveness and efficiency.

2.2 Zambia as a smart tourism destination

The Zambian government has also embarked on the Smart Zambia project with the signing of an agreement during the President Edgar Lungu's visit in China in 2015. The project was agreed with Huawei as the main supplier for the project. The project is named 'The National ICT Development Project' which

aims to build a national cloud data centre and also the development of ICT Training centre. Huawei provided the Zambian National Data Center with a reliable solution that included: A Three-Data-Centers-in-Two-Cities (3DC) solution that ensures the security and continuity of government services and data; a Huawei cloud solution with services such as government and enterprise cloud hosting; and Huawei energy solutions to guarantee safe operation of devices in data center equipment room.

According to Zambia's 7th Five-Year Development Plan, ICT has been identified as an important catalyst for socio-economic development and a driving force for good governance. In order to fulfil this mandate, Zambia needed to create a national program to train ICT talent. The Zambia government expects that the expansion of educational opportunities for ICT managers and technicians will increase the employment rate nationally and lower the costs of operation for Zambian ICT enterprises. In addition to supplying the technical infrastructure, Huawei has also provided an advanced ICT training solution that includes modern multimedia classrooms and labs, course materials, and on-site training. The result high standard for training and certification ensures that a qualified workforce is available for data center operations and business activities both inside and outside of Zambia. Dr Banda (2018), the Minister of Tourism claimed that the tourism sector relies a lot of the use of technology for transforming data into value propositions. He also added that ICT can help in bringing sustainable economic development in the country. The government is adopting a range of Smart Technology initiatives at all levels of public management of the country.

2.3 Understanding the prospects of smart tourism

Smart tourism helps tourists get information at any stage of the interaction in the hotel value chain. Tourists are now able to obtain information on the internet - Tourists can also enjoy an experience of the tourist destinations by applying three-dimensional virtual reality software. In this way, they can get to know about different information about tour destinations, receive electronic coupons and make various reservation confirmations at intelligent terminals.

The new era of ICT has also opened a wealth of new tools for the tourism industry. Nowadays, tourism destinations face a set of new challenges arising from changes in both consumers and the environment as influenced by the emerging technologies. In order to deal with these challenges, first destinations have to recognise the kind of changes that occurred then proactively respond (Soteriades et al., 2007). From a tourism perspective, ICT could contributes in terms of generating value-added experiences for tourists, while also improving efficiency and supporting process automation for the related organisations (Werthner 2003 as cited in Gretzel 2011). Thus, the development of Smart City could also encourage the formation of Smart Tourism Destinations. With technology being embedded within the destinations environment, it can enrich tourist experiences and enhance destinations competitiveness.

2.4 Tourism applications in smart tourism destinations

Recognizing the economic importance to mitigating the challenges was high on the agenda during the 2017 World Tourism Conference held in Rwanda earlier this year. Many African leaders discussed how to maximize opportunities and also reviewed the needs of the sector to reach its full potential. Different Ministers and tourism stakeholders such as tour operators, travel agents, hotels and airlines attended the conference. Different opportunities and challenges were discussed for achieving the tourism objectives.

Table 1 shows a number of opportunities for Smart Tourism in Africa. It is important for tourism providers to collaborate to improve the consumer experience to achieve competitive advantage. Buhalis and Wagner (2013) are of the view that destinations should use implement technologies to achieve higher level of competitiveness. In addition, earlier references in this article show that the African continent is taking several initiatives to improve the image of Africa as a smart tourism destination (Boes et al. , 2015). It is important for Africa to harness its resources to achieve this vision. McCabe et al. (2012) suggested a scenario-based design (SBD) that proved to be a useful approach to engage diverse tourism stakeholders in collaboration and overcoming technological knowledge barriers and generating new ideas for transforming the tourists' experience of the city. A similar technique was applied by Ronay and Egger (2013) to investigate the NFC Smart City concept and how plausible future scenarios for implementing such a concept in tourism destinations might look.

Table 1: Applications of Smart Tourism

	Applications	**Utility (Buhalis, 2000)**	**Dimensions (Smart Tourism) Cohen (2012)**	**Destination Components**
1	Augmented reality (AR) enables visitors to experience digital recreation of tourism sites and time travel (Chillon 2012)	Interpret ation	Smart people	Attractions
2	Vehicle tracking system provides a real-time information of transport network and could be distributed to end-user devices (Arup 2010)	Planning	Smart Living	Accessibility
3	Hotel should able in predicting energy demand for building and perform energy audits based on their environment management (Metric Stream, 2013)	Sustaina bility	Smart environment	Amenities
4	A multi-languages application that provide range of services such as electronic travel guide which also offer numbers of available packages for tourists (Jordan, 2011)	Guidance	Smart people, smart mobility	Available packages
5	Tourists are able to register their complaints through a Complaints Management System that supported by various ICT channels such as SMS or mobile applications which could directly route them to appropriate officials (Metric Stream, 2013)	Feedback	Smart Living	Ancillaries

The study of Buonincontri and Micera (2016) show that innovative technologies to improve the overall experience co-creation. They used two European Smart Tourism destination to provide insights and decision making. The authors are of the opinion that the use of smart technologies may have a positive influence on the tourism experience co-creation. Tourists are now able to engage and share their views about their experiences at any point in the value chain through different technological platforms.

Pearce (2015) suggested the integration between concepts to create tourist destination. Pearce (2015) suggests an incorporation of the geographic dimension (space and place), mode of production (structure, behaviour, and actors) and dynamic dimension (structure and leadership), in an organized system that comprises the whole that is a tourist destination (Pearce, 2015). Richards (2014) defines tourism as a "consumer of spaces", with the idea of "ization" – to transform a space according to the given activity practiced – thus, a place is characterised according to the activities that take place in it. Consequently, to the author, the tourist activity itself creates a destination or tourist space.

3. Research Methodology

The research approach used for the purpose of the study is exploratory setting the groundwork for understanding the prospects and challenges of Smart Tourism for African economies. Consequently, a qualitative research approach is used as the study does not intend to generalise its findings. The Content Analysis has been used by analysing websites, newspaper articles in Africa and Government reports to make the case for Smart Tourism. The analysis has been carried out both at the macro and micro level so as to obtain sufficient information about the current state of affairs in the African continent. In addition, to make the analysis objective, some important indexes such as ICT index for tourism for some selected countries will be used. The current research also uses case studies at the macro and micro level to demystify the current trends of Smart Tourism. The choice of the case studies and websites for inferences relates to the following research questions?

a. Does it relate to the concept of Smart Tourism?
b. Does the content help in understanding Smart Tourism in Africa?
c. Is the source of information valid?
d. Does it help to assess the prospects and challenges in Africa?

Content analysis is a method of analysing written, verbal or visual communication messages (Cole 1988). Content analysis is a research method for making replicable and authorised inferences from data to their context, with the purpose of providing knowledge, new facts, a representation of data and a realistic lead to action (Krippendorff, 1980).

Content analysis has been described as a family of analytical approaches from 'impressionistic, intuitive, interpretive analyses to strict textual analysis' (Rosengren, 1981), who further states that the kind of content analysis used depends on the research field of the researcher. Mayring (2008) detaches content analysis from any quantitative allusions by conceiving it as systematic, rule-governed and theory- driven analysis of fixed communication.

4. Findings

4.1 Smart tourism challenges

There are many challenges in making African countries as a Smart tourism destination. Though there is a promising growth in African tourism, the emergence of Smart Tourism needs investment in terms of technology but at the same time need for adoption of ICT oriented tourism at all levels of customer interaction in a hotel. In the first instance, African economies still suffer from lack of internet connectivity and poor bandwidth as a barrier for emergence of Smart Tourism. In addition, the concept of smart tourism also relies on the need for smart tourists who are willing to interact and use technology for enhancing their own customer experiences. There are other challenges such as the impact of Smart Tourism on the traditional economic sectors such as the need for tourist guides and cultural tourism.

4.2 The African Challenge: Improving ICT infrastructure and connectivity

Unfortunately, despite these promising ICT statistics, African countries still have very low ICT Development Index (IDI) scores. All African countries have either a medium or low IDI (ITU, 2011International Telecommunication Union) with those in North Africa (Algeria, Morocco and Tunisia)

and Southern Africa (South Africa, Mauritius and Botswana) having relatively higher scores. Abdoulkarim and Rugege (2013) report that the highest ranked African country is 70th globally out of a total of 155 countries. There is need to improve the overall ranking by engaging in more ICT for development (ICT4D) projects in Africa. The Secretary general of the ITU Dr Hamadoun had the following to say about the need for transformation:

"ICTs are truly transformational. With the power of technology, we can educate every African citizen, right across Tsthe continent. With the power of technology, we can open new opportunities and create new well-paid jobs for our people. With the power of technology, we can deliver healthcare services to every African citizen, even in the remotest villages. And with the power of technology we can empower African women and leverage the fantastic energy and passion of young Africans. This is not just a pipe-dream: this is real."

Although ICT has an important role to play in enabling a better life for all on the African continent, challenges to the realization thereof remain. African countries should work on the improvement of ICT infrastructure and connectivity to harness the potential of Smart Tourism for Africa.

4.3 ICT Literacy in Africa

As the number of tourists is increasing in Africa, it is important that tourism operators enhance their overall competitiveness through the use of technology. However, another challenge of the use of technology for Smart Tourism lies in the lack of ICT readiness. A study by Mahakata et al. (2017) identified several bottlenecks for a successful ICT strategy in tourism including the lack of skilled and trained people in the field of ICT. The ICT readiness index is about 1.93 for Africa as compared to 6 for Europe and 4 for the world at large. The eTransform Africa report clearly spells out that "the most prevalent challenges across the continent to fully move forward in these business areas are infrastructure, energy constraints and the ICT skills gap (compared to other parts of the world), which impacts users as well as the pool of available, skilled labour for firms wanting to do business in Africa".

4.4 Policy and regulations

Mahakata et al. (2017) also point fingers to the lack of appropriate policy regulations for promoting smart tourism or adoption of technology by tourism firms. They take the example of the lack of political will in Zimbabwe, as clearly indicated by the absence of ICT regulation/legislation to promote the use of ICT and to deal with legal issues that emanate from ICT. The support of the Mauritian government towards e-government has also boosted the smart tourism perspective. For example, the Mauritius Tourism Promotion Authority has worked for the informationisation of services such as application of permits and many other services. The government also organised an international conference on digitalisation and sustainability to support the smart tourism perspective.

4.5 Cashless payments in Africa

With 94 percent of retail transactions still in cash, there is a real need to displace cash given the countless benefits for consumers to shift behaviour. Additionally, benefits will benefit the sector and overall economy. Digital payments is far safer, and although in Africa the need still remains to have some cash available, it is important to develop a wider acceptance network that includes hotels but also tourist hot spots. It is also important to make appropriate use of data to understand tourists travelling spending behaviour and preferences. Mastercard is leading the way in data analytics, with products and services

that combine the power of data and insights. For instance, our Tourism Insight Platform provides data on spend as well as natural language processing sourced from social media and search engines like Instagram, Google and Amadeus.

4.6 Data protection and privacy concerns

Another important challenge for the African tourism operators to respect the data piracy and protection issues. The success of smart tourism relies a lot on the participation of tourists with the technology enhanced services. Gretzel et al. (2015) are of the view that the digital footprint of a smart tourist is huge and data comes at a cost. Data management and sharing have to be institutionalised, which can be hard within a fragmented industry like tourism that is mostly based on micro-businesses. Tourism enterprises that are already lagging behind digital developments might fall even farther behind when smart tourism is implemented at their destinations. Necessary knowledge/technology transfer and training are currently not discussed in the context of smart tourism.

4.7 Case Studies of Smart Tourism in Africa

4.7.1 Use of tourists maps

Map areas can be downloaded to a phone for offline viewing. When in an area one can open Google Maps and use a smartphone's GPS as well as the saved maps to view where they are. If Google Maps is queried for directions while on a WiFi connection and then goes offline, one can continue to follow directions and view the location on the map completely offline.

4.7.2 iCamp Kenya

A mobile solution iCamp Kenya was implemented to provide campers with a platform to locate camps in Kenya and get reliable camping information such as accommodation prices, highly rated camps, useful camping tips while planning a trip, transport options, directions to the camp and contact information. Quantitative research methods such as questionnaires were used to test the implemented system and collect primary data. The sample size for this population was 136 Vagabond Travels club members. The findings of the research show that users found the application was fully functional and easy to use. They were able to find their desired camps easily and were satisfied with the useful information that assisted them in planning their camping trip.

4.7.3 Social Media and Marketing in Africa

A destination risks losing opportunities by ignoring the value social media presents, whether the benefit is directly quantifiable or not. Currently, travellers communicate more on social media and spend much of their online time browsing different social networks. If a destination does not take an active front, competitors are bound to reach out to their target market. Gaining the public trust is critical to gaining business. In Africa, social media rankings does not have a direct correlation to a flourishing tourism sector due to the sensitive nature of the tourism industry. Tourism is affected by geography, social, economic and political factors that are complex and have a direct effect on tourism making social media a distant variable, (O'toole 2016).

4.8 Policy implications

The research shows that there are a number of opportunities for Africa to tap on smarttourism through the use of innovative technologies. A number of smart tourism practices in different countries are provided to highlight the potential for application in the tourism sector. However, it is observed that there is reluctance on the adoption of innovative tools due to the challenges outlined in the research. Some of the challenges are poor internet connectivity, lack of collaboration and policy discussion between African member states, low level of ICT literacy amongst others. However, these barriers are not overwhelming which can be dealt through the right determination of African leaders. Companies in the tourism sector should gear themselves to the concept of Industry 4.0. Tourism operators should also use social media tools to engage in co-creation and customer engagement. There should be an ongoing dialogue between the different policy makers so that the right regulations and laws are enacted. This will also ensure that African tourism operators are geared towards achieving sustainable economic development through the use of green practices and smart technologies. However, it is observed that smart tourism has been used mostly in African countries which are more advanced economically and technologically (South Africa, Kenya and Mauritius). The Zambian government are working with Huawei to provide smart solutions in the tourism sector.

4.9 The Future of smart tourism

Digitalisation represents an exciting opportunity for the travel and tourism industry with the opportunity to tap $ 1 trillion for the next decade (Deloitte, 2018). The use of technological platforms such as Airbnb and Uber have changed the approach of doing business enabling small entrepreneurs to compete with bigger firms. Travel agencies are now able to tap up-to- date information to provide more customised offerings. The Deloitte report has identified four key themes for the transformation of the tourism industry through digitalisation:

- Living travel experience - With technology it will be possible to get customised offerings and customers may easily share their experiences with other customers. In time, travel will become frictionless, blending seamlessly with other everyday activities.
- Enabling the travel ecosystem -The travel ecosystem will further improve with the possibility of greater collaborative networking and sharing of information. It is expected that the next generation of customers in hotels and airlines will have different consumer buying behaviour.
- Digital enterprise - Digital technologies that revolutionize manufacturing, optimize the real-time use of assets and eventually augment the industry workforce will transform operations. Innovations such as 3D printing, AI, IoT, VR and digital platforms will enable flexible working and changes to core operational processes.
- Safety and security - There will be increasing emphasis on data security and information management. The tourism sector should improve the cybersecurity measures and also protect confidential data of customer to maintain the trust. It is expected that more digital technologies (e.g. biometrics such as facial recognition, IoT, crowd analytics and video monitoring via AI) will be used to create a ubiquitously secure environment.

5. Limitations of Research

The research paper is conceptual in approach seeking to analyse the potential of smart tourism in Africa. One of the main limitations of the research is that the analysis lacks empirical evidence as it is qualitative in approach. Another concern has been the lack of statistics and research papers related to the theme in the African context. The statistics were available mostly for Kenya and South Africa. However, this limitation may be bridged by proper networking with different institutions.

6. Conclusion

It is obvious that tour operators, travel agencies, airlines and other stakeholders in the tourism sector may benefit if the countries are able to emerge as smart tourism destinations. The pathway may seem long but it is surely linked to the overarching goal of achieving sustainability. Government and other operators should address the key challenges with a clear roadmap as the global tourism sector is expanding. However, there is need for parallel growth and development in terms of infrastructure, air access policy and also tourism sites to make smart tourism a reality. The African countries can also benchmark globally in terms of technology and resources to deal with the challenges. As an ending note, it is said that the 'the journey of 1000 miles starts from the first step we make'.

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Inclusive Economic Growth

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Factors Affecting Public Participation in Environmental and Social Impact Assessments: Case Study of Five Projects in the Copperbelt Province of Zambia

Alice Lungu[1], Vincent Chiona[2] and Xoliswa Kauert[3]

Abstract

Public participation is important in any Environmental and Social Impact Assessment (ESIA) for major infrastructure projects. However, evidence shows that there is hardly any public participation in ESIAs in many infrastructure projects in the Copperbelt Province of Zambia. Therefore, this study sought to find out the factors that hindered public participation in ESIAs. Five projects in four towns were identified as case study projects. Using qualitative methods such as in-depth interviews, observations, and document reviews, data was collected from research participants selected from identified target groups using purposive, convenience, and snowballing sampling. The data collected was analysed using thematic analysis and simple frequencies. The results obtained revealed that the factors that hindered public participation in the ESIAs of the five case projects included inadequate public awareness, low literacy and education levels among affected community members, poor timing of ESIA meetings, long distances to meeting venues, and absence of incentives for participation. Other factors were lack of political will, and absence of guidelines on public participation in ESIAs. The implication for these findings is that infrastructure projects are being implemented without due consideration of impacts on local communities. Moreover, ESIAs are seemingly conducted merely as a requirement for project approval, and not as a tool for identifying potential environmental and social impacts and corresponding mitigation measures to ensure project sustainability. Thus, this study recommends that comprehensive guidelines for public participation in ESIAs be developed to assist project developers in the administration of public participation. Additionally, there is a need for strong political will at local and national governance levels.

Keywords: Public participation, ESIA, community, Zambia

1. Introduction

Over the past two decades, the Government of the Republic of Zambia (GRZ) has undertaken many infrastructure projects ranging from socio-economic to industrial projects supported by local and foreign project proponents alike. GRZ has also devoted itself to formulating policies and laws that provide an

[1]Lecturer, School of the Built Environment; Copperbelt University; P. O. Box 21692, Kitwe; alicesuzyo@gmail.com
[2]Environmentalist/Biology teacher, Luangwa Secondary School, P.O. Box 42, Luangwa District, Lusaka Province; vin.chiona@gmail.com
[3]Lecturer, School of the Built Environment; Copperbelt University, P. O. Box 21692, Kitwe; xolisk@yahoo.com

enabling environment for such investments such as the Environmental Management Act (EMA) (GRZ, 2011). The Copperbelt Province has also received a fair amount of major infrastructure projects (Phiri, 2011). However, while it is required to allow for public participation in Environmental and Social Impact Assessments (ESIAs) (GRZ, 1997), initial investigations revealed there was hardly any public participation in the ESIAs of several major projects despite indications of potential significant environmental and social impacts (DH Engineering Consultants 2013; 2014; Mwata Consultants, 2013; Freestop Environment Services Limited, 2015). Therefore, the study sought to find out the factors that hindered public participation in ESIAs of development projects in the province.

2. Literature Review

2.1 Understanding Public Participation in the Context of ESIAs

Public participation is the involvement of individuals or groups of people affected by or interested in "a proposed project, program, plan, or policy that is subject to a decision-making process" (Andre, et al., 2006, p. 1). Renn, et al. (1995) viewed it as a forum for exchange organised for facilitating communication between government and other stakeholders about a specific decision or problem. Since the 1990s, the concept of public participation in development projects has gained so much momentum in development practice that it is widely accepted as an important strategy of development (Cornwall, 2006). Regarding ESIAs, public participation is a process by which project proponents consult with communities to be affected by proposed projects in their areas before making a decision to proceed with the said projects (Rowe & Frewer, 2004). Thus, public participation provides a two-way communication and collaborative problem-solving system where better and acceptable decisions are made for the benefit of affected communities and project proponents (Dietz & Stern, 2008).

The drivers for public participation have mainly been the need for people for whom development is intended to have a voice and a choice (Cornwall, 2006), and meet their development needs (Mansuri & Rao, 2013). Furthermore, public participation affords communities fair representation in decision-making processes compared to the top-down model of development where decisions are made at the top and just handed down over to communities for implementation (Richards, et al., 2004; Reed, et al., 2006). Public participation can take place at various levels in the project duration including at the ESIA level. In ESIAs of infrastructure projects, public participation is an important component that must be incorporated at all stages in the ESIA process. According to Glasson and Therivel (2019), public participation begins from project screening through to auditing of predictions and mitigation measures. An ESIA is a process meant to inform environmental decision-making in the initial stages of planning by evaluating possible environmental impacts and proposing plans to mitigate these impacts before projects commence (Hickey, et al., 2010). ESIAs for development projects began in the 1960s in the United States of America, which developed its first National Environmental Policy Act (NEPA) in 1969 (Wood, 1995). NEPA's influence has extended to over 100 countries globally that now use the ESIA as a key tool for environmental protection and management (Noble, 2009).

The importance of an ESIA for any development project with significant identifiable impacts cannot be overemphasised. Most projects tend to alter not only the physical environment but also interfere with the social and economic fabrics of areas where they are implemented. Consequently, many scholars are concerned with issues of environmental quality, environmental management and sustainable development regarding development projects (Colby, 1991). Some believe that there is a nexus between infrastructure and environment. In this regard, the Independent Evaluation Group (2007, p. 1) explains that "the

infrastructure-environment nexus addresses the challenge of meeting the demand for infrastructure services while maintaining or improving the quality of the environment." Moreover, consistent with the principles of good governance, any project with potential impacts on environment is required to have an ESIA component that establishes the extent of these impacts, and how to mitigate them (Glasson & Therivel, 2019).

2.2 Challenges Facing Public Participation in ESIAs

Literature review shows that there are several obstacles to public participation in ESIAs. Firstly, Affected and Interested Persons (IAPs) lack access to necessary information on proposed projects and therefore, they fail to participate (Walker, 2012). Secondly, the language used for information dissemination may not be understood by many IAPs that may have low levels of education and literacy (Fraser, 2005). In such cases, public participation seems to be a process for the 'educated' that can read and understand complex ESIA documents (Doelle & Sinclair, 2006). Thirdly, some ESIA facilitators lack experience in ESIAs and fail to conduct ESIA activities with the required standards and rigor, and ultimately fail to explain the nature of the projects, their expected impacts and mitigation measures. This results in lack of confidence among the IAPs towards ESIAs (Rottmann, 2013). Lastly, IAPs may only be involved in ESIAs quite late in the process (Elliott, 2014). At this stage, it is rather very difficult to have their input into the project as most key decisions have already been made (Rottmann, 2013).

2.3 Public Participation in the ESIA Process in Zambia

2.3.1 Legislative background

The Government of the Republic of Zambia (GRZ) passed the first law called the Environmental Protection and Pollution Control Act (EPPCA) to address environmental concerns in 1990. The EPPCA was followed by Statutory Instrument (SI) No. 28 of 1997 that provided for Environmental Impact Assessments (EIAs) and Environmental Project Brief (EPB) for major projects and minor projects, respectively (GRZ, 1997). The SI defined major projects as those projects likely to cause significant impacts while minor projects were those likely to have less significant impacts. It also provided for public participation in EIAs and EPBs of proposed projects to allow IAPs to participate in decision-making processes. In 2011, the enactment of the Environmental Management Act (EMA) repealed the EPPCA (GRZ, 2011). That same year, the Zambia Environmental Management Agency (ZEMA) formulated the ESIA process that is followed to date and also categorised major stakeholders in the ESIA process as primary and secondary stakeholders (ZEMA, 2011). Primary stakeholders include project proponents, planning authorities and ZEMA, while secondary stakeholders include the public and all IAPs (Ibid, 2011). However, in the ZEMA ESIA process public participation is treated as a fifth and standalone stage coming after all major decisions have been made (see Figure 1).

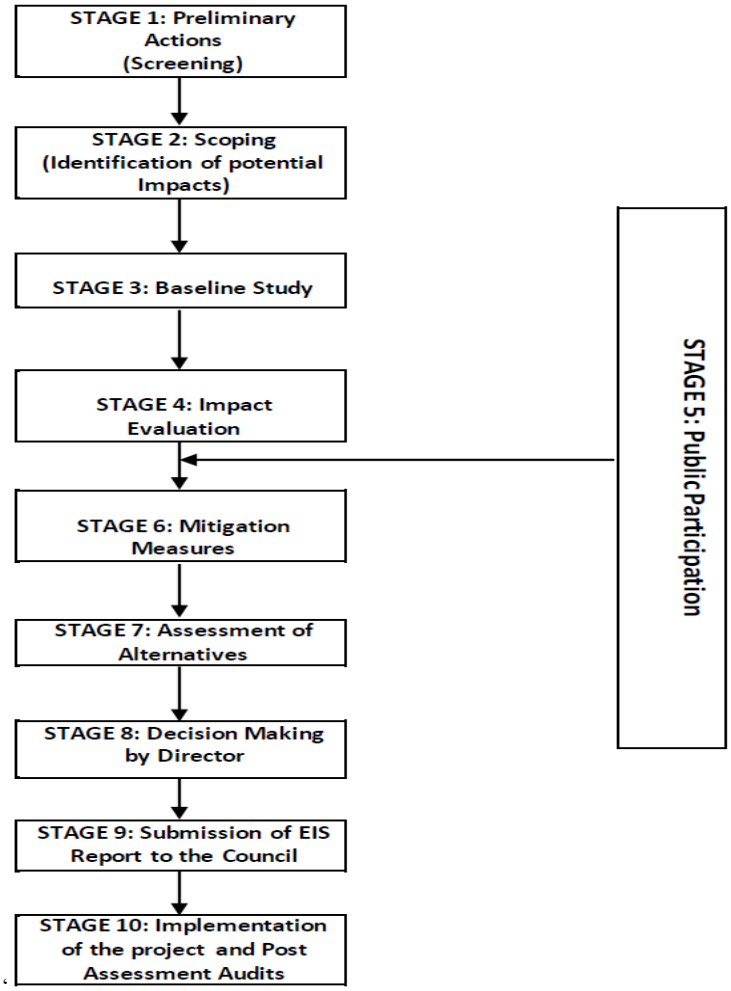

Figure 1: The ESIA Process and Public Involvement in Zambia (Source: ZEMA, 2011; GRZ, 1997)

2.3.2 Case Study Projects and Public Participation in the ESIAs

The Copperbelt Province is a mineral-rich province endowed with mineral resources such as copper, cobalt, and emeralds, among others. It also has vast farming lands across its ten districts. Like other provinces in the country, the province has had a fair share of major infrastructure projects among which are the five case study projects namely the Copperbelt International Airport (CIA) in Ndola, Freedom Park, and Mukuba Malls (Kitwe), the Park Mall (Chingola), and the Shoprite Complex (Chililabombwe). Evidence reveals that despite the potential environmental and social impacts that these projects presented, four of these projects recorded considerably low public participation in ESIAs against population of residents in the projects areas while one did not have any ESIA (See Table 1). For instance, Mukuba Mall recorded only 21 participants out of 6,086 (0.33%), Freedom Park Mall had 78 out of 6,086 (1.28%), Park Mall 25 out of 7,999 (0.31%). Although the CIA project managed to have several different meetings with affected people, the numbers of participants for each meeting were very low to represent a population of approximately 8,000 people. As for the Shoprite Complex, there were neither records of an ESIA or EPB having been conducted nor meetings held whatsoever.

Table 1: Public Participation in the ESIA processes of the Case Projects

Participants	First Meeting		Scoping Meeting		Consultative/ Disclosure Meeting		Public Hearing		Expected Number	Area population
CIA Project	100	5%	135	6%	338	16%	267	13%	2,097	7,987
Mukuba Mall	-	-	21	21%	13	13%	-	-	100	6,086
Freedom Park Mall	-	-	-	-	78	39%	-	-	200	6,086
Chingola Park Mall	-	-	-	-	25	48%	-	-	52	6,080
Shoprite Complex	-	-	-	-	-	-	-	-	-	6,158

Source: Compiled from DH Engineering Consultants (2008; 2013; 2014); Freestop Environment Services Limited (2015); Mwata Consultants (2013)

3. Methodology

This study adopted a qualitative exploratory approach to identify the factors hindering public participation in ESIAs of development projects in the Copperbelt Province (Creswell & Creswell, 2018). The choice to use a case study design enabled the study to investigate the phenomenon in natural settings (Yin, 2018). Five cases (projects) considered large by Statutory Instrument No. 28 standards were considered in the study (see Section 3.1). Six target groups were identified and these included ZEMA as regulatory authority, project proponents, Provincial Resettlement Office, local councils, Environment Specialists, and Interested and Affected Persons (IAPs). Seventy-three (73) research participants were selected. Six (6) participants were drawn from the first five target groups using purposive sampling and were engaged in in-depth interviews (see Table 2). The remaining sixty-seven (67) participants were selected from the IAPs target group using convenience, and snowballing sampling, respectively. Snowballing was applied to select participants from among former Chichele residents who had settled in different areas after being displaced by the CIA project. Of the 67 IAPs chosen, twenty-five (25) were engaged in individual in-depth interviews, while the remaining forty-one (41) were part of six focus groups comprising three groups of former Chichele residents consisting of two groups with six (6) members each and one group with five (5) members, two Chingola groups of eight (8), and nine (9) member groups, respectively, and one Kitwe group of seven (7) members (see Table 2). The research also involved the use of observation (mostly visual) method to understand the situation, interactions of the people and the physical setting that could not be obtained from interviews (Saunders, et al., 2016). Moreover, the research also reviewed secondary documents ESIA reports, scoping and consultative meetings minutes, attendance reports and other similar documents to obtain information regarding ESIA activities on the identified case projects (Creswell & Creswell, 2018). Data gathered from in-depth, and focus group interviews, observations, and document reviews were analysed thematically following a rigorous process of transcriptions, familiarization and evaluation, and coding of data, and finally identification and categorization of themes.

Table 2: Target Groups, Sampling methods, Respondents, and Methods of Collecting Data

Target Group	Sampling Method	No. of Respondents	Method of Collecting Data
Project Proponents	Purposive	1	In-depth Interviews
ZEMA	Purposive	1	In-depth Interviews
Local Councils	Purposive	2	In-depth Interviews
Environment Specialists	Purposive	2	In-depth Interviews
Interested and Affected Persons	Convenience	48	In-depth Interviews, Focus Group Interviews
Chichele Residents	Snowball	19	In-depth Interviews, Focus Group Interviews
Total		**73**	

4. Results and Discussion

The study revealed several major factors that contributed to low public participation in the ESIA process of four of the five case projects, and these are consistent with those identified in literature as main challenges contributing to low public participation (see section 2.2). Firstly, the long distances to the venues of ESIA meetings prevented the participation of Interested and Affected Persons (IAPs) in the ESIAs of the case projects. Most respondents could not attend ESIA meetings because venues were far from their homes, which required some form of transportation to and from the meetings, as one Chingola male respondent explained:

> *The organizers must ensure they provide transport to ferry the people to and from the venue ... Someone cannot come all the way from Kapisha and go back on foot.*

Similarly, A ZEMA official also noted that long distances to venues created a barrier to public participation as he explained in the following quote:

> *8It's not good when the people affected are in say Masala and you bring the meeting to the Civic centre, it means you are putting a barrier on time and distance.*

As a way of meeting the problem for future meetings, one Environmentalist suggested as follows:

> *It is advisable that such meetings take place in the communities where the project will be carried out. The venue must be convenient for all to access.*

Secondly, there was inadequate publicity of ESIA activities in project areas and this resulted in many IAPs not knowing about the projects. This is consistent with Walker's (2012) observation (see section 2.2) Consequently, they missed meetings where important matters were discussed. Many respondents claimed that they were not aware of the ESIA activities as one Kitwe female resident explained:

> *Most times we simply see things happening…there is lack of information about the meetings organized by the local authority.*

Another Kitwe resident, a male respondent explained as follows:

> *They* [project sponsors] *must be announcing continuously so that we become aware…we need constant reminders on these developmental issues… even for one month so that people do not give an excuse that they were not invited or informed.*

Thirdly, consistent with the findings of Fraser (2005) (see Section 2.2) many IAPs had low education and literacy levels that could have possibly affected their participation in ESIA processes. Of the 67 IAPs interviewed (see Table 2), 24 (35.8%) and 31 (46.3%) IAPs had primary and secondary school education, respectively while only 19 (17.9%) had tertiary level education (see Figure 2). Evidence shows that where the ESIA activities were publicised, only English was used as a medium of communication. Although some IAPs indicated having a basic level of education, they could not even read consent forms they were required to sign before starting interviews. Clearly, low education and illiteracy levels among IAPs affected their participation in ESIAs. It is one thing to publicise ESIA activities in affected areas but it is another thing how this information is disseminated to ensure that all IAPs access the necessary information in the format they understand.

Table 3: Gender Composition of the IAPs

Project Name	Participants		Total
	Male	Female	
Shoprite Mall	3	5	**8**
Park Mall	24	3	**27**
Mukuba/Freedom	12	2	**14**
CIA Project	14	4	**18**
Total	**53**	**14**	**67**

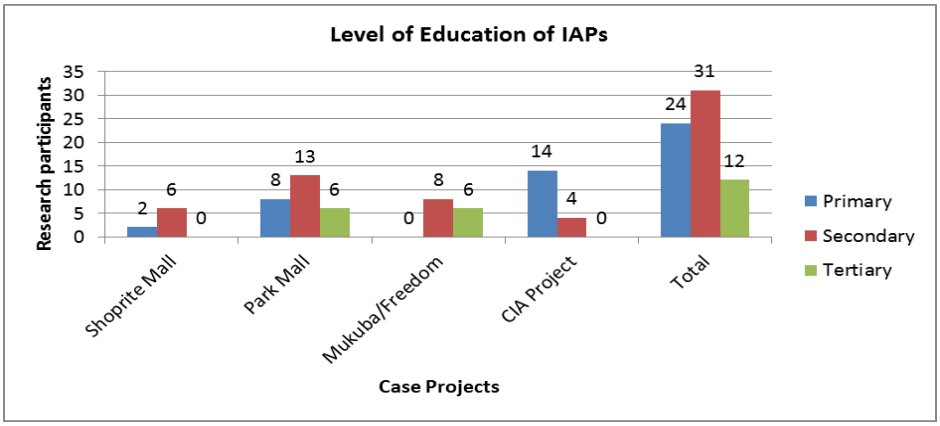

Figure 2: Education levels of Interested and Affected Persons

Fourthly, there was a general lack of interest in the projects because of the manner in which the ESIA processes had been handled. Seemingly, decisions to approve projects had already been made, and IAPs were only needed as social approval stamps since they were only made aware of the projects during the consultative and disclosure meetings (see Table 1). As one Kitwe male resident explained:

Sometimes the local council sits down with… few influential and educated figures [people] *and approve the projects and just arranges for a consultative meeting for people to hear about the project… they just want a basis to claim they informed the residents about the project.*

This claim was supported by another male resident who explained that:

Most times you find that most people who participate in these projects are politicians so someone like me who is not interested in politics but purely in business am forced not to participate.

Similarly, some IAPs felt that the decision to build the CIA project was already made, and no amount of negotiations would have prevented Chichele residents from being displaced. Hence, it was problematic for them to attend and contribute to meetings where decisions had already been made. This finding resonates with Elliott (2014) who identified the late involvement of the IAPs as a hindrance to their participation in ESIA. The fifth major hindrance to public participation in ESIAs was lack of political will. Government seems to have failed to handle former Chichele residents as Internally Displaced Persons (IDPs) in accordance with the National Resettlement Policy (GRZ, 2015) and the African Union (African Union, 2010, p. 12) that requires that IDPs be provided "to the fullest extent practicable and with least possible delay, with adequate humanitarian assistance" that include access to food and shelter, health, education, water and sanitation, and other such services. Although GRZ promised all these services to the IDPs, seemingly it did not fulfil these promises. Firstly, GRZ demonstrated a lack of political will by failing to attend the first meeting for the CIA project held in Chichele to explain to matters of resettlement and compensation. Secondly, it has resettled some IDPs in areas already occupied by other settlers. This has resulted in conflicts that have prevented the IDPs from building housing and hence, have opted to live in tents (see Figure 3). One male IDP had this to say regarding the conflicts that ensued with old settlers:

They brought the police officers from Kamfinsa when the wrangle was at peak but the police officers have now gone back, things seem to be calm, for us we are better others have not even put up structures but living in tents and some have abandoned the farms because of fear.

Figure 3: Former Chichele resident living in a tent in resettled land

Lastly, the IDPs have been resettled in new areas that lack basic social amenities, as shown in the following quote from a former Chichele male resident:

Water is a challenge, the water pump they installed is dry [see Figure 4]*... So for now instead of waiting I have dug a well...*

Similarly, another male resident complained as follows:

> *There is no transport here; we walk for more than 3 hours going to the roadside for transport. You should bring a school here; you* [government] *are the ones who brought us here. The soil is sandy and … the harvest isn't very good … we need more fertilizer.*

Figure 4: Dried up newly installed borehole in one of the resettlement lands

Moreover, despite government having promised to build houses for the IDPs, evidently, at the time of the study government had not only not compensated most of the IDPs monetarily but also failed to build them the promised houses, as the quote from one former Chichele male resident shows:

> *We were promised and told that the way you are leaving the schools, churches and clinics here that is how you will find them where you are going (new resettlement area) but up to this time they have not provided anything.*

GRZ's lack of political will was confirmed by a senior ZEMA official who explained that some government officials did not see the need for public participation in ESIAs in the following statement:

> *There are still some people even in government that do not understand why we endorse the ESIA and its inclusion in the Law. So if people in government offices do not understand, what about the common citizens? They may not appreciate the purpose of the ESIA.*

The sixth factor hindering public participation was poor timing of meetings. Many IAPs (71.6%) indicated they were involved in informal economic activities such as subsistence farmers especially in the case of former Chichele residents (see Figure 5). Therefore, when given short notices for meetings some of them opted to attend to their various economic activities rather than attend ESIA meetings. A Kitwe male resident explained as follows regarding poor timing of meetings:

> *Sometimes they announce very late when people have no time, so the local councils must inform the people on time so that we have enough time to prepare and submit our views on the projects.*

Similarly, another male resident succinctly explained as follows:

> *You know, nowadays people are busy looking for money like me and don't have time to sit down and listen to presentations which sometimes do not benefit them directly. … Sometimes it is the way information reaches the people; you find that information comes late when people have some other commitments somewhere else.*

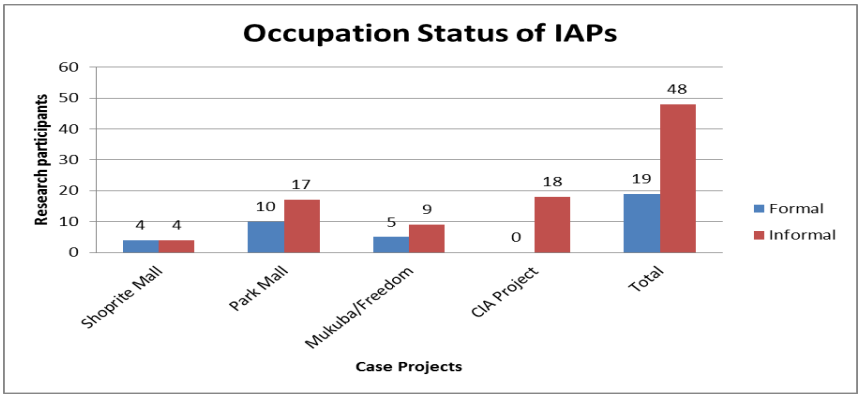

Figure 5: Occupation status of Interested and Affected Persons

Seventhly, incentives seemed to be another factor that affected public participation especially for the CIA project. Since scoping, consultative and public hearing meetings were held away from Chichele, a promise of transport to and from the meeting venues and food seemed to attract many people. As can be seen from Table 1, the number of participants improved slightly from that of the first meeting. However, in the public hearing meeting the number of participants falls slightly because at this point, members of the community learnt that the jobs that had been promised on the project might not materialise. Hence, some of the constant participants in the ESIA meetings felt disappointed and shunned the meeting. The quote below from one Environmentalist explains this scenario:

> *People who might have participated in a particular project but were not paid anything, tend to ignore future meetings. So if the project is being implemented in the village the developer can buy Munkoyo for the people as part of motivation. Although the law does not specify this incentive but it's an initiative.*

On addressing the issue of incentives, a male respondent from Kitwe stated as follows:

> *When people are provided with transport that is when they can even participate in numbers. Because people are lacking transport… And, others go with hunger thinking they will find food, so food provides an opportunity for people to attend, transport and food can be the main enticement for people to attend.*

Lastly, absence of guidelines on public participation in the ESIA has proved to be a major obstacle to public participation. For instance, since public participation exists as a standalone stage in the ESIA process (see Figure 1), it means that project proponents could easily forego it. This seems to be the case for the Chililabombwe Shoprite Complex project that had neither an ESIA nor EPB (see Table 1). Because public participation is 'deemed' an insignificant component of the ESIA, project proponents may decide to incorporate it only as a means of acquiring a social license. This also means that they could strategically choose meetings to which to invite public participation. This scenario is evident in the cases in the Mukuba, Freedom Park, and Chingola Park Malls projects where public participation is excluded in the first, and scoping meetings (see Table 1).

5. Conclusion

This study sought to find out the main factors that hindered public participation in ESIAs of infrastructure projects in the Copperbelt Province. Evidence from the five case projects showed that there was indeed hardly any public participation in ESIAs because of many factors. These included lack of access to necessary information, low education and literacy levels among IAPs, long distances to venues of ESIA meetings, and general apathy of the public to public meetings. Other factors were lack of political will, poor timing of meetings, inadequate incentives, and lack of guidelines on public participation in the ESIAs. One of the implications for policy and practice is that absence of or inadequate public participation in ESIAs entails that projects are being implemented without regard to the socio-economic facets of local communities. Next, the fact that public participation is a standalone stage in the ESIA process means that the public is delinked from ZEMA as the regulator, and project proponents. This situation allows project proponents to fail to fulfil their 'promises' while ZEMA takes a backstage position on following up on mitigation measures. Consequently, ESIAs seem to be conducted merely as a requirement for project approval. Public participation in ESIAs is very important and must be incorporated at all stages in the ESIA process. This can only be achieved when ZEMA develops comprehensive guidelines for public participation in ESIAs.

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Towards Improved Public Private Partnerships in the Delivery of Sustainable Infrastructural Projects

Kahilu Kajimo-Shakantu[1] and Ncedo Cameron Xhala[2]

Abstract

This study examines factors affecting the implementation of public private partnerships (PPP) particularly the identification of success factors aimed at enhancing knowledge and delivery in public infrastructure investment and development especially in developing countries. The study adopted a case study approach including expert interviews to collect empirical data. The main findings include the identification of three core success factors of public-private partnerships implementation ranked as follows: 1st ranked core factors were legal and regulatory frameworks, technical feasibility studies and public servant's readiness, 2nd ranked factors were risk allocation, monitoring and evaluation and 3rd ranked factors were decision-making, project procurement, cost benefit analysis, public institution readiness and in-house technical skills. The findings showed that public decision makers require comprehensive public-private partnerships knowledge, because these arrangements are characterised by inherent conflicts and opportunistic behaviours, which require to be well managed and/or mitigated in order to optimise their implementation. The study concludes that when public-private partnerships are appropriately structured with reasonable incentives, they can contribute to economic, financial, social, environmental and technological benefits. This study makes a contribution by identifying and examining core success factors which can improve public-private partnerships implementation and provides useful insights into ways to optimise PPP implementation.

Keywords: Developing countries, public finance, infrastructural projects, investment and development, public-private partnerships

1. Introduction

The global economic trends which are characterised by periodic fluctuations deplete public-sector funds and widen infrastructural financing gaps (Airoldi et al., 2013). Over time, public private partnerships (PPP) have increasingly emerge as suitable public options which contribute to fiscal stability in various countries especially in public infrastructure investment and development (Xhala and Kajimo-Shakantu,

[1] Head of Department, Department of Quantity Surveying and Construction Management, University of the Free State, P.O. Box 339, Bloemfontein, SA Kajimoshakantuk@ufs.ac.za
[2] Doctoral Graduate, Department of Quantity Surveying and Construction Management, University of the Free State, P.O. Box 339, Bloemfontein, SA ncedox833@gmail.com

2018). While PPP bear similar characteristics to loans offered by a group of lenders, they represent a special discipline characterised by discrete subsets of syndicated lending (Kahwajian et al., 2014).

It is important that the public sector blends the financing of public infrastructure development with sustainable approaches and techniques that attract the private sector in the financing of public infrastructure (Gurara, 2017; Feremo, 2015). The financing mechanisms and models need to be complementary and efficient to enhance the implementation of PPP (Della-Crose and Yermo, 2013). However, the implementation of PPP require numerous legislative frameworks, as well as policy and regulatory reforms to increase the successful delivery of projects (Weihs-Raabi, 2012). Numerous challenges which confront European countries are similar to challenges facing the African continent, especially South Africa (Weihs-Raabi, 2012). Deau and Touati (2014) indicate that the public sector's view of PPP include a number of benefits namely; better costing, improved construction, better risk management, reduced operational and maintenance costs and improved project delivery. While PPP are important instruments characterised by economic benefits, some criticise the implementation thereof (Lewis and George, 2014; Valila, 2005).

Limited knowledge of PPP heightens the criticism of public infrastructure investment and development as a sustainable financing instrument (Natarajan, 2015; Natarajan, 2007). Nataraj (2007) highlights that outdated information or knowledge of PPP centres around incomplete information, which compounds the misunderstanding in public infrastructure investment. Several studies, such as those of Della-Croce and Yermo (2013) and Ehlers (2014) indicate the positive and negative benefits of PPP. The need for holistic knowledge on PPP is compounded by increasing criticism and resistance to public infrastructure investment due to inadequate knowledge (Lewis and George, 2014; Valila, 2005). This study sought to examine factors which affect the success of PPP in order to enhance knowledge in the financing of public infrastructure investment and development and possibly improve PPP outcomes.

2. Assessment of PPP in Public Infrastructure Investment

The Asian Development Bank Institute (2011) indicates that PPP accelerate because of limited public finance and numerous restrictions that constrain public infrastructure investment. Yamout and Jamali (2007) highlight that public policy instruments such as PPP emerged globally during 1990, signalling a courteous alternative approach to privatisation. Edwards, and Shaoul (2003) claim that PPPs are implemented by various governments due to intolerable privatisation of public assets. Globally, governments consider PPP as alternative financing methods that are suitable in the long-term financing of public infrastructure (Kulasingam, 2012). PPP illustrate "the sharing of risks [wherein] governments retain asset control in retrospect to privatization" (Mutandwa, 2015:118).

PPP implementation in developing countries is increasing due to lower productivity and suboptimal cost recovery strategies (Zhou, 2012; World Bank, 2009). The developing countries' experiences show that public finance is adversely affected, and PPP are considered alternative financing mechanisms (Zhou, 2012). As shown in developed as well as developing countries such as Australia, UK, Germany, Indonesia and Nigeria, PPP are marred by challenges of inefficiency and suboptimal pricing strategies (Harris, 2003).

The African Development Bank (2011:14) reports that PPP are financing mechanisms used to "attract finance, share the risks, mobilize technical expertise, the managerial know-how, a tool to avoid cost overruns and which is associated with the closing of the infrastructure deficit gap." In agreement, Ogunsanmi (2013) states that the Nigerian PPPs were driven by the increasing public infrastructure deficits, and economic growth and development objectives. Furthermore, Ogunsamni (2013) claims that the Nigerian PPP narrowed the public infrastructure investment financing gaps. The required Nigerian financing in public infrastructure capital averaged $19 trillion and was difficult to close (Ogunsamni, 2013). The global PPP stimulate governments' interest due to the rising public infrastructure capital expenditure (Hodge and Greve, 2008). HM Treasury (2013) indicates that in the UK, PPP experiences reflect a total volume of 600 PPPs that were implemented through the Project Finance Initiatives. The UK PPP averaged $100 billion in schools, roads, military equipment, bridges, and hospitals. The global increase in PPPs for health averaged $4 billion worth of contracts in 2010 (Carty, 2012). ADBI (2011:4) highlight that PPP in public infrastructure investment are associated with positive socio-economic growth benefits. Mutandwa (2015) articulates that PPPs positive spin-offs narrow public infrastructure deficits.

According to Romero (2015), the PPP experiences in emerging markets increased infrastructure investments that averaged $22.7 billion and S134.2 billion in 2004 and 2012. Furthermore, Romero (2015) reveals that PPPs increase economic growth prospects and increase public infrastructure investments and development. PPP experiences in matured markets are driven by low interest rates and stimulate investors' quest for more yields (Romero, 2015). Although PPPs implementation has increased globally, public infrastructure investment projects fell in 2013, averaging $84.4 billion (Romero, 2015).

For Roehrich et al. (2014), the numerous benefits of PPP in public infrastructure investment comprise cost savings, efficient use of resources, and economic consideration of public infrastructure projects. According to the IMF (2013), globally, various governments now realise that partnerships in public infrastructure investment are crucial to close the financing gap in public infrastructure investment. The IMF (2013:2) highlights that "investment in infrastructure is critical to achieve inclusive and sustainable growth; however, governments face significant capacity constraints in financial and technical terms." Notwithstanding, the growth of PPP in developing countries is attributed to fragile macro-economic climates, that stifle public finance in the area of public infrastructure investment (Hodge and Greve, 2008).

The implementation of public infrastructure investment through public debts and deficits, as argued in this paper, does not harness economic growth but constrains public finance in public infrastructure investment. PPP are favoured and advocated as alternative financing instruments championed by various scholars of public infrastructure investment (Aziz et al., 2012). However, PPP implementation has some limitations (Armstrong, 2005). In addition, despite limitations, PPP are considered suitable instruments that require improved understanding when considered in public infrastructure investment (Natarajan, 2015). The rationale is to ensure that PPP implementation is feasible as instruments in public infrastructure investment.

3. Methodology

The chosen methodology included two case studies namely; the KHI Solar One (case study 1 project) and the R4 Expressway (case study 2 project), with expert qualitative semi structured interviews as the primary methods for data collection. The case studies were chosen purposively as they were large enough, involving infrustructure development in road and transport and energy respectively and also involved various stakeholder partneships from both the public and private sectors. The nature of the projects in the case studies were suited to answer the research questions and provide valuable insights and lessons on PPPs and had project participants with reasonably extensive knowledge on PPPs and public project finance and development, which they were willing to share. Being an exploratory study, the data collection process was qualitative whereby the participants provided indepth accounts of public private partnerships implementation which were supplemented by the analysis of case study documents. An interview guide was used in the two selected two case studies with seven experts who had extensive knowledge of public and private infrustracture investment project implementation of in South Africa and Czech Republic respectively, ranging from 10–24 years. Participation was voluntary and participants‘ consent was obtained. Annonymity and confidentiality of participants were assured. Each interview took over an hour to complete and the collected data were analysed qualitatively using emerging themes. Atlas.ti software package was used to manage, store and retrieve data. The emergeing themes were coded and similar factors grouped together using the same colour as shown in Table 1. The themes were further analysed and some of the key findigs are presented and discussed in the following section.

4. Findings

The core success factors of PPP are indicated in Table 1. Table 1 also shows the differences and similarities and inter relatedness between the two analysed case studies and the expert interviews. As indicated in the methodology above, these are highlighted by a colour coding system where the same colour denotes the same factors across the data set.

From Table 1, a number of core factors that can enhance successful implementation of PPPs in public infrastructure investment were developed as indicated in figure 1. In Figure 1, the most important core PPP success implementation factors were ranged by the frequency of responses and ranked from the highest frequency to lowest. As indicated, the core PPP success factors are ranked from 1 to 5, with the highest coverage of responses on factors ranked first and the least coverage ranked fifth. The ranking order first means highest ranked core PPPs success factors while fifth rank means the lowest ranking of core PPPs success factors. The following section presents the findings from the first ranking to the fifth ranking.

Table 13: Findings from cross tabulation of Case Study 1 and 2 and Case Study Interviews

Research Question	Case Study 1 (Document analysis)	Case Study 2 (Document analysis)	Case Study Interviews (A and B)
RQ1: What are the core PPPs' success factors?	Project management knowledge Technical knowledge and skills Monitoring and evaluation Risk allocation Decision making Political will Shared authority Innovative technology Economic, environment, social and technical benefits Feasibility studies Affordability Cost benefit analysis Bankability Legal framework Methodological support Presence of financing institutions Willingness to implement PPPs Open, transparent and competitive tendering	Land acquisition Specialised technical skills Project management knowledge Strong financial markets Partners financing capacity Competitive bidding and tendering Economic and social benefits Risk allocation Long-term strategic vision Cost benefit analysis Technical feasibility studies	Risk allocation Good partnerships Shared objectives Matured legal framework Land acquisition Strong private sector presence Technical feasibility studies Cost benefit analysis Affordability Value for money Contract management Strong political will

Source: Authors' own compilation (2019)

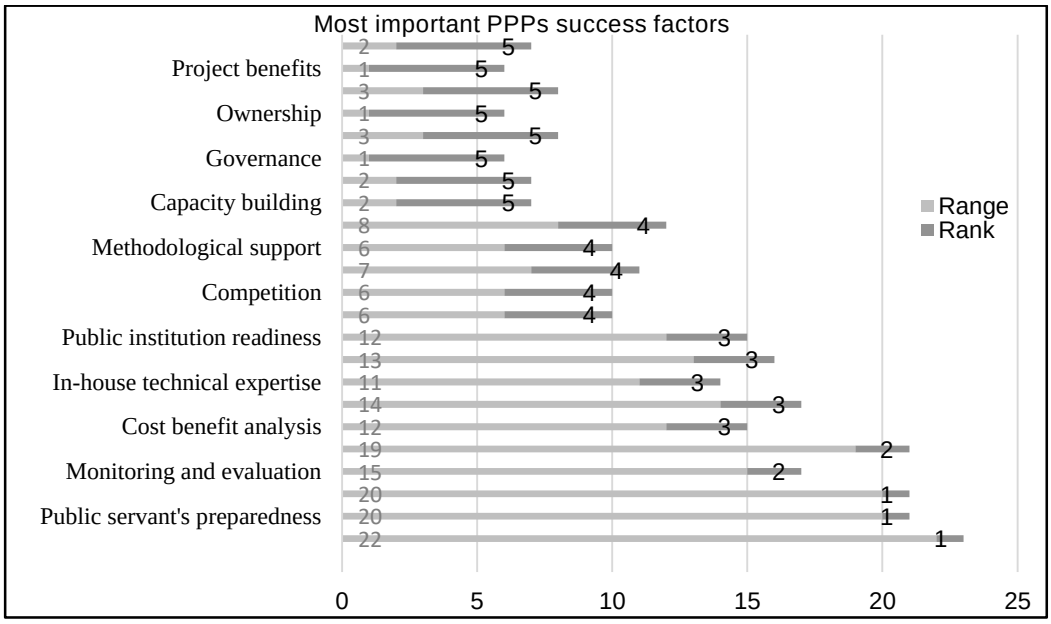

Figure 1: Most important PPPs success factors by range and rank (Source: Author's own compilation 2019)

It was important to understand the core success factors which enhance PPPs implementation in public infrastructure investment. In analysing the findings from Table 1, the important PPP success factors were further ranked from 1 to 5 and the highest coverage of responses on factors is ranked first, while the least coverage is ranked fifth. Only the first three ranked success implementation factors are discussed in this paper under section 5 below.

5. Discussion

5.1 Legal and regulatory framework, technical feasibility and public servants' readiness

The first ranked core PPP success factors symbolise the first core requirements that PPP need to realise the successful implementation in public infrastructure investment. The findings revealed that legal and regulatory frameworks were the predominant factors that PPP require in order to develop stable institutions that adequately manage and control PPP transactions effectively. This has to be the case also because of the complexity of PPP, long-term contractual nature and the requirement to remedy any dispute that arises out of contracts through the courts of law. It is therefore important that the countries in which PPP are implemented should have sound legal and regulatory frameworks that enable the functioning of PPP. Tadmalla (2015), Li and Akintoye (2013) and Tang et al. (2010) demonstrate the importance of improved legal and regulatory frameworks in PPP implementation to improve their success in public infrastructure investment. As found in the study, other first ranked core factors include technical feasibility studies and preparedness of public servants. The study's reference to technical feasibility studies refers to public servants having the technical skills to perform cost benefit analysis studies and to determine the costs of PPP projects into fiscus. Findings further demonstrated the importance of feasibility studies as core to the realisation of PPPs projects.

It was further found that it is vital to identify PPP projects that fit the PPP scheme, to determine the PPP projects' viability and affordability, and to demonstrate that public servants have the necessary technical, legal and project management skills to implement PPP projects. Findings revealed that successful implementation of PPP in public infrastructure investment lies in public servants' ability to understand the appropriate legislative and regulatory framework that guide PPP implementation. Findings suggested that it is extremely difficult to realize PPP success without these first ranked important core success factors as the foundation to successful realisation of PPP projects. The findings suggest that it is necessary to have well-defined legal and regulatory frameworks that will ensure harmonised PPPs implementation.

The first ranked important core PPP success factors symbolise the foundation of interaction and cooperation between partners that are bound by regulations. Findings revealed that the legal views serve to control the opportunistic behaviour of agents to implement projects according to agreed terms of the contract. Findings also demonstrated that PPP are long-term contracts which require legal and regulatory prescripts that serve to minimise opportunistic behaviours among the parties when PPP are in place. Findings imply that since PPP in public infrastructure investment are characterised by conflicts and opportunistic behaviours, legal regulations serve to avert 'holdups' when PPPs are implemented. Findings indicated that the legal principles state the requirements of technical feasibility studies to be conducted to demonstrate the feasibility of PPPs projects in public infrastructure investment. Thus public-sector officials need to have all the project information and select agents on the basis of better information to

avoid increases in transactional costs. Findings revealed the significance to understand the legislative and regulatory frameworks in PPPs, as indicated by some responses that there is a *"need of general law, but it is logical that the law must be very general, but of course each PPPs project are different" (P). "The understanding of legal and regulatory framework is important when administering and managing PPPs contracts" (M).*

5.2 Risk allocation, monitoring and evaluation

The second ranked important PPP success factors symbolise the next core requirements of PPPs in order to improve the successful implementation in public infrastructure investment. It was found that monitoring and evaluation, and risk allocation were the predominant factors identified and ranked as second factors important to PPPs successful implementation. These factors indicate the need to adequately allocate risks to the best partner within the PPP framework. This also means that the private partner must be prepared and able to manage the allocated risks while the public sector manages the risks that can be best managed by them. This finding further suggests that it is not necessary to allocate and transfer all the risks to the private partner except the ones that the public sector is unable to manage. It was also found that monitoring and evaluation are important core PPPs success factors because PPP projects require efficient and effective monitoring and evaluation to enhance the successful delivery of PPPs projects. These findings highlight the importance of careful consideration of risk allocation, monitoring and evaluation of risks in mitigating the failure of PPP projects in public infrastructure investment.

Findings further demonstrated that risk allocation should be understood as a primary requirement when PPP are considered during the various stages of planning, design, construction, and implementation. The findings are consistent with Mbele (2010) who demonstrates that it is important to allocate and manage technical risks, economic risks, financial risks, and implementation risks in PPP implementation. Findings indicated that the public-sector decision makers are bound to understand risks that would create conflict by averting any financial, implementation, project, environmental, performance and technical risks to improve PPP projects success. It was found that it is important to understand the role of monitoring and evaluation and to undertake effective monitoring and evaluation practices that lessen or control the risks in order to avert opportunistic behaviours. Findings suggest that the monitoring and evaluation practice should describe and define quality, measure and monitor quality. As Li and Akintoye et al. (2013) suggest, continuously checking quality is consistent with monitoring and evaluation practices and a requirement that enhances the control and monitoring of risks in PPPs.

5.3 Decision making cost benefit analysis, procurement and in-house technical expertise

The third ranked important PPP success factors symbolise core requirements that PPP need to meet in order to improve the successful implementation in public infrastructure investment. It was found that cost benefit analysis, decision making, in-house technical skills, project procurement, and public institutional readiness were predominant factors identified and ranked third core factors which are important in PPP successful implementation. These findings highlight the success factors in public infrastructure investment especially during the initial PPP stages whereby decision makers are required to undertake costs benefit analysis studies. The findings resonate with the assertion of Leahy (2005) that it is important to quantify PPPs cost savings in public infrastructure investment projects, due to numerous increases in

PPP project implementation. These studies demonstrate the return on investment and affordability, and need to meet value for money principles as important implementation requirements.

It is assumed and argued that knowledgeable and experienced public servants have the potential to mitigate opportunistic behaviour of agents when tasked with the delivery of public infrastructure investment projects. The IMF (2009) demonstrates that the private construction firms' delivery outputs need to conform to expected terms of contracts with throughput quantity, specific benchmarks, and timing, while government controls the private construction firms' performance. Findings suggest that public servants with knowledge and experience should be involved in PPP projects and need to identify gaps in information that the agent may withhold from public-sector decision makers and mitigate those. Findings identified that this process will ensure the readiness of public-sector institutions which possess full information of projects and control opportunistic behaviour of agents. Findings further suggest that linked to core success factor one, public servants in institutions which are ready to roll out PPPs in public infrastructure investment should be incentivised to stimulate extra performance by monitoring and evaluating the activities of the agents with project delivery. Having in-house technical skills and project control may contribute to minimising opportunistic behaviour of agents resulting in yielding better positive results in project implementation.

6. Conclusion

The study endeavoured to examine factors which affect the implementation of private public partnerships especially relating to important success implementation factors of PPP in public infrastructure investment and development. The findings highlighted three core success factor groups ranked first, second and third respectively. Strong and sound legal and regulatory frameworks are crucial for the improvement of PPP implementation. From the findings, monitoring and evaluation, and risk allocation also emerged as important factors in ensuring sustainable PPP in infrastructure investment. Thirdly, decision making, cost benefit analysis, in-house technical skills, project procurement, and public institutional readiness were also highlighted as critical in the quest towards improving infrastructure investment via PPP. Public-sector decision makers need to make appropriate decisions about the implementation of PPP in public infrastructure investment projects.

The study highlights that adequate institutions with competent and technical savvy public servants are likely to make optimal decisions that reduce the transaction costs in PPP implementation. Strategic decision making does not only affect public sector implementation capability, but also affects private sector agencies. Public servants are required to possess basic technical skills in finance, project management, contract management, procurement management, and public-sector infrastructure delivery of projects as these in-house technical skills enhance the successful delivery of PPP when considered in public infrastructure investment. The study concludes that appropriate structuring of PPP coupled with reasonable incentives hold the potential to contribute to socio-economic, financial, environmental and technological benefits.

The study also recommends that public-sector officials need to structure appropriate PPP schemes that fit in with public infrastructure investment. Further, the public sector need to identify key success and failure lessons when implementing PPPs in public infrastructure investment projects. Both public and private sector actors should learn key lessons from failed PPP projects to increase successful implementation of PPPs. In addition, public sector officials need to stimulate political, bureaucratic, and methodological support and increase political will by delivering projects successfully by improving project management practices.

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Women's Entrepreneurship and Sustainable Livelihoods in Lusaka Urban

Atangambuyu Silungwe[1] and Wilson Silungwe[2]

Abstract

This paper stems from a study that investigated women's entrepreneurship and sustainable livelihood among small-scale women entrepreneurs in Lusaka Urban in Zambia. The study was important as it looked at women in Zambia, as important players in the growth of an economy as much as their male counterparts are. The study focused on women's potential involvement and contribution to economic growth and their quest to attain sustainable livelihoods at small scale level. Regardless of the perceptions towards women's role in the economies as important, there is inadequate literature particularly in the case of Zambia that directly identifies the link between women's economic activities such as women's entrepreneurship and sustainable livelihoods, especially at the small-scale level. The study also highlighted the intervening factors that render the quest for sustainable livelihoods unattainable among these women. The method of enquiry was both quantitative and qualitative approach in which focus group discussions, observations and questionnaire surveys were used as data collection tools. The overall findings of the study were that women's entrepreneurship did not lead to sustainable livelihoods among small-scale women entrepreneurs in Lusaka Urban due to several impediments that negatively affected their businesses' potential to the success. A number of recommendations from the study are listed and discussed that are aimed at guiding policy makers to create an enabling environment that will stimulate the growth and success of women's entrepreneurship in Zambia.

Keywords: Entrepreneurship, women entrepreneurship, small-scale entrepreneur, sustainable livelihood.

1. Introduction

This research investigated women's entrepreneurship and sustainable livelihoods among small-scale entrepreneurs in Lusaka Urban. Women's entrepreneurship has been recognized in most polities during the last decade as an important, but unexploited sub-sector that can profoundly contribute to the growth of any economy, according to Fetsch, Jackson and Wiens, (2015, p.1). Fetsch, Jackson and Wiens state that there is documented evidence from research that shows that women entrepreneurs potentially can create new jobs for themselves and others.

[1]Campus Director, Rusangu University, Lusaka, Zambia
[2]Executive Director, Zambia Institute for Tourism and Hospitality Studies

According to Tandrayen-Ragoobur and Kasseeah (2012, pp.12-40), entrepreneurship is the process of establishing, organising and managing an undertaking or business. The undertaking often carries with itself considerable risks Yetisen and others (2015, pp.3638-3660) suggest that the concept entrepreneurship has over the years attracted traditional definitions centred around the process of designing, launching and running new businesses, which predictably begin as small business entities offering products or services for sale or hire. Entrepreneurs conceive and start these business entities. Scott and Venkatraman (2000, pp. 217-226), however, attempt to deviate from the traditional definitions of entrepreneurship by suggesting that entrepreneurship actually is the "...capacity and willingness to develop, organize, and manage a business venture along with any of its risks in order to make a profit."

According to Croitou (2012, p. 2068), entrepreneurship has been identified as a major driver of economic growth in most parts of the world. Most economies around the world are creating entrepreneurial economies as part of public policy because there is convincing empirical evidence that suggests that entrepreneurship provides the necessary support to the economy through job creation, wealth creation and producing the necessary products to stimulate trade within and outside the country. Entrepreneurship is considered an important driver for economic development (Kritikos, 2014, p.1).

Although considered a recent phenomenon, women's entrepreneurship forms an important sub-sector within the larger entrepreneurship sector. It is, therefore, imperative to not only embrace women's entrepreneurship as an integral sub-sector within the overall entrepreneurship sector, but also to study the phenomenon. The need to investigate women's entrepreneurship emanates from two main reasons, and according to the OECD (2004, p. 5), they are the following:

1. Women's entrepreneurship has been recognized during the last decade as important, but untapped subsector that has tremendous potential to contribute to economic development within economies around the world.
2. The inadequate literature that covers women's entrepreneurship leads to the conclusion that society and academia (social sciences research) have cast a deaf ear towards women's entrepreneurship as a subsector and a discipline of study respectively.

This study, therefore, focussed on empirically investigating women's entrepreneurship and sustainable livelihoods as a way to meet the literature gap, while gaining an understanding whether women's entrepreneurship leads to sustainable livelihoods.

1.1 Objectives of the study

The overall objective of this study was to investigate whether women's entrepreneurship in Lusaka Urban are able to attain sustainable livelihoods. The focus was on the small-scale entrepreneurs. In investigating the possible correlation between the two identified variables, the types of entrepreneurial activities, factors motivating the choice for entrepreneurship, challenges women entrepreneurs face and whether these women entrepreneurs attained sustainable livelihoods from their entrepreneurial efforts.

2. Related Works

Several related studies were reviewed during the investigation of women's entrepreneurship and sustainable livelihoods.

2.1 Unveiling of profiles of women entrepreneurs in Mauritius: A study by Tandrayen-Ragoor and Kasseh

Tandrayen-Ragoor and Kasseh (2012, pp.12-40) conducted a study under the topic "Unveiling of profiles of women entrepreneurs in Mauritius". The overarching aim of the research was to examine the characteristics of women entrepreneurs and their activities so as to better implement policies aimed at encouraging women entrepreneurship in that country. The goal was to stimulate economic empowerment of families through empowering women because as the women attained economic empowerment through entrepreneurial activities, their families stood to benefit through sustainable living, which was having a stable family income.

The study concluded by stating that stimulating women entrepreneurship contributed to both economic and social inclusion. The study concluded by challenging governments around the world to create and implement projects to encourage women's entrepreneurship as a pathway out of poverty, as it was discovered in the study that women remain an untapped economic resource that had been under-utilized in most countries because of inherent discriminatory practices leading to gender inequalities. The study made a very strong business case for promoting women's economic development, entrepreneurship and enterprise in developing countries and in particular in a small island developing state like Mauritius.

Tandrayen-Ragoor and Kasseh further concluded that Mauritian women entrepreneurs were more likely to focus mainly on familiar activities and thus transferring into the same sectors of business ownership as what they were doing in the mainstream labour market sector.

2.2 Barriers of women entrepreneurs: A study in Bangalore Urban, India by Gayathridevi in India

A study conducted by Gayathridevi (2014, pp.24-30) aimed at identifying and evaluating the various constraints/barriers faced by the women entrepreneurs in the Association of Women Entrepreneurs in Karnataka and Karnataka State Women Development Corporation.

The study found that women not only faced barriers as entrepreneurs, but as women themselves. When compared with their male counterparts, women faced more problems. The problems of women ranged from mobilizing resources financial capital, marketing skills, sourcing raw materials, sales, labour, technical competencies, withstanding competition, adoption of new technology, electricity power cuts, lack of family support, lack of training, lack of awareness, lack of government support and so forth.

2.3 Problems faced by the rural women entrepreneurs in India by Manickavasagam and others

A study by Manickavasagam and others (2007, p.432) highlighted the problems faced by the rural women entrepreneurs in India. They further reviewed the steps government was taking in order to develop women entrepreneurship. The study was mainly based on secondary data. The researchers consulted with various published research papers in leading journals such as *The Southern Economist*. General information was

collected from different libraries. The researchers consulted some teachers teaching the subject and noted their views on the topic. A few rural women entrepreneurs were interviewed for their views on women entrepreneurship.

Some of the hardships women entrepreneurs encounter in India according to the findings from the study by Manickavasagam and others (2007, p.432) include: lack of female role models, inefficient marketing arrangements, socio-cultural barriers, lack of confidence, problem of financing, and negative self-perceptions.

The study revealed that the government did not have special training programmes for women entrepreneurs and no special financial assistance in the rural areas, though some NGOs are engaged in training of rural women entrepreneurs with different training programmes but no sufficient financial assistance is provided to them. Women, who have started business, find various challenges such as how best to sell their products as well as knowledge on how to competently run their businesses.

3. Research Design and Methods

The study design adopted was mixed in the sense that both the quantitative and qualitative design were utilised. This was important for purposes of triangulating and consolidating the findings.

The target population was women entrepreneurs within Lusaka Urban. Specific trading areas within Lusaka were, therefore, targeted and these were: Kamwala, Town Centre and Northmead markets where a questionnaire was administered and Woodlands and Chilenje markets where observations were conducted. The three trading areas were chosen because of their proximity to each other, making the work of data collection easy. This population provided the base for sampling respondents for the questionnaires, discussants for the focus group discussions and the targets for observations. The respondents for the semi-structured interviews were selected from the WEDAZ organisations on the basis that they are officials of the organisation directly concerned with the improvement of networks of women entrepreneurs.

A total of 120 women entrepreneurs were conveniently sampled as respondent for the questionnaire from the three markets identified. The choice for 120 respondents was on the basis of the assumption of representativeness especially that the markets do not have well maintained registers and thus sampling from the register would not be possible. Thus a total of 40 respondents from each market were selected. These were sampled conveniently on the basis of availability.

In addition to the 120 respondents selected to participate in the study, 24 women entrepreneurs were sampled from the few registered and regular members of the Women Entrepreneurs Development Association of Zambia (WEDAZ) to participate in the FGDs. The FGD discussants were sampled according to their availability and also ability to attend the discussions at a central place as this research did not have a budget for transporting discussants. The discussions took place in a comfortable conference facility and were organised in three (3) groups of eight (8) discussants each. The discussants discussed a wide range of issues on the subject of women entrepreneurship and sustainable living in Zambia.

With regard to observations, 50 women were observed during this study. The women were conveniently sampled for this purpose on the basis of availability. This researcher visited the markets and took time to observe the women that were available on the days the markets were visited. The findings of the observations are discussed in the chapter on findings.

Thematic analysis was used to analyse the qualitative data that was transcribed from the video recordings of the FGDs. Thematic analysis focuses on identifiable themes and patterns of living and/or behaviour which is organised into categories (Cooper & Schindler 2008, p.421; Neuman 2006, p.460). The data collected from the questionnaires were analysed using SPSS. Descriptive statistics as well a correlation coefficients were drawn analysing various variables.

4. Presentation and Analysis of the Findings

This study focused on the small-scale women entrepreneurs. The findings are now presented in the following categories.

4.1 Types of entrepreneurial activities

The findings from the study show that women entrepreneurs in Lusaka were inclined to trading food items more than any other type of merchandise. Statistics show that 80.8 per cent were involved in the trade of food items, while only 19.2 per cent were trading in non-food items such as cosmetics, medical supplies, household goods and so forth. The findings from the FGDs were not any different. Nineteen out the 24 women (79.1%) indicated that they were trading in food items, while 4 out of 24 women (16.7%) indicated that they were trading in non-food items. Only 1 (4.2%) ran a training facility where she trained women in various home-making skills such as housekeeping, cooking, baking and so forth.

Furthermore, from the observations, it was revealed that a total of 76 per cent (38 out of the 50) of the women observed were trading in food items such as beans, vegetables, fruits, fish, kapenta, mealie meal, sugar, salt, cooking oil, cassava and so forth while only 10 percent were trading in non-food items such as cosmetics, medicines, and so forth. Additionally, 8 percent were operating hair salons while 6 percent operated business centres where they did photocopying, printing, typing, selling mobile phone talk-time and so forth.

4.2 Factors motivating choice for entrepreneurship

It was learned in the interviews that 40.8 per cent had opted for entrepreneurship primarily due to the desire to make a decent profit that would help them live a better life, while a 59.2 per cent went into entrepreneurship out of interest in career with the view that it was a good occupation option. They stated that they had passion for entrepreneurship.

This researcher wanted to know if there were any respondents who had engaged in other occupations before embarking in entrepreneurship. From the responses collected, 82.5 per cent stated that they were engaged in other occupations before turning to entrepreneurship. From the 82.5 per cent, 57.6 per cent switched to entrepreneurship because they loved the idea of being entrepreneurs while 36.3 per cent stated that they opted for entrepreneurship with a view of making more money, than they were earning. Only 6.1 per cent indicated that they opted for entrepreneurship when they lost their employment.

The case of FGDs yielded similar information with regard to the factors that motivated women to opt for entrepreneurship. From the discussions, the women stated that they were prompted into entrepreneurship because of the need to meet material and financial needs that could not be fully met by their salaries alone. According to the statements from the women in the focus group discussions, the drive into entrepreneurship was for purposes of sustaining their lives and those of their family members because of insufficient salaries that they were getting from their regular jobs.

4.3 Challenges women face as entrepreneurs

This study sought to understand the challenges women entrepreneurs currently face in Zambia. The women shared some of the many challenges they face as they engage in their various entrepreneurial activities. Some of challenges faced by women entrepreneurs as revealed in the study include:

1. Lack of access to start-up capital,
2. Lack of business training/skills and experience,
3. Bureaucratic business registration systems and
4. Negative attitudes by society towards women in business
5. Inhibiting costs of inputs,
6. Gender issues in the entrepreneurial sector that has been considered a preserve for men,
7. Inadequate financial support from financial and government institutions.

4.4 Sustainable livelihoods

In order to attain sustainable livelihood, the five capitals of sustainable livelihood must be met. Serrat (2010, p.30) conceived the Sustainable Livelihood Pentagon to explain the five capitals.

1. Natural capital natural resource stocks (soil, water, air, genetic resources etc.) and environmental services (hydrological cycle, pollution sinks etc).
2. Human capital skills, knowledge, labour (includes good health and physical capability)
3. Economic or financial capital capital base (cash, credit/debt, savings, and other economic assets)
4. Social capital social resources (networks, social claims, social relations, affiliations, associations)
5. Physical capital Infrastructure (buildings, roads), production equipment and technologies)

In order to analyse the state of the economies of the individual women entrepreneurs' homes, data for their average monthly home incomes and expenditures were collected. Statistics show that the average incomes from the enterprises were as follows: In the questionnaire, the response categories ranged from K1,000 and below to K5,000 and above each month (the money is quoted in Zambian Kwacha). From the responses collected, 31 out of the 120 respondents (25.8 %) were earning below K1,000 a month from their businesses, while 45 out of the 120 respondents indicated that they earned between K1,000 and K2,000 each month from their businesses, representing 37.5 per cent of the responses. Six (6) out of 120 (5.0 %) were earning between K3,000 to K4,000 while 9 out of the 120 (7.5 %) were earning between K4,000 and K5,000 per month. A total of 20 out of 120 (16.6%) earned more than K5,000 a month from their businesses.

On the other hand, the findings show the following expenditure patterns in the homes: 53.3 percent (64 out of 120 respondents) spend less than K1,000 each month, while 20.8 percent (25 out of the 120 respondents) spend between K1,000 and K2,000 per month. Furthermore, 5 out of the 120 respondents (4.2 %) spend between K2,000 and K3,000 per month, while 13 out of the 120 respondents (10.8 %) spend between K3,000 and K4,000 per month. One (1) out of the 120 respondents (0.8 %) spends between K4,000 and K5,000 per month and a total of 12 out of the 120 respondents (10 %) spend above K5,000 per month.

A cross-tabulation of income from the business and household expenditure of the business income yielded the following results as an example: 96.8 per cent that earn below K1, 000 also had their expenditure at less than K1,000 a month. One household out of the 31 households (3.2%) earning less than K1,000, spent between K1,000 and K2,000 each month according to the data collected. The response implies that either the respondent did not understand the question or that the business was being heavily supplemented by other sources of income for the family. In both cases, it clear that the households in this category did not satisfy the financial capital on the basis of income of the business and expenditure at home. The findings show that the enterprises were not sustaining the livelihoods of the women as the businesses were not supporting fully.

A total of 26 households out of the 45 households (57.7%) that earned between K1,000 and K2,000 maintained their expenditure at less K1,000 a month. For the households earning between K1,000 and K2,000, it was learned that they also spent within the range of K1,000 to K2,000. This category totalled 19 households out of the 45 (42.3%). For the households that earned between K2,000 and K3,000 totalling nine households, one household (11.1%) spent less than K1,000 a month, five (55.6%) spent between K1,000 and K2,000, while three households (33.3%) had their monthly expenditure ranging between K2,000 and K3,000. Concerning the K3,000 to K4,000 monthly income range, one household (16.7%) out of the total six households spent less than K1,000 a month, another one (16.7%) spent between K2,000 and K3,000 while four households (66.6%) spent between K3,000 and K4,000 each month.

In the K4,000 to K5,000 monthly income category with a total of nine households, two (22.2%) out of 120 respondents indicated that their household expenditure was less than K1,000 a month, while six households (66.7%) spent between K3,000 and K4,000 a month. In addition, one household (11.1%) spent between K4,000 and K5,000. Twenty (20) households earn above K5, 000, according to the gathered data. Of the 20 households, four households (20%) spent below K1,000, one household (5%) spent between K2,000 and K3,000, three households (15%) spent between K3, 000 and K4,000 while 12 households (60%) spent over K5,000 a month. It was learned from the cross-tabulation table for instance that for those who spent up to K1,000 each month from their businesses, 30, earned up to K1,000, 26 earned up to K2,000, one earned up to K3,000, one earned up to K4,000, two earned up to K5,000 and four earned more than K5,000. This shows that more women were spending closer to what they were earning from their businesses. The lower categories of below K1,000, between K1,000 and K2,000 and K2,000 to K3,000 totalled 58 women out of 64 (90.6%) while the higher categories of between K3,000 to K4,000, K4,000 to K5,000 and above K5,000 totalled 6 out of 64 (9.4%).

It can be concluded from the statistics above that on the basis of income from the businesses, if it was the sole source of funds for home consumption, it would not suffice for sustainable living because almost all the households indicated that they had to supplement their income with other sources of income in order to survive. The revenue from the business was not enough. A similar trend is seen as far as other aspects of life such as affording paying school fees, medical bills, buying sufficient clothes and buying sufficient food. The businesses for the women can be considered unsustainable since a good percentage of the women were indicating that they could not afford these essential needs for their homes.

The narratives in the FGDs yielded similar findings. The findings of the FGDs show that the income from the businesses was not sufficient to sustain household expenditure. As far as possession of disposable income by the women to allow them to be bank some cash during a particular month, the statistics show that the majority, 36.7 percent, considered their income sufficient to allow them to save some money

every month while 63.3 percent stated that they were unable to save anything. This leads to the conclusion that as far as sufficiency of income to allow for saving of extra income is concerned, women's entrepreneurship was not leading to sustainable living since financial capital, an integral component of the Sustainable Livelihood Pentagon, was not satisfied.

Another test for sustainable livelihoods conducted was the ownership of physical capital. It was established by Serrat (2010, p.31) that ownership of physical capital/assets such as houses, land, heavy machinery, business premises and other such assets was evidence of sustainable livelihood because these assets were of a permanent nature and would sustain the owners for a long time. In the questionnaire administered, respondents were asked to state whether they owned the house they lived in, the business premises they operated from and whether they owned a car. The following statistics were gathered: 80 out of 120 respondents (66.7%) indicated that they did not own the house they lived in, instead they rented it while 40 out the 120 respondents stated that they owned the house they lived in, representing 33.3 per cent. In order to make sense of the statistics and in order to house ownership was cross tabulated with the average income in order to see the trends of house ownership as it relates to income levels.

A similar test was conducted on the ownership of the premises at which the women operated their businesses. The responses show that a total of 39 out of the 120 respondents (32.5%) who participated in this study indicated that they owned the premises where they operated their businesses. Eighty one respondents (67.5%) stated that they did not own the premises. The study further tested the relation between the two variables by cross tabulating income with ownership of business premises where the entrepreneurs operated from in order to observe the distributions regarding the two variables.

The findings show that 81 out of 120 respondents (67.5%) did not own the premises from which they operated their shop. This is in contrast to the 39 out of 120 respondents (32.5%) who indicated they owned the shop they operated in. This test yields the result that leads to the conclusion that women's entrepreneurship in Zambia does not lead to sustainable livelihood since the most women do not own physical capital. Cross-tabulating the two variables, income and ownership of premises leads to the conclusion that income of the business does not necessarily determine ownership of the premises.

In further testing for ownership of physical capital, respondents were asked to indicate whether they owned a car. As Serrat (2010, p.31) suggests, ownership of assets is a demonstration of sustainable living. A car is useful for sustainable living as it assists in many areas especially in easing transportation challenges as the women entrepreneurs do their business. The distributions show that: Only seven out of 120 respondents (5.8%) owned a car. 113 out of 120 respondents (94.2%) did not own a car. It is clear that the ownership of physical capital in this instance was not satisfactory and thus it is easy to see that women entrepreneurship was not leading to sustainable living.

From the findings shown so far, it can be concluded that women entrepreneurship does not lead to sustainable living because most of the women in the study indicated that they did not own physical capital.

Respondents were asked whether they were able to invest their money into other projects and business activities that would advantage the family economically. The responses show that 59 out of 120 respondents (49.2%) stated that they were investing while 61 out of the 120 respondents (50.2%) stated that they were not. Cross tabulations were conducted to further see the distribution of those who invested as opposed to those who did not in relation to income.

Another aspect of this study investigated sustainable living in relation to ownership of social capital, which according to Serrat (2010, p.30) was one of the hallmarks needed for one to enjoy sustainable living. Social capital is ability to relate with family both nuclear and extended family, as well as other social relations. One way in which people relate is through support for each other. This researcher was interested to find out whether there was a correlation between income and ability to support members of the extended family. Statistics show that 81 out of the 120 respondents (67.5%) were able to support their extended family members in one way or the other while 39 out of the 120 respondents (32.5%) were unable to support their extended family members. These statistics show that most women are able to support their families, in a way demonstrating ownership of social capital.

As far as the women entrepreneurs' perceptions of profitability of their businesses were concerned, the findings show the following: 83.3 per cent considered their businesses profitable while 16.7 per cent considered their businesses unprofitable. The responses collected from this test were absurd since the majority of the women were giving the clear responses that their businesses were unprofitable. It became necessary at this juncture to test whether there was a correlation between average monthly income and perceptions of profitability. Cross-tabulation was conducted to see how the income variable matched with perceptions of profitability variable. The objective was to see whether those who earned a little more considered their businesses profitable as compared to those who earned less. In the income bracket of K1,000 and below, 24 per cent of respondents stated that they considered their businesses profitable.

In the income bracket of between K1,000 and K2,000, 35 out of 120 (29.1%) stated that they considered their businesses profitable, while 9 considered their businesses unprofitable. In the income bracket of between K2,000 and K3,000, the 9 out of 120 (7.5%) respondents stated that they considered their businesses profitable, while none considered their businesses unprofitable. In the income bracket of between K3,000 and K4,000, three (2.5%) stated that they considered their businesses profitable, while the other three considered their businesses unprofitable. In the income bracket of between K4,000 and K5,000, all the 9 (7.5%) respondents considered their businesses profitable. In the income bracket of K5,000 and above, all the 20 (16.6%) respondents considered their considered their businesses profitable.

4.5 Relating Findings to Reviewed Literature

The case of women entrepreneurs of Mauritius as studied by Tandrayen-Ragoor and Kasseh (2012, pp.12-40) was that the majority of the women (39.39%) were in the 31-34 age category while another 40 per cent were in the age bracket of 45 to 59 years. This in a way contrasts with the Zambian scenario where the women entrepreneurs were younger, predominantly in the 21 to 30 age category.

When comparing the cases of Mauritius and Zambia as far as marital status was concerned, Mauritius, with 81.6 per cent of the women in small scale entrepreneurship being married, scores far less than Zambia with 52.2 per cent of women entrepreneurs who are married. The education attainments recorded related results between Zambia and Mauritius. Majority of the women in both jurisdictions were in the high school category. What is also clear is that most women in both jurisdictions are did not have college level training, therefore, did not have any specialised profession.

Literature shows that the women entrepreneurs of Mauritius mainly engaged in the garment industry. Statistics show that around 29 per cent of women entrepreneurs were in garment making while 21.7 per cent were in handicrafts and jewelry. The other 19.6 per cent were in the manufacturing of food products. The choice of business for most women was in line with their previous work, where the small enterprise of the female entrepreneur was just an extension of their previous activity where she was the employee or in activities which she has some prior knowledge (Ayres-Williams & Brotherton, 1999, pp.107-113).

The findings from the study show that women entrepreneurs in Zambia were inclined to trade businesses, particularly food related items. Statistics show that 80.8 per cent were involved in the trade of food items, while 19.2 per cent were trading in non-food items such as cosmetics, medical supplies, household goods and so forth.

The FGDs yielded similar results with 79.1 per cent of the women indicating that they were trade sector. It could be concluded that factors prevailing in a country or community dictate the choice of entrepreneurial activity that the women engage in. In the case of Mauritius, the majority of women opted for the garment industry because most of the entrepreneurs worked within that industry before, while the women of Zambia opted for trade related businesses because that sector was easy to engage in and did not need much capital to start.

There are several examples from the reviewed literature that describe the factors that motivated the choice for entrepreneurship among women from different jurisdictions. In the case of the United States of America, for instance, several examples can be sited. It is also clear from the reviewed literature that the women entrepreneurs in the case of America were engaged in different trades which include the service industry such as media and catering (in the case of Martha Stewart) and beauty products (in the case of Mary Kay Ash). In the case of women entrepreneurship in Zambia, factors motivating choice for entrepreneurship included the desire to make a decent profit that would help them live a better life, while others opted for entrepreneurship out of interest in the career with the view that it was a good occupation option. They stated that they had passion for entrepreneurship.

Other studies within Africa reveal the following challenges that women in Africa face according to Dejene (2006, p.3), women have higher labour burden as compared to men, women's high illiteracy rate also limits the types of vocational and skills training they can be offered, women entrepreneurs concentrate in less lucrative industries, women in the mainstream labour market are concentrated in the personal services and retail industries thus transferring into the same sectors of business ownership from the mainstream labour market sector seems like an obvious transition.

The case of Zambia is not too different. Small-scale women entrepreneurs struggle with lack of access to start-up capital, lack of business training/skills and experience, bureaucratic business registration systems and negative attitudes by society towards women in business. Other peripheral challenges faced by women entrepreneurs include inhibiting costs of inputs, gender issues in the entrepreneurial sector that has been considered a preserve for men, lack of financial support from financial and government institutions.

A study conducted by Kabir and others (2012, pp.265-280) dealt with the impact of small-scale agricultural entrepreneurship on livelihood of rural poor women of Bangladesh and the role of NGOs to develop women's living standards in that country and control over the resources. The study concluded by confirming that that most of the entrepreneurs in rural Bangladesh had improved their socio-economic conditions through small-scale entrepreneurship. Entrepreneurship in the livestock sector was

significantly associated with financial, physical and social capital. Vegetables entrepreneurship had significant co-efficient with natural and physical capital. Fisheries entrepreneurship was also significant and positively associated with human capital.

The findings of the study of Bangladesh showed that semi intensive entrepreneurs have benefited the most. They also show that the role of NGOs, micro credit and training program have great impact on entrepreneurs livelihood patterns and developed living standard. Moreover, poor livelihood assets, vulnerabilities and weak transforming structures and process are identified as constraints for sustainable livelihoods of entrepreneurs and associated groups. It is, therefore, necessary to provide institutional, organizational, and government support for sustainable small scale agricultural entrepreneurship.

From the study done, there is evidence to suggest that women entrepreneurship in Zambia does not lead to sustainable living as most women showed and explained on the challenges they faced and at the same time the failure of their businesses to make better income and more revenue.

5. Recommendations

The study findings provided information regarding the four the following:

1. Types of entrepreneurial activities women engage in
2. Factors that motivate choice for entrepreneurship
3. Challenges that women entrepreneurs face in Zambia
4. Women's entrepreneurship and sustainable livelihood.

From the findings of this study, the following recommendations are proposed:

1. As the findings of this study show, a lot should be done to improve women's entrepreneurship in Zambia. For instance, the Government of Zambia must empower micro-financing organisations to be able to extend their financing services to small-scale enterprises especially those operated by women in order to assist them have reasonable capital to invest in their business ventures. It was learned in this study that most women lack capital to be able to boost their businesses.
2. Policy makers such as government must create knowledge centres where women entrepreneurs, as well as men, especially those running small scale businesses, can go and learn technical skills of entrepreneurship. It was observed in this study that a large group of entrepreneurs luck entrepreneurial skills.

6. Conclusion

This research was investigating women entrepreneurship and sustainable livelihood among small-scale entrepreneurs in Lusaka Urban district. The focus of the study was trading. It is evident from the information collected and presented that women entrepreneurs in Zambia are motivated by certain factors to engage in entrepreneurship as an occupation, that the women face certain challenges that impact negatively on their efforts to succeed as entrepreneurship, but above all that women's entrepreneurship does not lead to sustainable livelihoods in Zambia because of the factors that have been raised. Policies that support women entrepreneurship must be formulated in order to motivate more women to engage in entrepreneurship. These should include deliberate financial support as well as provision technical skills

and knowledge in entrepreneurship and enterprise management so that the women can run these business ventures profitably.

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Empirical Analysis of Investment Strategies on the African Content: International and Domestic Market

Agape Kapasa[1]

Abstract

Africa is a changing continent. Although it is home to some of the world's most impoverished nations, over the last ten years Africa has seen tremendous economic growth and many organizations contributing to this change. International development organizations and governments alike are seeking the best ways in which to accelerate these accomplishments to achieve the Millennium Development Goals. As such, this study seeks to update the literature on the effects that two of the largest foreign funding mechanisms have on the development of the continent. Foreign direct investment (FDI) inflows to the continent reached $42 billion dollars in 2011, while official development assistance (ODA) amounted to approximately $50 billion. FDI, however, has seen rapid growth since the early 2000s, while ODA has been climbing slowly since post-World War II. The study examines the core that both FDI and ODA have on the United States Development Programme's Man Development Indicator. It finds significant differences between Low-income countries in Africa and Lower -centre, Upper berth -middle, or High income countries in Africa, as classified by the World Bank. In Low-income countries, ODA has a negative impression on the Human development index (HDI), while FDI has an ambiguous effect. On the other hand, in Lower-middle, Upper-middle, or High income countries, FDI has a positive and significant impact on the HDI, while ODA's impact is negative. The termination indicate that FDI has been more effective in achieving development, while Low-income countries require internal changes to benefit more from foreign capital of any type.

Keywords: Domestic market, foreign direct investment, international market, investment strategies.

1. Introduction

Africa is a rapidly changing continent. Home to some of the globe's fastest growing economies, the youngest population, and a booming private sector, much of the literature and statistics on Africa have become outdated in the last decade. Annually, almost $100 billion dollars flow in to the continent from foreign governments or investors in the form of Official Development Assistance and Aid (ODA) and Foreign Direct Investment (FDI). ODA "consists of disbursements of loans made on concessional terms (net of repayments of principal) and grants by official agencies of the members of the Development Assistance Committee (DAC), by multilateral institutions, and by non-DAC countries to promote economic development and welfare in countries and territories in the DAC list of ODA recipients,"

[39] Texila American University, Zambia

(World Bank, 2013). ODA consists of three types of capital: grants, concessional loans, and contributions to multilateral institutions including the United Nations, the World Bank, the International Monetary Fund, and regional development banks (Soubbotina, 2000).

"Official aid alone will not be adequate for funding efforts to accelerate economic growth and poverty alleviation and other Millennium Development Goals (MDGs) in Africa," (Ratha, Mohaptra, and Plaza, 2008, p. 2). As such, this study includes FDI as a primary independent variable in addition to ODA. Much of the literature indicates that it will be an important resource for Africa in order to meet development goals. This is explored further in the literature review.

FDI "are the net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments," (World Bank, 2013). FDI has grown on average 17% per year over the last 10 years, even when accounting for dramatic decline after the Global Financial Crisis. ODA, on the other hand, has grown at about 10% per year over the last 10 years. FDI is becoming a more popular and more common source of foreign capital for African governments.

With the United Nation's Millennium Development Goals (MDGs) to halve poverty drawing near the 2015 deadline, non-governmental organizations, development banks, development institutions, and governments are seeking to diversify their capital offerings and optimize them for results. As such, it's pertinent to understand the impact both FDI and ODA have on development and poverty alleviation in the African context, where over 400 million people continue to live in extreme poverty despite recent economic advances.

The goal of the study is to better understand the impact of each capital source and improve the decision-making of investors, development agencies, multilateral institutions, and other programs focused on providing capital to African nations. In the case of development agencies and other mission-driven organizations, improved decision-making for funding can create more successful program outcomes. For investors, improved decision-making can help companies enjoy the benefits of profitability and positive stakeholder impact. Furthermore, the results will also provide insight for African governments seeking to better understand what internal factors can increase the nation's ability to reap any benefits associated with FDI and ODA inflows.

The research questions are:

1. Does FDI increase development in Africa?
2. Does ODA increase development in Africa?
3. Are there differences in development outcomes based on national income classifications?

For the purposes of this study, poverty alleviation is synonymous with increases in development, both economic and human. These questions seek to understand the effects of FDI and ODA's impact on poverty alleviation and development increases, as measured by changes in the United Nation Development Programme's (UNDP) Human Development Index (HDI). The HDI is a composite, "single statistic which serves as a frame of reference for both social and economic development," according to the UNDP. It is a "new way of measuring development by combining indicators of life expectancy, educational attainment and income," (United Nations Development Programme, 2011).

The study uses the UNDP's measurement of HDI as a proxy for development for many reasons. There have been previous studies on FDI and ODA's effects on development in Africa, but few have used the HDI. A study by Bezuidenhout (2009) analyzed the impact of FDI and ODA on development, but used GDP growth as a proxy. Due to income disparity, this is likely an unsuitable reflection of development in Africa, especially at the bottom of the economic pyramid. Bezuidenhout did not find significant results with regard to ODA's impact on GDP growth, but found that FDI has a negative impact on GDP growth (2009). Masud and Yontcheva studied the effects of ODA in 2005, but used literacy and infant mortality as dependent variables. They found that ODA, when separated as NGO aid, reduces infant mortality (Masud and Yontcheva, 2005). Their results on ODA's impact on illiteracy were inconclusive. This does not provide enough insight in order to make a conclusive statement on ODA's impact on development. Further, the analysis was not exclusive to Africa.

The HDI, which captures quality of life, access to knowledge, and the standard of living, is an improved composite measure for all three of the dependent variables used by Bezuidenhout (2009) and Masud and Yontcheva (2005). The study conducted by Gohou and Soumaré was the first to use the UNDP's HDI as the dependent variable, however they did not include ODA data (2011). This thesis seeks to build on each of these by using FDI, ODA, and HDI data by contributing new findings to the literature.

This thesis addresses the following research question: Do FDI and ODA increase development in Africa, and how does the influence vary by national income classification? The analysis tests the effects of the independent variables – FDI and ODA – on the dependent variable, a composite measure of development status, the UNDP's HDI. The thesis progresses with a detailed review of the relevant literature on FDI and ODA in the African context as well as reasoning for using the HDI. A description of the method and sample follows. Finally, a presentation of the results precedes the discussion of implications for practice, along with limitations of the study and suggestions for future research.

Africa: A Changing Continent In the yesteryear , researchers have analyzed the effect of foreign direct investment (FDI) and official ontogenesis aid (ODA) independently on poverty reduction. Few stress specifically on Africa, a continent that "clay under researched" (Asiedu, 2004). Due to the speed at which the continent is development and changing economically, any existing research regarding development has become outdated over the last five to tenner -spot years. For this reason, the report focuses specifically on FDI and ODA's impact on development and poverty alleviation in Africa alone. The continent as a whole has experienced astounding GDP growth rates: "a third of countries in the region will be growth at or above six per centum," (Chuhan-Pole, Angwafo, Buitano, Dennis, Korman, and Sanoh, 2012). The International Monetary Stock predicts that African nations will claim seven of the ten fastest growing economies throughout the next decade (The Economist, 2011). In addition to unprecedented economic growth, there are trends in culture and line of work that affect the way the continent receives and uses foreign cap. Globalization, Privatization, and the liberalization of trade are trends in business organization that have dramatically increased the flow of FDI into the continent (Asiedu, 200quadruplet). An exceptional example is the rapid growth of the information and communicating technology sector, largely due to the privatization of the industry. Since 2002, mobile phones per century inhabitants in Africa have increased from two to almost sixty by 2011 (World Bank , 2013). The population is not only growing , but also shift . By 2040, there will be 1.1 million African of working eld and L % of the total population will be sustenance in cities by 2030 (Roxburg, Dörr, Leke, Tazi-Riffi, van Wamelen, Lund, Chironga, Alatovik, Atkins, Terfous, Zeino-Mahmalat, 2010). As citizen move out of rural areas and away from

agrarian lifestyles, utilisation in the industry and service sector will acclivity and likely propel many families to centre course of study condition.

The growing middle class securities industry segment represents a potentiality spending power of $1.4 trillion by 2020, up from $860 billion in 2008 (Roxburg, et al., 2010), piquing global interest in both world and private sector. Telecommunications troupe and consumer packaged goods retailers are eager to compete for a sizable dowery of the potential market. Famously, Nokia and Coca-Cola are two of the best-recognized brands on the continent (Ledgard, 2011). Global consumer packed goods companies like Carl August Nielsen and IRI are competing to get a share of the consumer data and are investment heavily to do so. 7 Looking Ahead Many global organizations are prioritizing poverty easing in Africa over the next decade. In 2001, the United Res publication announced the Millennium Development Destination, which galvanize "unprecedented efforts to meet the needs of the world's poorest," (United Carry Nation , 2001) with a set of eight time Synonyms/Hypernyms (Ordered by Estimated Frequency) of noun bind aim . The targets include the reduction of "poverty, hunger, disease, and lack of adequate shelter and exclusion – while promoting grammatical gender equality, health.

Foreign Direct Investment and Official Ontogenesis Assistance in Africa For many decade, ODA was the primary source of upper-case letter that development delegacy provided to developing countries. However, there has been a lack of obvious progress along with strong scrutiny of the use and management of help one dollar bill. Therefore, development agencies are looking to diversify how their dollars are spent, especially in Africa.

National development aid arrangement, as well as non-governmental organizations and multilateral organizations, are reconsidering traditional aid and development assistance and are diversifying their capital letter offerings, particularly with investing in the buck buck private sector. For example, members of the Inter-American English Ontogenesis Coin bank, such as the Multilateral Investment Fund and the Inter-American Investment Group, have been established to make direct equity investments in private business (Inter-American Development Bank, 2013). In addition to the desire for diversification, an overall increase in capital is needed for the achievement of the Millennium Development Goal to be feasible. In order to halve poorness in Africa, NEPAD predicts that 7% yearbook outgrowth in the neighborhood 's Gross domestic product is required from 2001. Unfortunately, despite some impressive economic growth in some individual nations, the neighborhood as a whole is not growing fast enough. As such, there is a resourcefulness break of 12% of the continent 's GDP, about $64 billion, that is preventing the possibleness of halving poverty by 2015 (NEPAD, 2001). It is predicted that much of that resource gap will be filled with foreign direct investment capital flows (Asiedu, 2004). FDI brings many welfare, and due to its increasing front in the African economy, will be a key player in Africa's economic growth. On the other manus, ODA, popular since the 1970s, has slowly climbed over the past four X but now risks being outpaced by FDI permanently. See Figure 1 to comparability the growth of the majuscule flows since 1970.

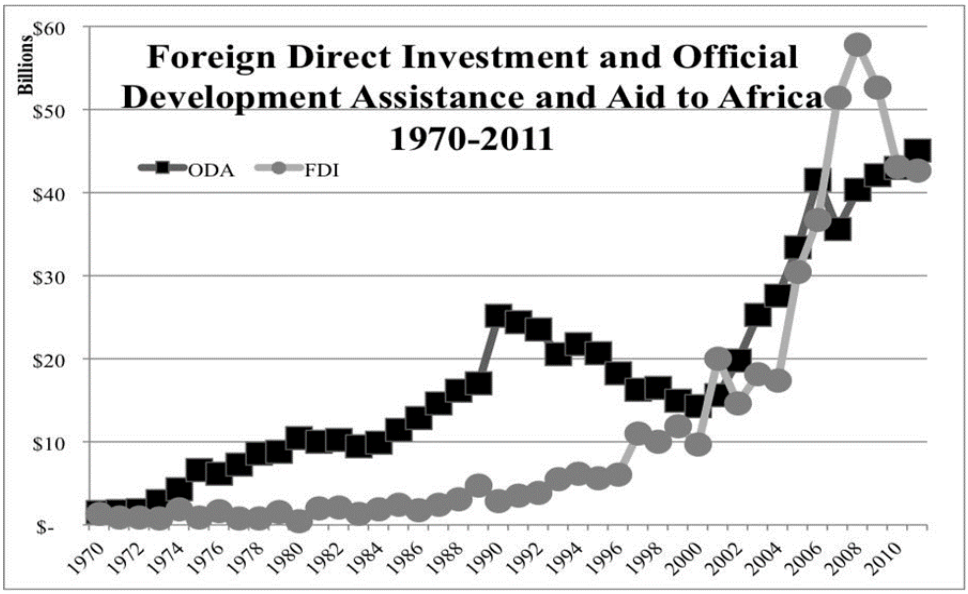

Figure 1: Foreign Direct Investment and Official Development Assistance and Aid to Africa, 1970-2011

Official Growth Assistance ODA has been the "main source of external financing for growth commonwealth" since Human Race War II (Soubbotina, 2000). For context, it's important to promissory note that grants make up the majority of financial aid capital flows (Soubbotina, 2000). This capital source represents the share of public politics around the public to developing 10 countries. ODA inflows to Africa have been increasing slowly, almost reaching $L billion in 2010 (World Bank, 2013). Help clam are field of study to scrutiny due to the reputation for putrefaction in recipient countries. Some say that ODA has largely been ineffective and has left gazillion remaining in abject poverty.

The misallocation and misuse of developing assist investment firm is often the culprit. In Holocene tenner, tie musical arrangement were introduced to prevent misdirection. Tying arrangements are solidifying of consideration, such as those that require "recipients to purchase goods and services from the donor country or from a specific group of countries," (Soubotina, 2000). However, this "may reduce the value of aid if the arrangements are motivated by a desire to benefit suppliers of certain countries and that may prevent recipients from buying at the lowest price," (Soubbotina, 2000).

With a large act of caveat tied to ODA inflows, its effectiveness has been the topic of a figure of field of study. The literature finds conflicting evidence on the macroeconomic shock of ODA on economic and human development, and the literature is further muddied by the use of different measurement for development amplification or poverty reducing. For example, the International Monetary Fund published a study on the upshot of official development aid on infant death rate and literacy as proxies for human development (Masud and Yontcheva, 2005). Masud and Yontcheva discovery that ODA has no significant impact on gains in literacy, while some forms of segmented ODA reduce infant mortality in developing countries around the world (2005).

2. Data and Methodology

The Cosmos Bank's African Development Indicators, the Human Development Report of the UNDP, the United Body Politic Conference on Business deal and Development, and the Freedom House are the main data origin for this research to perform panel arrested development analyses. Sampling The sample is an unbalanced panel data set. It includes data for 52 African countries for the years ranging from 1980-2011. The data are divided into two groups, based on the World Bank's Income Classification Rankings as of June 30, 2012. Due to the lower levels of ontogenesis on the African continent, the countries are split into two groups in order to maintain significance in the data. Twenty-six of the countries in the sample are classified as Low-income, meaning that 144 National Income (GNI) per capita is $1,025 or less as of 2012. The remaining portion of the sample are Lower berth - middle-income, Upper-middle income, and in the font of Equatorial Guinea, High 16 income, all with GNI per capita of $1,206 or greater as of 2012 (World Bank, 2012).

Table 1: Countries in the sample

Group 1 (GNI per capita $1,025 or less)		**Group 2 (GNI per capita $1,026 or greater)**	
Country	**World Bank Income Group (22)**	**Country**	**World Bank Income Group (22)**
Benin	Low	Cameroon	Lower-middle
Burkina Faso	Low	Cape Verde	Lower-middle
Burundi	Low	Congo, Rep.	Lower-middle
Central African Republic	Low	Cote d'Ivoire	Lower-middle
Chad	Low	Dijbouti	Lower-middle
Comoros	Low	Egypt, Arab Rep.	Lower-middle
Congo, Dem. Rep.	Low	Ghana	Lower-middle
Eritrea	Low	Lesotho	Lower-middle
Ethiopia	Low	Morocco	Lower-middle
The Gambia	Low	Nigeria	Lower-middle
Guinea	Low	Sao Tome & Principe	Lower-middle
Guinea-Bissau	Low	Senegal	Lower-middle
Kenya	Low	Sudan	Lower-middle
Liberia	Low	Swaziland	Lower-middle
Madagascar	Low	Zambia	Lower-middle
Malawi	Low	Algeria	Upper-middle
Mali	Low	Angola	Upper-middle
Mauritania	Low	Botswana	Upper-middle
Mozambique	Low	Gabon	Upper-middle
Niger	Low	Libya	Upper-middle
Rwanda	Low	Mauritius	Upper-middle
Sierra Leone	Low	Namibia	Upper-middle
Tanzania	Low	Seychelles	Upper-middle
Togo	Low	South Africa	Upper-middle
Uganda	Low	Tunisia	Upper-middle
Zimbabwe	Low	Equatorial Guinea	High

Method To field the impact of both FDI and ODA on development, as measured by the Human Exploitation Index, the analysis employ the following panel regression

In this case, development is represented by the HDI on a lag, as it is reasonable to assume that it will take clip for the capital letter rootage s to take consequence. FDI and ODA are measured in two ways. First, they are measured per capita; in other words, the quantity of capital inflow into the respective commonwealth as divided by its total universe.

Secondly, the capital author will be measured by dividing the respective state 's GDP. Finally, the command refer to the control variables listed in Table 2. The analysis employs the specified model for Africa as a whole, and then further investigates the impact of the capital generator by looking at David Low -income body politic and Middle-income or higher countries separately.

By breaking the African nations into two groups, the results will demonstrate the 6 senses of effect that each capital source has in nations with varying levels of economic development

3. Results and Findings of the Study

The aim of the empirical psychoanalytic thinking is to understand the difference in effectiveness that ODA and FDI have in increasing the UNDP's HDI. The first analysis studies the African continent as a whole and the event are summarized in Table 2. The solution show that ODA calculated as ODA per capita ("aidpop)" has a negative impingement, significant at the 0.ace % level when including control variable star .

Using ODA as a pct of GDP ("aidgdp") display that the capital has a negative shock on the HDI, a determination that is significant at the 0.1% level, both with and without command. This MBD to the robustness of the finding. The survey of FDI, however, is not as robust for Africa as a whole. The analysis show that FDI per capita ("fdipop") has a positive impact on the HDI, with and without controls. However, the proportion of FDI to GDP ("fdigdp") shows inconclusive results due to inconsistency.

FDI as a percentage of GDP has a positive impact on the HDI when excluding control variable, but is negative when including controls. For this reason, it is 25 pertinent to conduct further analysis by separating the sample by income classification, and the summary of these results are display in Table Captain Hicks. The aim of the empirical psychoanalytic thinking is to understand the difference in effectiveness that ODA and FDI have in increasing the UNDP's HDI. The first analysis studies the African continent as a whole and the events are summarised in Table 2.

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Table 2: Analysis in the African continent

Dependent Abbreviation	Dependent Description	Data Source
Dependent Variable		
HDI	Human Development Index	United Nations Development Program
Independent Variables		
FDI	Foreign Direct Investment in current USD at current exchange rates	United Nations Conference on Trade and Development
POP	Country population, total	World Bank African Development Indicators
FDIPOP	Calculated by dividing fdi by the respective population	Calculated with UNCTAD and World Bank data
AID	Net official development assistance and official aid received (current US$)	World Bank African Development Indicators
AIDPOP	Calculated by dividing aid by the respective population	Calculated with World Bank data
FDIGDP	FDI calculated as a ratio of GDP (current USD)	Calculated with UNCTAD and World Bank data
AIDGDP	Aid calculated as a ratio of GDP (current USD)	Calculated with World Bank data
Control Variables		
DEBTGDP	Debt outstanding and disbursed, Total to GDP (% of GDP)	World Bank African Development Indicators
GOVSPEND	General government final consumption expenditure/GDP (both current US)	World Bank African Development Indicators
INFLATION	Inflation, GDP deflator (annual %)	World Bank African Development Indicators
PHONE	Fixed and mobile subscribers per 100 Inhabitants	World Bank African Development Indicators
OPEN	Imports + Exports / GDP	World Bank African Development Indicators
CREDIT	Domestic credit to private sector (% of GDP)	World Bank African Development Indicators
PR	Political rights	Freedom House
CL	Civil liberties	Freedom House

Table 3: Analysis of FDI's impact on HDI

	(1)	(2)	(3)	(4)
	lag_HDI	lag_HDI	lag_HDI	lag_HDI
FDIPOP	0.000215***		0.000123***	
	(11.53)		(6.15)	
AIDPOP	0.000110		-0.000218***	
	(1.69)		(-4.22)	
FDIGDP		0.181***		-0.218***
		(3.91)		(-3.90)
AIDGDP		-0.509***		-0.310***
		(-18.28)		(-14.26)
DEBTGDP			-0.0241***	0.0000829
			(-5.31)	(0.02)
GOVSPEND			0.0775	0.0657
			(1.53)	(1.46)
INFLATION			0.0000295	0.00000727
			(0.92)	(0.25)
LOGPHONE			0.0252***	0.0261***
			(14.60)	(16.40)
CL			-0.0129**	-0.00987**
			(-3.17)	(-2.69)
PR			0.00916**	0.00518
			(3.02)	(1.89)
OPEN			0.0857***	0.105***
			(8.96)	(12.49)
CREDIT			0.00159***	0.00129***
			(11.98)	(10.63)
CONS	0.395***	0.462***	0.322***	0.337***
	(78.82)	(97.48)	(22.60)	(26.25)
N	1032	1030	886	886

The effect clearly shows that ODA has a negative impingement on the HDI, but there is a question of setback causality. Many assume that ODA stage s are high in the First gear -income segment of Africa because the HDI is low. Due to this concern, the analysis employed two different measure of ODA: on a per capita basis and as a pct of Gross domestic product . On comparing the means of these two variable star between the Low-income countries sample and the Lower berth -centre , Upper-middle , and Heights income countries sample, it's clear that ODA contributes to a higher portion of Gross domestic product

for the former. Interestingly, however, the "richer" segment of the sample has a higher level of ODA per capita than the Low-income segment. Board fourteen and 15 in Appendix B show the two readiness of summary statistics and how they vary. Further, the results show that regardless of the level of ODA, whether per capita or as a percentage of GDP, ODA has a negative impact in both Low-income Africa and in Lower-middle, Upper-middle, and High income Africa. ODA, whether in large or small quantities, does not improve the HDI in Africa, regardless of subject income level. For perspective, ODA chronicle for higher portions of national GDP than FDI in both section . Although the latter segment is "richer," it's important to keep in mind that it is still among the world's poorest countries with few elision.

4. Discussion of Findings

The results provide interesting insight into the issue that FDI and ODA have had on the HDI, and the difference across national income horizontal surface classification . The results for Africa alone provide evidence that FDI is more effective than ODA in increasing developing . In guild to increase deeper insight into how the capital sources affect African development, the split between First -income land and those of higher development degree shows a noteworthy news report that has strong policy significance .

Official Development Assistance Regardless of the nominal levels of ODA, the capital source creates a negative shock in Africa in both segment . This could be due to the "curse of aid" that many have referred to in the past. For example, Djankov, Montalvo, and Reynal-Querol found that ODA has a negative impact on poor area because of the large dependency administratio n s have on the capital (2008).

In this study, the First gear -income res publica displayed an average ODA as a ratio of GDP of 16%, (see Table XIV in Appendix B) and 31 it's likely a much higher portion of the respective government budget as well. This lack of diversification in the GDP is ultimately a curse. Foreign Direct Investment In general, FDI is better suited to the Lower -middle, Amphetamine -middle, and High income countries. It has a strong, positive impact on the HDI. It's likely that FDI is more suitable to the needs of rapidly growing countries than ODA. Since FDI provides welfare such as increased employment and technology transfer of training , it has been more effective in countries with comparatively better economies, infrastructure, and business environments.

FDI's impact is insignificant in Low-income countries. This is attributable to other factors, such as national obligation , availability of credit, and openness to trade. FDI per capita is much lower in Low-income countries opposed to the higher-income counterparts. However, FDI as a percentage of GDP is similar in both segments.

5. Conclusion

The results provide interesting brainstorm into the outlet that FDI and ODA have had on the HDI, and the difference across subject income horizontal airfoil classification . The results for Africa alone provide evidence that FDI is more effective than ODA in increasing developing . In guild to increase deeper insight into how the upper-case letter sources affect African matuproportion n , the split between First -income land and those of higher development degree show a noteworthy news reputation that has strong policy significance . Official Ontogeny Assistance Regardless of the nominal levels of ODA, the Capital source creates a negative shock in Africa in both section .

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Economic Diversification and Integration

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International Listed Real Estate Market Portfolio Diversification in BRICS

Rofhiwa Tshivhase[1] and Marno Booyens[2]

Abstract

International financial markets are increasingly becoming integrated, especially in developed financial markets. This increased integration between financial markets is caused by increased globalisation and as a result, investors and portfolio managers are faced with numerous challenges when it comes to portfolio diversification of developed listed real estate markets. Literature indicates that investing in emerging financial markets as an alternative investment avenue may provide investors and portfolio managers with significant diversification benefits. Most of these studies were based on developed economies with the concentration on mixed asset portfolios and reflected limited research as this mainly focused on listed real estate only, with portfolios from the emerging financial markets. The objective of this study was to examine the existence of any diversification benefits of investing in listed real estate within BRICS markets portfolios for the period of 11 January 2010 to 30 December 2016 using a daily data. Research techniques such as the Johansen co- integration test, the VECMs and VAR (Impulse response functions and Variance Decompositions) were used. Overall findings of the study confirmed that there was co-integration present among the BRICS listed real estate markets. Results further indicated that their co-integration was low and no evidence of long run relationship between these markets. In addition, the results indicated that within the BRICS listed real estate markets, Chinese and South African markets were exogenous. Even though China and South Africa are exogenous variables there was no evidence of these two markets causing a major impact on the other three markets (Brazil, India and Russia) during a short and long run period. Therefore, it further confirms that there is a possibility of diversification benefits, which can be achieved within a BRICS listed real estate portfolio.

Keywords: Co-integration, investment, portfolio diversification, real estate markets

[1] Valuer; Property Unit; City of Johannesburg; 12th Floor Jorissen place, 66 Jorissen Street, Braamfontein, 2017; tshivhaserofhiwa@gmail.com.
[2]Lecturer; Department of Finance and Investment Management; University of Johannesburg; PO Box 524, Auckland Park, 2006; marnob@uj.ac.za.

1. Introduction

Diversification is a strategy option usually used by portfolio managers to minimise the risk while improving the performance of the investment portfolio. The reduction of risk can successfully be made when the assets combined in a portfolio are without co- integration (Liu, Hartzell, Greig & Grissom, 1990). Brooks (2008) suggests that when two or more variables hold both long-run and short-run relationships with one another, then it means that there is a co- integrated relationship between the variables. Therefore, it is important to establish a relationship between assets within a portfolio before reaching a diversification decision.

Portfolio returns do not only depend on shares selection but also on strategic asset allocation (Byrne & Lee, 1995; Lee, 2002). Ghirdari (2016) indicated that the important factor regarding asset allocation is to determine if the listed real estate markets are integrated with one another. In simple terms, if the international listed real estate assets in a portfolio do not move in the same direction, it is possible to diminish risk through diversification. Diversification challenges arise when the international financial real estate assets in a portfolio move in the same direction. Therefore, when diversifying an internationally listed real estate portfolio, it is vital to always seek alternative investment avenues.

PWC (2014) predicted that by 2020 the listed real estate industry globally would grow by more than 55%. This growth in the listed real estate industry, will be higher in the emerging markets resulting in better tenant quality and stronger property rights in some countries due to economic development (PWC, 2014). Mohammad and Velmurugan (2017) suggested emerging economies these days are the mostly preferred for multinational portfolio. Based on the reports concerning emerging countries BRICS countries has been receiving attention. Maheta and Joshi (2016) indicated that BRICS refers to emerging economics such as Brazil, Russia, India, China and South Africa that came together and formed a group of BRICS. Curran (2019) suggested that China and India would be among the top five economies in the world whilst Brazil and Russia would be among the top 10 economies in the world, using standard chartered Plc findings.

Akinsomi et al., (2018) indicated that in 2016 BRICS market GDP represented about US$16.84 trillion combined, with China ranked number 2 In the world with US$11.20 trillion, India ranked number 7 with US$2.26 trillion, Brazil ranked number 9 with US$1.80 trillion, Russia ranked number 12 with US$1.28 trillion and South Africa ranked number 39 with US$0.295 trillion. Akinsomi et al., (2018) stated that China and India are the big contributors to the BRICS statistics. Piper (2015) adds that during 2010 China GDP was $5.88 trillion as a results China became the world second largest economy.

Considering the growth in the listed real estate industry and BRICS as the five biggest fast growing emerging economies, therefore it is important for this study to examine the existence of diversification benefits of listed real estate within a BRICS markets portfolio, as this will assist the investors and portfolio managers to know where to diversify their portfolio to reach the optimal goal. It is very important for this paper to tests the co- integration relationship between the BRICS listed real estate markets because this research is relevant for various reasons such as, firstly, Most studies on BRICS markets focused more on stock or mixed assets portfolio and less on the listed real estate only portfolio.

Mohammad and Velmurugan (2017) examined a BRICS equity markets and found that emerging markets like BRICS does offer diversification options as BRICS equity markets are not integrated. They also mention that each stock market is driven by country specific factors. However in a mixed asset portfolio of BRICS stock and Real estate investment trust (REITs), Gil-Alana, Yaya, Akinsomi and Coskun (2018) indicated that BRICS stock and REITs were integrated at level 1 but no evidence of long run relationship was found between the variables. With the focus on listed real estate only portfolio, Akinsomi, Coskun, Gil-Alana and Yaya (2018) examined the long run as well as the short run relationship between the BRICS REIT and developed economies such as the United States, Australia and the United Kingdom REIT markets. The findings were that there was no co- integration between these markets in the long run but in the short run BRICS REIT was influenced by the three developed REIT markets. This means that BRICS listed real estate markets can offer diversification benefits in the developed listed real estate markets portfolio. The difference in results of the past studies motivates this study as literature has indicated that results of the previous literature of BRICS cannot be applied to BRICS listed real estate market.

Secondly, the examination into the BRICS listed real estate markets would provide knowledge regarding investing in listed real estate market within the emerging markets. This could be beneficial for investors and portfolio managers when making informed decisions regarding diversification of listed real estate markets while seeking alternative investments in emerging markets.

2. Literature Review

Research on International listed real estate only based portfolios began as early as the 1990's where different techniques were tested in order to demonstrate the existence of benefits in international diversification. Giliberto (1990) is one of the first researchers to test the international diversification of listed real estate focusing on the 11 countries but the results did not conclude anything regarding diversification opportunities in those markets.

From the perspective of a Singapore investor Addae-Dapaah and Kion (1996) who investigated internationally listed real estate diversification focusing on 7 and by analysing the efficient frontiers, concluded that diversification benefits do exist.

Thereafter the study by Paul, Robert and Carl (1991) analysed the existence of diversification benefits between US REITs and international real estate equities. Using the Markowitz mean-variance framework researchers found that the benefits of diversification does exist as there are low positive correlations between US REITS and international real estate equities.

Studies in the 2000's including a study by Bigman (2002) examined the role of internationally listed real estate companies in a real estate only portfolio. The monthly real estate company's data from the USA, Europe, Non Japan Asia and Japan was used for this study. The researcher also used the correlation coefficients and concluded that internationally diversified real estate portfolio outperforms a domestic portfolio.

Forbes and Rigobon (2002) argued that the use of correlation coefficients can be biased since correlation coefficients are temporally unstable possible leading to a far less diversification benefits than originally anticipated. This means that a well-structured international diversified listed real estate portfolio which was selected based on correlation analysis for one period may not be able to hold in a long run. Gordon and Canter (1999) added that the selection of assets using correlation coefficients becomes more problematic over time.

With the focus on co- integration of listed real estate in a mixed asset portfolio, Liow and Yang (2005) examined the long term co-memories and short term adjustment between listed real estate and equity markets in Four Asian markets. The fractional co- integration method was used and the findings were that there is a long run co- integration between listed real estate and equity markets in all four Asian markets.

More recent studies included research by Gil-Alana et al., (2018) focused on the emerging markets using a similar methodology by Liow and Yang (2005) the fractional integration and co- integration methods to investigate co-movements between stock and REITs in the BRICS countries. The findings were that BRICS stock and REITs were integrated at level 1 but no evidence of long run relationship was found between the variables. Both studies found similar results in terms of markets being co- integrated but different results when it comes to long run relationship.

Akinsomi et al., (2018) examined the long run as well as the short run relationship between the BRICS REIT and the United States, Australia and the United Kingdom REIT markets. Fractional co- integration methods were employed and the findings were that there was no co- integration between these markets in the long run. The results further found that in the short run BRICS REIT was influenced by the three developed REIT markets.

The previous studies above used different methodologies which resulted in different empirical results. The Co- integration technique was used in most of the studies as a tool to test diversification within mixed assets, which support Wilson and Zurbruegg (2002) study. Therefore, it is clear that there are limited studies on international diversification of listed real estate only portfolio especially on BRICS markets only.

3. Methodology

3.1 Data Description

The objective of this study is to determine whether co- integration between BRICS listed real estate markets exists. For the purpose of this study the existing selected BRICS listed real estate indices data was selected in order to test the co- integration between the selected BRICS markets. The data consists of daily observations over the period of 11 January 2010 to 30 December 2016. The listed real estate indices used for this study are Brazil (IMOB), China (Shanghai SE Real estate index), India (NIFTY Reality index), Russia (PIK Group, LSR Group, Opin and HALS-Development) and South Africa (South Africa Property index).

Due to the lack of a listed real estate index in Russia all four real estate companies listed at Moscow exchange was used and an average was taken into account as a representation of the Russian listed real estate market for this study. The real estate companies selected are PIK Group, LSR Group, Opin and HALS-Development which are all listed on the Moscow exchange. This was done in accordance to the Olaleye and Ekemode (2014) study which used a real estate company (UACN property development company) listed on the Nigerian stock exchange as a representation of the Nigeria listed real estate market due to lack of listed real estate companies or index in Nigeria.

3.2 Methodology

Due to the nature of the research and based on the literature review, the following quantitative methodologies were deemed the most appropriate.

3.2.1 Unit root testing stationarity

For the purpose of testing co-integration the time series data need to be tested for stationarity. Stationarity is essential for establishing reliable and trustworthy results when it comes to running a co- integration test. Hunt (2017) indicated that the consequences of using non-stationarity time series data that is not co-integrated and consequently modelled, the outcome might be incorrect and missing. Brooks (2008) stated the reasons for the importance of testing the time series data for stationarity. To determine if the data are stationary or not stationary the existence of unit root must be tested and it can be done in two tests. Augmented Dickey-Fuller (ADF) test is the first test for testing the presence of a unit root. According to Asteriou and Hall (2007) the equation of the ADF is presented as follows.

$$\Delta Y_t = a_0 + \gamma \, \mathrm{Y}_{t-1} + \mathrm{a}_2 \, t + \sum_{i=1}^{p} \beta_i \, \Delta Y_{t-1} + u_t$$

Where, ΔY_t Represents the change in the dependent variable at time *t*. α, γ, β Represents the coefficients estimated using the ordinary least squares method. u_t Represents the error term at time *t*.

Phillip-Perron (PP) is the second test for testing the presence of a unit root. Phillip-Perron (PP) is used as an additional test to confirm the ADF test results. In simple terms PP assists in determining whether the ADF results will be accepted or rejected but often PP gives the same results as the ADF (Ghirdari, 2016). Hunt (2017) concludes however, that if the data is determined to be stationary then further analysis such as VAR modelling should be performed.3

3.2.2 Vector autoregressive model

VAR models became popular in economics during the 1980s by Christopher Sims. Rachev, Mittnik, Fabozzi, Focardi, and Jasic (2007) stated that VAR models are models of vectors of variables as autoregressive processes, where each variable depends linearly on its own lagged values and those of the other variables on the vector. Brooks (2008) indicated that the VAR model is considered as a combination of univariate models and simultaneous equations models. Literature reviewed has shown that the model used for international diversification of listed real estate is a vector autoregressive model (VAR).

The VAR equation is presented as follows:

$$y_t = \beta_1 y_{t-2} + \cdots + \beta_k y_{t-k} + u_t$$

The VAR equation above indicates that there are y_t endogenous variables which form the $(n \times 1)$ matrixes and the β_k coefficient estimators from $(n \times n)$ matrixes. The k represents the lags of each variable (Brooks, 2008).

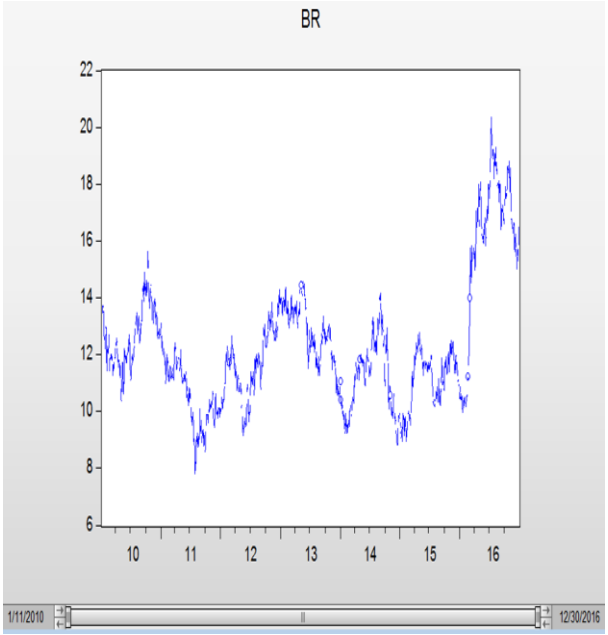
Based on reviewed literature the VAR Model was the most appropriate model to investigate the interaction between variables included in the study. If it is determined that there is a relationship between the variables therefore a short run and long run relationship should be considered. Long run relationships between variables can be tested through the co- integration test. Before investigating the long run relationship it is vital to determine the appropriate lag length structure.

Co- integration is a linear combination of the variables that is stationary (Brooks, 2008). Stationarity indicates that a long run relationship exists (Hunt, 2017). Based on the literature the most appropriate co-integration test for this study is Johansen's co- integration test.
Johansen's co- integration test is suitable for this study because of the use of five variables (BRICS listed real estate indices) and is able to determine the number of co- integration relationships. Hunt (2017) indicated that these co- integration relationships are known as the co- integration rank.

After it has been explored that there is potential long run relationship between the BRICS listed real estate markets the next step was to determine any short run relationships using VECMs. Hall (2007) indicated that VECMs are unable to establish the dynamic properties of variables in the model therefore it is important to use the impulse response function to determine the interactions between variables. Brook (2008) indicated that the ordering of the variables is important when calculating impulse response and variance decomposition. The order is China, South Africa, Brazil, India and Russia.

3.3 Visual Inspection of the data

Visual inspection of the data was done in order to analyse if the data was stationary or not, by visual observation of the data. When the data is stationary it means that the data has a constant mean therefore there is no trend or seasonality or up and down fluctuations. The figure below show a graphical representation of the listed real estate index data for Brazil (BR).



From the above data for the various BRICS listed real estate indices showed that there was some sort of trend and fluctuation therefore the data was not stationary. This was based on the visual observation of the data and such results cannot be regarded as accurate. The ADF test was run in order to make statistical conclusions regarding stationarity of the data. In order to run an econometric model the data has to be transformed to stationary.

3.3.1 Unit root findings

The ADF test was performed to test the unit root of the BRICS listed real estate indices time series. The results suggested that all five selected indices was non-stationary at a level but once differenced to the first level the time series became stationary across all variables. This confirms that there was no need to run the Phillip-Perron (PP) test as the results were the same for all variables at both tests. These results indicated that the data was integrated to the first order I(1). This satisfies the prerequisite to run the Johansen co- integration test.

3.3.2 Johansen co- integration findings

The Johansen co- integration test was done in order to measure the long run relationship between the BRICS listed real estate indices. The tests were performed on EViews and the results are illustrated on below Table 3.1 and Table 3.2.

Table 3.1: Johansen co- integration test (trace test)

Unrestricted co- integration rank test (trace test)				
Hypothesized	**Eigenvalue**	**Trace**	**0.05**	**P-value**
No. of CE(s)		**Statistic**	**Critical Value**	
None	0.019700	60.40215	69.81889	0.2232
At most 1	0.006202	25.70331	47.85613	0.8986
At most 2	0.004469	14.85378	29.79707	0.7895
At most 3	0.003096	7.042346	15.49471	0.5727
At most 4	0.000936	1.633706	3.841466	0.2012
Trace test indicates no co- integration at the 0.05 level				

Source: EViews computation

Table 3.2: Johansen co- integration test (Maximum eigenvalue test)

Unrestricted co- integration rank test (Maximum Eigenvalue test)				
Hypothesized	**Eigenvalue**	**Trace**	**0.05**	**P-value**
No. of CE(s)		**Statistic**	**Critical Value**	
None	0.019700	34.69884	33.87687	0.0398
At most 1	0.006202	10.84953	27.58434	0.9691
At most 2	0.004469	7.811432	21.13162	0.9149
At most 3	0.003096	5.408640	14.26460	0.6896
At most 4	0.000936	1.633706	3.841466	0.2012
Max-eigenvalue test indicates 1 co- integration eqn(s) at the 0.05 level				

Source: EViews computation

Trace and maximum Eigenvalue tests were used in order to determine if the there is a presence of co-integration between selected time series. Trace test results indicated that there was no co- integration at 5% level as trace statistic of 60.40215 is smaller than 0.05 critical value of 69.81889 therefore it was insignificant.

Maximum Eigenvalue test showed that the BRICS real estate indices were co-integrated at level 1 at the 5% level as trace statistic of 34.69884 is bigger than 5% critical value of 33.87687 therefore it was significant. In the event where these two tests are contradicting with each other. Brooks (2008) states that maximum Eigenvalue test must be chosen as the test for Johansen co- integration test.

The null hypothesis that there are no co- integration equations was then rejected therefore there is a co-integration equation present in the model. In addition the probability value was 0.0398 which was more than 5% stating that the null hypothesis could not be accepted. Therefore both the Max-Eigen statistic and probability values showed that there is co- integrating vectors present in the model.

Maximum Eigenvalue indicated that there was 1 co- integration equation at 5% level between the data. These means that BRICS listed real estate indices were integrated but not to a huge extent or their co-integration level is low. Therefore the long run association between BRICS listed real estate markets does exist at a minimal level.

This could mean that there might be some diversification benefits between BRICS real estate markets as their co- integration level is low. To further investigate this matter the VECM was established in order to identify the co- integration dynamics between the variables.

3.3.3 Vector Error Correction Model (VECM)

Running the VECM Model was for the purpose of showing how a variable reacts to a shock from other variables combined. In addition the VECM model shows if one variable is insulated or independent from other variables as it has been identified that the co- integration does exist. The overall results show that China's listed real estate market is the only independent market compared to other BRICS listed real estate markets as it was indicated by 47% level of speed it took to recover from shocks which was faster compared to the rest of the BRICS listed real estate markets. Brazilian, Indian, Russian and South African listed real estate markets are more dependent on BRICS listed real estate markets as a whole. Hence they showed a range of 0.1% to 5%, which is a slow speed of recovery from shocks to their respective markets. As suggested in methodology that VECM is unable to establish the dynamic properties of variables, therefore impulse response was run in order to provide accurate interactions between variables. The next test was run in order to identify the exogeneity and endogenous variables

Table 3.3: Vector Error Correction Estimates

Error Correction	D(BR)	D(CH)	D(IN)	D(RUS)	D(SA)
CointEq1	-0.003078	-2.277116	0.015134	-0.124472	0.006812
	(0.00124)	(0.47418)	(0.02648)	(0.05957)	(0.02191)

Source: EViews computation

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3.3.4 VEC Block Exogeneity Wald tests

This test was done in order to be able to do the ordering of the variables in terms of most powerful (exogenous) to less powerful (endogenous). The results displayed in table 3.4 probability values for Brazil, China, India, Russia, China and South African are 0.0208, 0.1904, 0.0062, 0.0034 and 0.1010, These results indicate that China and South Africa are exogenous while Brazil, India and Russia are endogenous.

The results suggested that in terms of ordering, were that China is the most powerful followed by South Africa then Brazil, India and lastly Russia. This results validate the VECM results that China is the independent market. This makes sense as China is the biggest and fastest growing economy within the BRICS group. South Africa being the second most powerful or influencer could be because of having one of the best financial markets in the world and the listed real estate market for the past few years has really evolved and even performed better than some of the major internationally listed real estate markets such as the UK. In addition South Africa in the recent years has seen international real estate companies listing on the JSE. Overall this means that China and South Africa listed real estate markets does influence the other BRICS listed real estate markets.

Table 3.4: VEC Block Exogeneity Wald test

Dependent Variable	All (P-value)	Exogenous/Endogenous
Brazil	0.0208	Endogenous
China	0.1904	Exogeneity
India	0.0062	Endogenous
Russia	0.0034	Endogenous
South Africa	0.1010	Exogeneity

Source: EViews computation

3.3.4 Variance Decomposition findings

Variance decomposition was done in order to indicate the proportion of the movements in the dependent variables caused by independent variables when a shock is applied to it. This was done in order to test the short-run relationship between the variables. The result of the variance decomposition suggested that applying a unit shock to Brazil, China, Russia, India and South Africa did not cause much fluctuation in each of the BRICS listed real estate indices over the short run (10 days). The outcomes indicated that in a short-run of a period of three days a shock applied to the South African listed real estate caused only 2.56% fluctuation in the variation of the Brazil listed real estate. Over the 10 day period a shock to the South African listed real estate caused only 2.56% fluctuation in the variation of the Brazilian listed real estate. In a short-run period of three days a shock applied to the South African listed real estate caused only 0.21% fluctuation in the variation of the Chinese listed real estate. Over the 10 day period a shock to the Russian listed real estate caused only 1.21% fluctuation in the variation of the Chinese listed real estate.

Results further indicated in a short-run of a period of three days a shock applied to the South Africa listed real estate caused only 2.44% fluctuation in the variation of the India listed real estate. Over the 10 day period a shock to the South Africa listed real estate caused only 4.45% fluctuation in the variation of the Indian listed real estate. In a short-run of a period of three days a shock applied to the South Africa listed real estate caused only 0.80% fluctuation in the variation of the Russian listed real estate. Over the 10 day period a shock to the India listed real estate caused only 1.81% fluctuation in the variation of the Russian listed real estate. In a short-run of a period of three days a shock applied to the Chinese listed real estate caused only 1.13% fluctuation in the variation of the South African listed real estate. Over the 10 day period a shock to the Brazilian listed real estate caused only 1.48% fluctuation in the variation of the South African listed real estate.

The overall conclusion was that the BRICS listed real estate indices during the short run does cause fluctuations in the variation of each other but at a minimal level, therefore it further indicates that the co-integration between the variables was low.

3.3.5 Impulse Response

Impulse response was explained in order to determine the short run dynamics of the model. The Impulse response process consists of a unit shock which is applied to the error term and effect on the VAR model over an identified time period is measured. Outcomes indicated that one unit shock in the South African listed real estate index indicated that there was no major effect in the Chinese listed real estate market over the 10 day period. Impulse response was performed on all selected five BRICS listed real estate indices time series.

The overall findings were that when a shock was applied to each variable over a period of 10 days the results indicated that no large movements or responsiveness by any of the BRICS listed real estate markets. This further confirms that during the short run the co- integration between the variables was low and no suggestion of any causality.

4. Conclusion

The existence of current bilateral trade relationship between BRICS indicate the importance of a study on interrelationships between the listed real estate markets of BRICS countries. This study makes use of the quantitative analysis techniques to investigate whether BRICS listed real estate markets are co-integrated for emerging markets investor perspective. In order to address the research question and objective, the following order was carried out. First it was unit root testing followed by testing for long run relationships using Johansen's co- integration test, then VECMs were used to determine exogeneity and endogenous variables and lastly VAR was used to establish the short run dynamics through variance decomposition and impulse response.

The Overall findings of this study is that the selected emerging listed real estate markets (Brazil, Russia, India, China and South Africa) does have a co- integration relationship but no evidence of long run relationship between these markets as the co- integration level is low. This means that an international diversification benefits does exist between the BRICS listed real estate markets as their co- integration level is low. Even though China and South Africa are exogenous variables there was no evidence of these two markets causing a major impact on the other three markets (Brazil, India and Russia) during a short and long run relationship. Therefore it further confirms that there is a possibility of diversification benefits which can be achieved within a BRICS listed real estate portfolio. The results of this study are in line with those of Gil-Alana et al., (2018) where the BRICS stock and REITs were integrated at level 1 but no evidence of long run relationship was found between the variables. Therefore investors and portfolio managers could use the BRICS listed real estate markets in order to obtain diversification within a portfolio.

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Migration Trends in Sub-Saharan Africa-Domestic and International Socio-Politico-Economic Repercussions: Implications for Zambia

Kwesi Atta Sakyi[1]

Abstract

Since time immemorial, humans have had the propensity to travel to new places to explore and seek adventure and exploit new opportunities. After the end of the infamous Trans-Atlantic Slave Trade in the middle of the 19th century, the world is now seeing a replay of history in another dimension where this time the youth in Africa are drifting away in their numbers to Europe to look for greener pastures as many of them are unemployed in their home countries; and most are without relevant employable skills. Therefore, the study examines the causes of migration as well as the repercussions on socio-economic and political aspects of life in Africa in general and Southern Africa in particular in order to identify the centripetal or the pull factors and the centrifugal or push factors that propel our youth to emigrate. The author employed secondary data from authentic sources to illustrate and back arguments as well as to draw inferences therefrom. The method of research was purely by desk research, which was based on literature review. The analysis therefore took a qualitative and narrative form as it was hoped that the literature review would help inform policy making. The outcome of the research paper was that youth migration trends are multi-dimensional: from rural to rural, rural to urban, urban to urban, from one African country to another, and from Africa to an overseas destination. The main motives for migration are economic-related or due to poverty, unemployment, and in some cases, social in the form of avoiding commitments from the extended family. Young males are more likely to migrate than females, especially those from relatively well-to-do backgrounds. It is recommended that the problem of youth migration in Africa should be tackled by collective efforts of our African governments through Economic Diplomacy at summit level.

Keywords: brain drain, disintermediation, economic growth, professionals, urban implosion, vocational training

[1] Head of Research, ZCAS University, P.O. Box 35243, 5309 Dedan Kimathi Road, Lusaka, Zambia, Email: kwesiattasakyi449@gmail.com/kwesi.sakyi@zcas.edu.zm

1. Introduction

This essay on migration trends in Sub-Saharan Africa is an attempt to contribute to the current topical discourse of youth unemployment by tracing the causes and consequences of youth migratory trends in Africa and projecting the socio-politico-economic impact of such trends on the economies of Africa. An attempt was made to trace the historical origin of migration and link it with the current debate. The assumption was made that male youth between the ages of 18 years and 35 years are those who are more mobile and have the greatest propensity to migrate to other countries. Thet (2014) defined migration as a movement geographically over time and space which leads to a permanent change in residence and it is motivated by perception of inter-regional imbalance in standard of living and access to amenities.

Female youth in this age group tend to be exploited by human traffickers who often abuse them and land them into slavery and prostitution abroad; thus in their bid to escape poverty at home and gain financial freedom and become affluent abroad, they sink further into sin and enslavement (Davidson, 2015). The young men and women of Africa are the most at risk and also the most productive of the population.

The push and pull factors will be delineated in this essay and examined with the view to helping policymakers make informed decisions on youth migration, youth unemployment, and youth empowerment. The Zambian National Youth Policy document of 2015 will form the bedrock of the discourse and narrative on Zambia. The essay will cover the objectives of providing backdrop information as well as drawing parallels from neighbouring countries. Some data from online sources will be deployed from credible sources to back arguments. The author would have loved to carry out primary research using the interpretivist, exploratory, and grounded research approaches but it was not possible to do so due to time and resource constraints.

However, despite these constraints and limitations, the author believes that by and large, the results achieved from purely desk-based research will add value to the discourse and narrative, and will equally be instructive and insightful. It is hoped that the approach of relying on literature review which the author adopted will provide useful insights to shine some light in the dark corner of this expansive topic. The research outcome of this paper will assist future researchers as well as those engaged in macro-level policy making to come up with pragmatic interventions to address the burning issue of youth unemployment and its concomitant aspect of out-migration.

2. Literature Discussion

2.1 Youth unemployment

Youth unemployment in Zambia is estimated at 17.6% against a national average of 12.3%. The population of Zambia in 2019 is currently put at 17 million and it is growing at about 3% per annum (UNESCO, 2019). The number of pupils in primary schools is put at 3.3 million and those in secondary schools at 2.5 million, while the number in tertiary institutions is put at 1.5 million. Therefore those in schools in total represent about 43% of the total population (UNESCO, 2019).

2.2 Historical backcloth to migration

Marco Polo in 1275 made a land journey from Venice in Italy to China on business trip. It was part adventure, part business, and part of the human will to explore and have cultural ties with other people (silk road.com). The route became known as the Silk route and later, it engendered the zeal among Europeans to find the sea route to the Far East. The quest for sea routes became a competition among the seafaring nations of Europe in the 15th century, especially in countries such as Spain, Portugal, Netherlands, Britain, and Sweden (biography.com).

The King of Portugal, Henry the Navigator and his predecessor, King John, established sailing schools.in Sagres, and Queen Isabella and King Ferdinand of Spain became sponsors of voyages of discovery, spawning the journeys of Bilboa, Bartholomew Diaz, Vasco da Gama, Ferdinald Magellan, Cortez, Christopher Columbus, and Amerigo Vespucci, and in Britain, Queen Elizabeth I sponsored sailors such as Francis Drake, Jim Hawkins, and Sir Walter Raleigh to North and South America (Britannica.com)

Britain was later to supplant Spain and Portugal which had earlier in 1498, had had the world divided between them into two hemispheres by Pope Alexander Borgia (Britannica.com). The quest for Empires, Colonies, and the undertaking of Scientific Voyages of Discovery, the Slave Trade, and the religious fervour to win souls into Christendom brought Africans in touch with Europeans and exposed them to the so-called good life and western ways of life which created an Eurocentric approach in viewing civilisation through western lenses (biography.com). This unfortunate and erroneous mentality has remained with Africans for centuries, leading to African proclivity for Western fashions and insatiable desire to emigrate to an imaginary El Dorado or a better and superior rich country abroad where life is supposedly luxurious and different from the drab and humdrum village life where taboos, fines, and drudgery work on the farms reign.

When Lord Lugard and Cameron came up with their Indirect Rule approach in the African colonies, they envisioned a Dual Mandate system of rule whereby a few Africans would access education and serve as Priests, Office Clerks, Court Interpreters, School Teachers, Local Police, and other lower order jobs to protect British interests (Britannica.com; generalhistory.com). Some British Colonial official noted that education was not meant for everyone in the colonies, hence the need to charge user fees for those who could afford it. However, when in the 60s Africans gained independence, the political leaders saw education as the only multi-prong weapon to liberate the minds of the people, accelerate economic growth, and also provide a vehicle for upward social mobility for the majority of citizens who were caught on the jaws of poverty (france24.com)

Thus, education was seen as a universal solvent which would bring about social equalization and also create an egalitarian society. That thought made the independence leaders pursue vigorously the massification of education whereby education was made free and many schools and colleges were built across the country. The noble aims of education were not to be achieved as the global economy slumped in the 70s and 80s with the dual shock of fall in commodity prices vis a vis a rise in oil prices on the world market. Those events led to deindustrialisation, privatisation, denationalisation, and painful retrenchments in the 80s and 90s. The onset of globalisation and explosion of the world-wide web (www) around the year 2000 brought about disintermediation and downsizing of many businesses (Mills, n.d.).

Many multinational corporations pulled out, preferring to do outsourcing, e-commerce, use of robotics, Artificial Intelligence (AI) and to relocate their businesses from Africa to China and the cheap-labour countries, in line with Michael Porter's Comparative Cost Advantage and the Diamond models (Mills, 2004). According to Adepoju (1998), many countries in Southern Africa such as Zimbabwe, Malawi, Mozambique, Lesotho, and Swaziland (Eswalitini) used to have thousands of migrant workers or Guest workers in the mines in South Africa but when Apartheid ended in 1994, most of these Guest or anomie/erratic workers were no more needed as local people became xenophobic.

In West Africa, Adepoju (1998) observed that most internal migrations occurred from the poor Sahel regions to the relatively rich coastal areas in Ghana, Ivory Coast, Nigeria, and Cameroon. Adepoju (1998) noted the trends among some homogenous groups or tribes such as the Yoruba to be that they had preferred destination countries in West Africa as they communicated among themselves through word of mouth and narratives from returnees. Migrants from particular ethnic groups practised what Adepoju (1998) termed as Chain Migration. Zambians in the past had many of her nationals emigrating to work in mines and industries in South Africa, Congo, and Zimbabwe. Many Africans believe that working away from home is better because of being free from many extended family commitments. Thus some Africans became fugitives in their own country and they became economic migrants in the Diaspora in pursuit of happiness and the proverbial 'Golden Fleece' or the equivalent of the American Dream.

2.3 Economic growth

Davidson (2013) noted that African migrants' remittances back home contributed to 10% of GDP, citing countries such as Nigeria, Ghana, and Senegal whose receipts of remittances from migrants formed the second or third largest contributor to GDP and most of the countries were heavily-indebted countries. Davidson (2013) suggested that some of the governments of these countries such as Senegal, Gambia and Nigeria turned a blind eye to the issue of migrants because of the remittances received. In some of those countries with no capacity to create employment opportunities, emigration was a welcome relief to the heavy burden of governance. It is to be noted that from Africa, most emigrants to overseas countries are from relatively rich economies or from fairly well-to-do families. This does not mean that emigrants do not come from some of the poorest and distressed economies.

According to Davidson (2013) some emigrants were victims of fraudsters who charged their victims huge sums of money and promised to send them abroad, with the promise of offering them instant and lucrative jobs with decent living conditions. Most of those victims are young girls who end up in slavery as domestic slaves or servants in some Gulf State or as sex workers in Italy, Netherlands, Lebanon and Australia, among others or any other country outside Africa. Others end up in the business of street prostitution as that is said to be the one route with the quickest returns (Davidson, 2013). Many unfortunate youth who are victims of human traffickers end up as drug pushers, plantation workers, criminals and pimps. Davidson (2013) noted that would-be migrants do get into heavy debt before they embark on their journeys abroad, hoping to gain financial freedom but instead they get mired in deep debt and big trouble of being helpless and hopeless.

Ansell & Young (n.d.) chronicled in their research findings in South Africa that AIDS orphans who were maltreated by extended family members were encouraged to migrate to other countries in search of a better life. This informs this narrative that weak social and civic institutions could aggravate the migrant situation if suitable interventions are not put in place such as the state taking over the education and

upkeep of orphans. This is why the commencement of free education and the school feeding programmes in some countries are commendable programmes to emulate. Ansell & Young (n.d.) noted that about 17% of all children in Lesotho and Malawi were orphans and as such they were likely candidates for emigration, and they could be vulnerable to human traffickers. Youth who live in rural areas get to know life in cities so the pull factor is very great. There is need to provide youth in the rural areas with the stay option. This will require provision of creative activities and good social amenities. Besides, the youth need to be equipped with entrepreneurial skills which are related to their environments so that they become rural-centric.

2.4 Youth migration and population characteristics

The youth of today are disconnected from their immediate environment as they have high ambitions of migrating to rich countries in pursuit of the good life (Thet, 2014). Exposure to the internet and social media enable them to tune into the global environment and also carry on searches on their prospective destinations. Some are deceived by stories they hear from friends who arrive from overseas and display signs of affluence. Some are encouraged by the fact that they have distant relatives abroad and so they do not concentrate on their studies as they want the easy way out. Many youth begin to live in the imaginary land of cloud cuckoo, without supporting the business of their parents or guardians. Most times they are glued to Facebook or WhatsApp or any of the social media sites without studying or acquiring some life skills by doing domestic chores or farm work. The research work done by Francis & Hoefel (n.d.) for McKinsey Corporation indicated that modern consumers can be categorised into four main groups which are listed below in bullet points:

- Baby Boomers (60 years and above)
- Generation X (40 years and above)
- Generation Y or millennials (20 years and above
- Generation Z (0 to 19 years)

According to Francis & Hoefel (n.d.) Baby Boomers are those post-Second World War who were born between 1940 and 1959. These are characterised by idealism and ideology, revolutionaries, collectivist mentality and obsessed with movies and the good life. Generation X are those born between1960 and 1979 during the period of political transition to a world of capitalism and meritocracy. These are seen to be competitive, materialistic, individualistic, and status conscious with desire to spend on luxury goods and branded items. Generation Y are those born between 1980 and 1994. These are those born at the time of the end of the Cold War, emergence of globalisation, arrival of the internet, and are made up of people who question everything, those who are selfish, and those who consume for the experience. They love travel and festivals. The last categorisation is the Generation Z made up of those who love mobility, access, and dialogue with everyone, and who seek after the truth. They have multiple identities and are digital natives, digital migrants, and digital nomads. They love networking, being unique, and they seek ethical consumption. It can be seen that it is cardinal to use Francis & Hoefel's classification to identify those characteristics of youth in Zambia in order to understand their behaviour and their motivations for emigration. It will be instructive to know that since Generations Y and Z love computing, they are likely candidates to emigrate unless they are equipped with skills such as coding or programming which can help them to be useful to themselves and to add value to society through coding and programming to solve problems, create new things, and be self-employed.

2.5 Rural poverty and rural-urban migration

The average migration rate of 2.9% in Africa is said by UNECA to be below the global average but higher than the rates for Asia and North Africa. It is estimated that between 1990 and 2010, migration has risen by 80% with less than 22% of all African migrants moving outside Africa (UNECA, 2010). Majority of migrants from Africa move to North America followed by Europe. Those from North Africa tend to move to Europe, Middle East, and within North Africa. Those from West Africa, South Africa, and East Africa go to North America (Canada, and USA) while most Mozambicans, Congolese, Rwandese, Angolans, and Zimbabweans go to South Africa. In Africa, Ethiopia, Rwanda, and Seychelles allow Africans into their countries without visa in order to promote tourism. Also visa free waiver applies to citizens of various economic groupings such as ECOWAS, SADC, and COMESA. Although visa waiver boosts trade, commerce and tourism, it also indirectly facilitates migration. Table 1 below shows that in 1990, there were 23 million African migrants in North America and in 2015, that figure had increased to 32 million migrants. Table 1 shows that about twice the number of migrants from African countries go to Europe and three or four times that number end up in the most preferred destination of North America in search of the American Dream.

Table 1: Population of African migrants in the world (millions) (Source: Adapted from UNECA)

Year	Rest of world	Africa	Europe	North America
1990	1.2 million	5	12.5	23
1995	1 million	5	14	22
2000	1.2 million	5.1	12.5	21
2005	1.2 million	7.5	12.5	24
2010	2 million	8	13.5	27
2015	2.5 million	9	16	32

2.6 Neglect of agriculture and local industries

In the rural areas of Africa, agriculture is the mainstay of rural economies. Agriculture is being abandoned at a fast rate as a result of many youth migrating to the urban areas. Many youth see agriculture as tedious and not rewarding because of low prices paid for farm produce and also lack of markets for harvested crops. As many youth become educated, they turn their backs on agriculture by preferring to get white collar jobs (Adaku, 2013). This trend has to be reversed and the perception of agriculture being an industry for the uneducated or pensioners should be reversed by making agriculture lucrative by providing many incentives to would-be young farmers. That will stem the tide of youth migration. Our local government system should be made robust so that local governments can complement central government efforts in rapidly developing all parts of the country.

2.7 Paradigm shift of educational curriculum

African governments should undertake school curricula reforms to align curricula content with labour market demand by pursuing new models of education such as STEM education with emphasis on Science, Technology, Engineering, and Mathematics. This new emphasis will divert the attention of the youth from migration.

Figure 1 identifies the push factors which cause the youth to migrate, among them social, economic and political exclusion, corruption in high places, lack of skills, poverty, conflict, and activities of human traffickers (Adaku, 2014). These factors are well-documented in the literature on migration. These factors need to be addressed critically by the authorities if unplanned and illegal migration is to be curbed.

Figure 1: Push factors

Figure 2 captures the pull factors which attract migrants to emigrate. Among them are the enticement of the Green Card Lottery online, perception of a good life out there, desire to earn the status of citizenship of a developed country, pursuit of benefitting from health insurance and human rights protection. Migrants forget that those privileges do not come easy or cheap as it takes some migrants up to say 20 years or more to regularize their stay abroad. Those who do not succeed to regularize their stay in most cases become fugitives who constantly try to evade the long arm of the law. Many end up in prisons and detention centres. Many incentives which used to be accorded migrants have been withdrawn following the 2007 and 2008 Global Economic Meltdown and the 9/11 terrorist attack in the USA. Migrants are now like unwanted and unwelcome commodities which must be sent back to sender or maker.

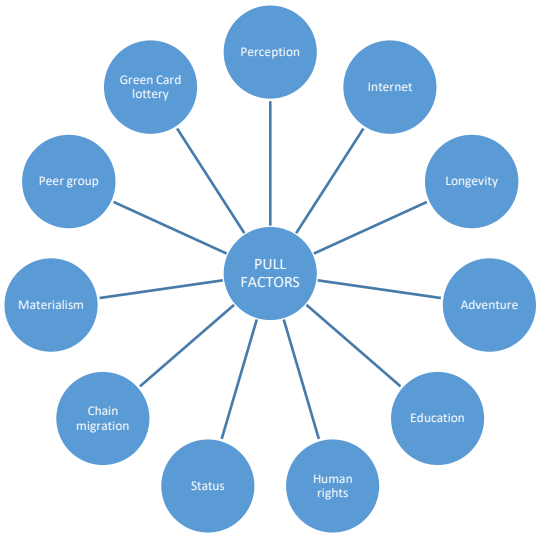


Figure 2: Pull factors

Table 3: Causes of Youth Migration in Zambia

Push Factors	Pull factors
Declining local industries due to globalisation and privatisation	Social media content
Lack of professional and vocational skills	Internet contacts
Lack of well-articulated government support system to youth	Perceived high standards of living
Social rejection and lack of parental care for orphans	Perceived access to unskilled jobs
Peer influence from home and abroad	Adventure
High cost of living at home	High per capita incomes
Lack of access to basic facilities	Stable governments
Poor-paying jobs and high heavy taxes	Access to quality education
High levels of Corruption	Social status of being Been-to
Perceived Poor governance system and bad policies such as the high pensionable age, lack of Press freedom, Electoral malpractices	Invitations by friends
Neglect of youth in governance	Ageing population in rich countries
Perceived Political Corruption	Acquiring foreign citizenship via Green Card Lottery online
Tribalism, Nepotism in public institutions	Acquiring luxury goods
Climate change	Access to high quality medical care
HIV-AIDS and orphans	Having long life
War, Conflicts, Oppression	Accessing social insurance
Human Traffickers	Market demand gap
Porous borders	Labour market demand gap
Poverty of Local Governments to provide local jobs and amenities	Human Rights and Civic organisations supporting migrants
Lack of recreational facilities	Fraudulent online emigration agents
Poor returns from farming	Colonial historical ties of language
Difficult access to capital	Group or Chain migration by following a relative abroad
Running away from extended family responsibilities	Obtaining scholarship to pursue quality education abroad as African universities are not stable and they are not transparent
Exclusion	

Table 4 exhibits the global trends of migration showing the percentages of migrants as percentage of the total populations of their places of origin. Europe, Latin and Central America, and Oceania are the leading migrants in the world. The trend for Africa from 1990 to 2010 seems to be stable around 2.9%. North America has the least number of migrants because it is an affluent area which receives more than it loses with a positive net migration (Brookings.online).

Table 4: Global rates of emigration 1990-2017 (Source: Brookings, Online)

TABLE 3.2. GLOBAL RATES OF EMIGRATION: 1990-2017

Although the number of migrants originating from Africa increased by 80 percent from 1990 to 2017, Africa's emigration rate still declined from 3.2 percent to 2.9 percent over the period owing to a near doubling of the region's population.

Region of origin	Number of international migrants by major region of origin as a share of total population of region of origin						
	1990	1995	2000	2005	2010	2015	2017
World	2.9%	2.8%	2.8%	2.9%	3.2%	3.4%	3.4%
Africa	3.2%	3.0%	2.8%	2.8%	2.7%	2.9%	2.9%
Asia	1.8%	1.7%	1.7%	1.8%	2.1%	2.3%	2.3%
Europe	6.6%	6.7%	6.8%	7.0%	7.5%	7.9%	8.2%
Latin America and the Caribbean	3.4%	4.1%	4.7%	5.2%	5.8%	5.8%	5.8%
Northern America	1.0%	1.0%	1.0%	1.1%	1.2%	1.2%	1.2%
Oceania	3.6%	3.7%	4.0%	4.1%	4.3%	4.6%	4.6%

Note: This table shows the number of emigrants from a specific region as a share of the total population of the region of origin.

Source: Author's calculations, United Nations Population Division, International migrant stock: The 2017 revision, http://www.un.org/en/development/desa/population/migration/data/estimates2/estimates17.shtml.

*This essay is based on a revised working paper Shimeles, A. (2010), "Migration trends, patterns and policy issues in Africa," AfDB Working Paper series No 119.

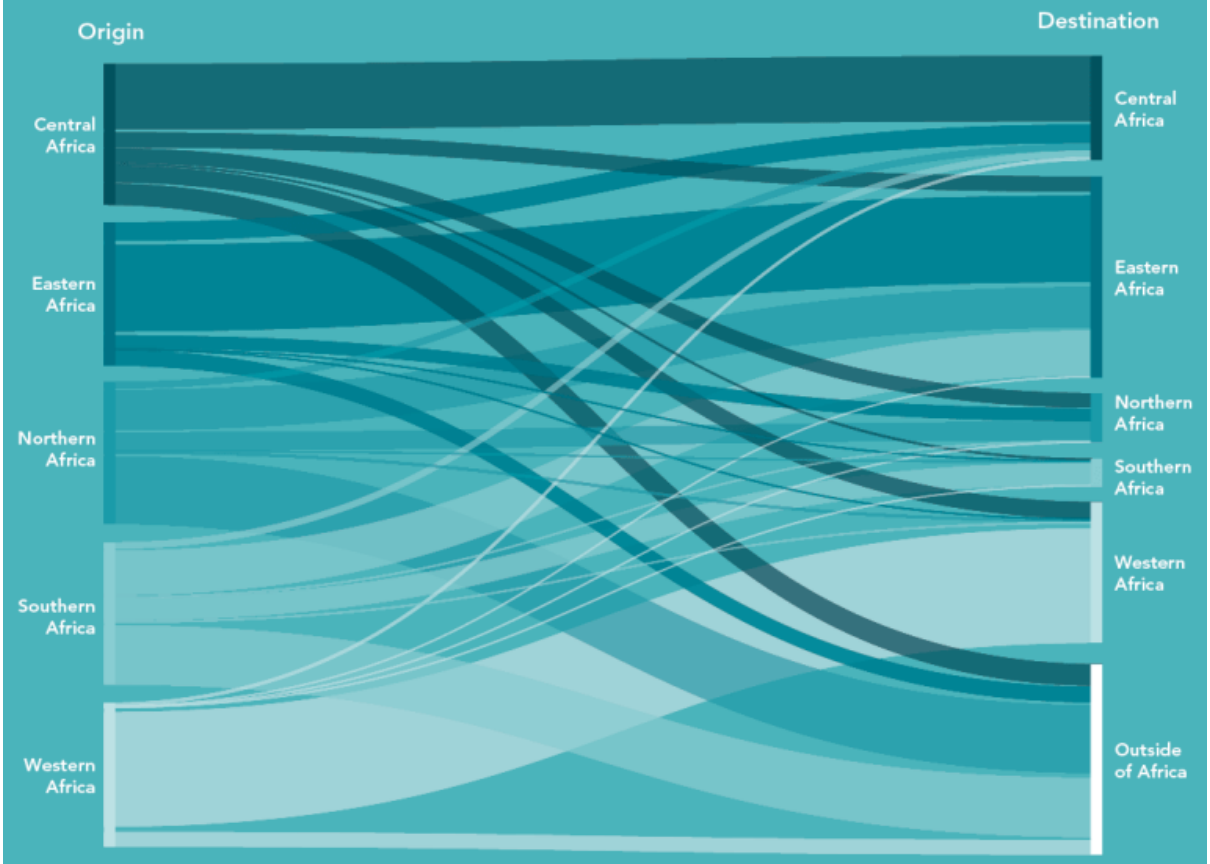
Table 5 shows the types of migration within Africa. All the types within Africa do not create international headlines because of cultural affinities. However, the trends also do show some linguistic affinities in the sense that a migrant from say a Lusophone country such as Angola may likely migrate to another Lusophone country such as Guinea Bissau or Mozambique while those from Francophone and Anglophone countries will follow similar patterns. To ease pressure on some countries, it will be instructive for schools in Africa to start teaching the major official languages in Africa such as Swahili, French, Portuguese, Spanish, Arabic and Hausa in order that African would-be migrants would become multi-lingual and bilingual. This will make migrants more mobile and they will have less cultural shock when they migrate. Table 5 and Figure 4 show rural-urban migration as accelerating urban implosion, agglomeration and growth of conurbations or mega-cities which are not sustainable in the long run because they exceed their threshold populations and put pressure on accommodation, school places, and basic infrastructure. Rural-urban migration needs to be reversed by making farming more attractive to the youth in the rural areas (Adaku, 2013). The education curricula should embrace the Pestalozzi philosophy of educating the head, heart, and hands of our youth so that they can think critically, have passion for entrepreneurship, and also learn to do things practically with their hands (Denny, 2003).

Table 5: Trends and patterns of migration- generic analysis

TYPE OF MIGRATION	IMPACT	LOSING AND RECEIVING AREAS
1. Rural-rural migration	Normal; welcome	Rural
2. Rural-urban migration	Depopulation of rural and congestion of urban areas; Increase in crime; inflation; unemployment	Urbanization; Shanty settlements; Urban agglomeration
3. Urban-rural migration	Normal; welcome	Rural
4. Urban-urban migration	Unwelcome; normal; Pressure on carrying capacity of land; deterioration in services	Urban; Urban implosion; Development of strong nodal connectivity and Primate cities
5. Intra-country migration	Inter-cultural marriages; unity; integration; ethnic disputes over land; Skewed development	Decay areas and Growth poles; Primate cities; Ghost towns
6. Inter-country migration (Africa)	Competition; Cheap labour; Xenophobia; Cross-fertilization of ideas	Human capital attrition; Capital outflows and inflows from remittances
7. Inter-Regional Bloc migration	Xenophobia, *Anomie;* Increase in trade volume; High standards of living. Synergy; Economies of scale and scope; Free Trade and Customs Area	Circulation of ideas and skills; Multi-lateral approach in solving regional problems
8. Inter-continental migration	Culture clash; Brain-Drain; Brain-Gain	Increased Globalization; Increase in FDIs
9. Illegal migration	Diplomatic wrangles; Stateless émigrés; Cultural Shock; Crime; Prison' Repatriation costs	Maltreatment; Modern Slavery; human traffickers
10. Legal migration	Loss of highly skilled professionals	Exposure and gain in higher incomes and R&D
11. Internal-displacement	Trauma from war and loss of property due to natural disasters; Government Transfer payments; Donor support	Loss of cultural artefacts; high cost of reintegration. Land pressure and environmental degradation
12. External Displacement	Trauma; double cultural shock	High cost of resettlement
13. Economic/ Social/Political/Environmental-refugees	Wasted man hours not working for years; High cost on host country	International intervention needed by held from International Community for security guarantees

FIGURE 3.5. MIGRATION PATTERNS WITHIN AND FROM AFRICA IN 2017 (% OF MIGRANTS BY ORIGIN AND DESTINATION)

African migrants overwhelming remain within Africa; less than a quarter emigrate outside of the continent. East Africa and West Africa are host to the largest shares of African migrants, at 30 percent and 26 percent, respectively. Notably, a majority of migrants from East Africa and West Africa emigrate within their own sub-regions.



	Destination						
Origin	**Africa**	**Eastern Africa**	**Central Africa**	**Northern Africa**	**Southern Africa**	**Western Africa**	**Outside of Africa**
Africa	**78.54**	30.33	13.1	5.99	3.33	25.79	21.46
Eastern Africa	88.67	**64.75**	13.67	9.34	0.75	0.16	11.33
Central Africa	84.09	11.11	**48.82**	10.55	1.38	12.23	15.91
Northern Africa	49.56	29.93	4.56	**13.36**	0.05	1.67	50.44
Southern Africa	55.78	33.22	4.6	0.38	**16.43**	1.16	44.22
Western Africa	89.17	0.06	2.29	0.83	0.02	**85.97**	10.83

Note: This table shows the percentage of total African migrants who have emigrated to different parts of Africa and outside of Africa.

Source: Authors' computations based on data provided by U.N. Department of Population. http://www.un.org/en/development/desa/population/migration/data/estimates2/estimatesorigin.shtml.

Figure 4: Migration patterns within and from Africa in 2017 by origin and destination

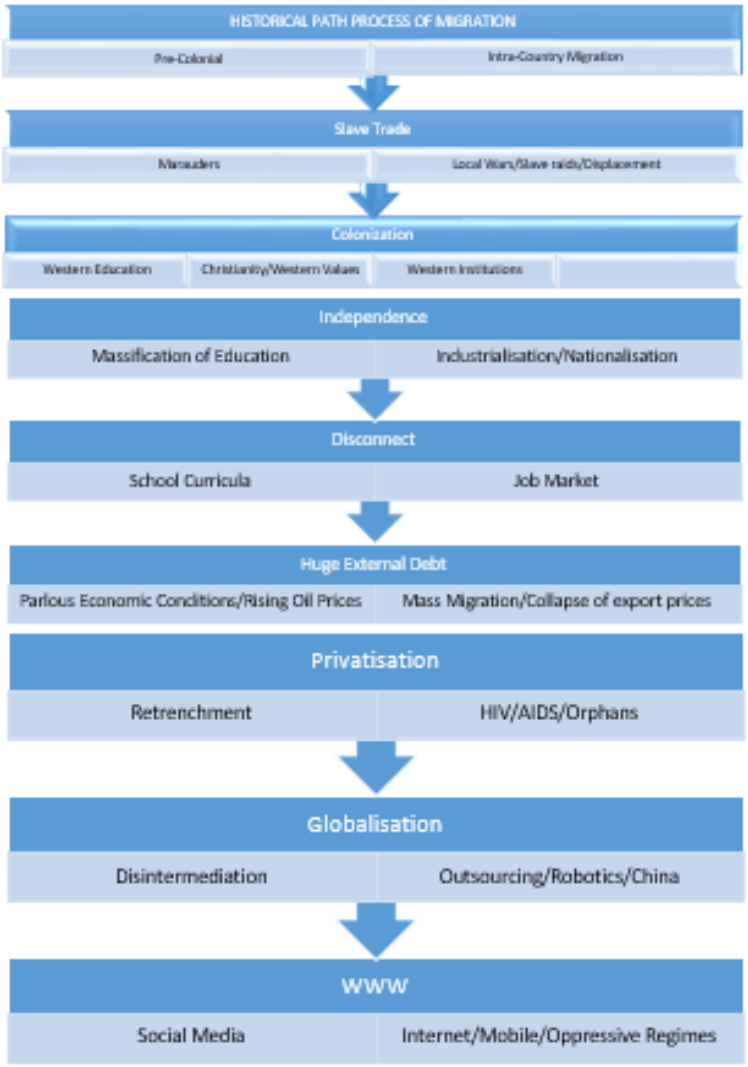
(Source: Brookings [Online]

Figure 5 traces the historical antecedents of modern migration by offering a conceptual framework in a linear manner. In the pre-colonial period antedating the Portuguese arrival on the West Africa Coast around 1440, Africans used to trade among themselves with the famous example of the Trans-Saharan trade route linking the coastal parts of West Africa with the North African countries called the Maghreb. Salt, kola, gold, leather-ware, guns and animals formed some of the commodities of trade exchange. The trade routes linked places such as Kano, Fez, Marrakech, Agades, Gao, Timbucktu, Salaga, and Audaghost. That trade made people long to travel for commerce, adventure, and curiosity. It created migrants in those days. Starting from 1550, after the Spanish priest Las Casas had recommended that the Black Negroes would be suitable to work on the Sugar and Cotton plantations in the New World, the slave trade boomed and millions of young Africans were raided and captured to be sold into slavery from places such as Congo, Angola, Nigeria, Ghana, Benin, Senegambia, and other places in Africa. The trade in slaves, gin, sugar, arms, clothes, and arms was dubbed the Triangular Trade because it touched Europe, Africa, and the Americas. The slave trade caused mass migrations as people fled the slave raiding areas in search of safety elsewhere. By 1833, the slave trade had been abolished and it was replaced by legitimate trade which came with colonization. From 1910 onwards, colonization took root in Africa after Lord Lugard and Cameron had proposed Indirect Rule for Africa and the French had adopted the policy of Assimilation or Equality. The Portuguese adopted the policy of Assimilando. Colonial rule brought with it trade, education, Christianity and western values. Western education led to Euro-centrism or European interpretation of African values by using European standards. That led to Africans developing inferiority complex and relegating their African cultures into limbo. Western education was tailored to the needs of the colonizers. When the colonizers left, the school curricula which they left behind led to mental colonization and enslavement because they failed to address not only the labour needs of the ex-colonies but also all facets of their needs in every aspect of human endeavour. The colonial educational legacy to Africans led to many Africans developing the passionate desire to travel abroad to enjoy the good life or acquire their education abroad in order to earn them some superior status. Africans began to look down on their own home-grown education, leading to more migration.

Attainment of Independence in the 60s brought euphoria of abundance and self-rule. In the immediate post-independence period, jobs were galore because of the leaders' desire for rapid nationalisation and industrialisation. When in the 70s and 80s oil prices went up and export commodity prices went down on the global market (dual shock), many graduates from the schools and colleges had no choice but to migrate for greener pastures overseas, fleeing from economic hardships at home. They became economic migrants and fugitives. The crunch came in the 90s when the huge external debt crisis led to privatisation, denationalisation, deindustrialisation, mass retrenchments of labour, and a parlous economy with shortages of essential commodities such as sugar, cooking oil, flour, mealie meal, and detergents. At the time, it was realised that there was disconnect between the educational curricula and the requirements of the labour market. Many school leavers and retrenchees lacked entrepreneurial skills as well as marketable vocational skills. The problems of the 90s were worsened by the HIV-AIDS pandemic which made people lose interest in living. To some, the only panacea was to plunge into a journey of migration to flee the burden of looking after so many orphans of deceased relatives. From 2000 onwards, globalisation and the internet arrived on the scene whereby many jobs were disintermediated by either using ICT facilities or robots. In some instances, jobs were outsourced or offshored to cheaper locations in labour-surplus countries such as India and China, thereby creating more unemployment (Mills, n.d.). All these factors caused many people to migrate to relatively rich countries where skills and professionals are in short supply. Countries such as Japan, Canada, Norway, Sweden, Denmark, and UK have high ageing

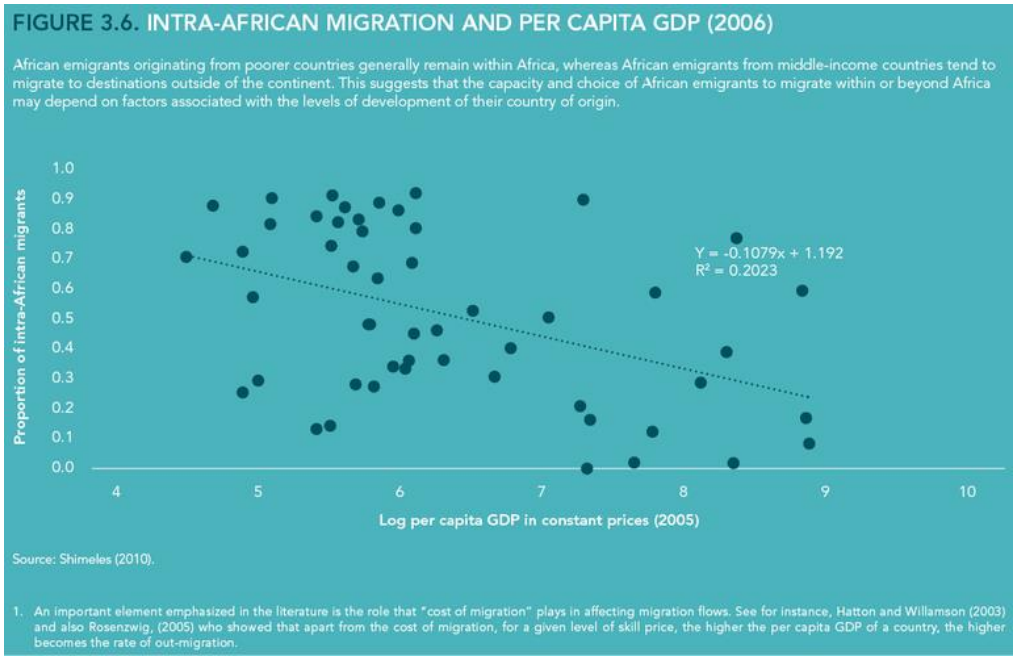
populations and low fertility rates which require them to have inflow of skilled migrants. The young digital natives in Africa are those currently below 19 years, who are active and regular users of social media sites. These are at risk as they can be easily enticed online by human traffickers to migrate. This historical narrative informs the reader that migration in Africa has a long history and the factors which affect it are complex, ranging from ecological, political, social, economic, and psychological. To formulate policies to address the issues of migration, these underlying factors have to be carefully analysed and weighed for their pros and cons.

Figure 5: Historical Conceptual Framework of African Migration



In Figure 6, the data shows that as per capita income increases the rate of migration reduces. This entails that African governments need to work hard to make their countries prosperous in order to reduce migration (Brookings, online).

Figure 6: Intra-African Migration and Per Capita GDP (2006)



Source: Brookings [Online]

3. Method

The essay used secondary research by accessing online articles and journals. In this vein, the essay adopted the review approach by making deductive and inductive inferences which led to the creation of valid and ethical knowledge by building upon what had already been done and trying to build a solid argument to support the premise of the research. Data collected from online sources were deployed to support arguments and they were duly acknowledged. These methods allowed the researcher to build his narrative on a solid foundation.

4. Results

In Table 7, it can be inferred that Lusaka is a Primate City in the sense that its population is more than all the other cities combined. This has negative implications in that it shows that development is not evenly distributed in Zambia and as such all roads lead to Lusaka for commercial and administrative transactions. Lusaka can become a sprawling urban conurbation that can easily lead to urban decay, urban implosion and also increase in anti-social activities such as prostitution and crime. In the urban hierarchy, Lusaka becomes a growth pole. Attempts should therefore be made to grow the other urban centres for them also to become growth poles so that the rural-urban migration can be reduced.

Table 7: City Populations in Zambia (2015)

City	Population
Lusaka	2,281,702
Kitwe	646,827
Ndola	530,129
Chipata	508,361
Lundazi	378,225

Source: CSO

Table 8 Population of Zambia by province 2015

Lusaka	2,777,439
Copperbelt	2,362,207
Southern	1,853,464
Eastern	1,813,445
Central	1,515,086
Northern	1,304,435
Luapula	1,127,453
Western	991,500
Muchinga	895,058
North Western	833,818

Source: CSO

Table 8 above shows total populations of the 10 provinces of Zambia. The last three provinces shown on the table with the lowest populations are North Western, Muchinga, and Western provinces. It can be inferred from the figures that these regions, from historical records, are losing areas due to out- migration (Heisler, 1973). They are far from the Line of Rail as well as from the Copperbelt. Added to that, they have least developed infrastructure. These three provinces from colonial times were supplying labour to the mines (Hiesler, 1973).

Table 9: Motives for migration

1. Employment
2. Education
3. Health
4. Family
5. Adventure

Insights gained from the literature on migration indicate that the main motive for migrants in Sub-Saharan Africa to migrate is primarily due to economic and demographic pressures (Adaku, 2013) Migrants move out to other regions and countries in search of well-paying jobs as well as to improve their incomes, and have the means to remit monies home to look after their families and dependants. Other motives for African migrants to migrate are to pursue higher education abroad, to seek medical care, to join their families, and to seek adventure.

Table 10 above shows net migration statistics for Zambia which indicates that Zambia on five occasions gained from migration while on six occasions it lost out. This indicates that overall, Zambia has had losses from migration despite having a low population density of 17.4 people per square kilometre. Economically-speaking, Zambia should be able to attain critical mass for rapid economic development if it were to allow more immigrants to come in in order to create high demand for goods and services.

Table 10: Net Migration Rate Change, % in Zambia (Source: UNECA)

2015	-0.46	-75.94 %
2010	-1.92	16.33 %
2005	-1.65	-201.92 %
2000	1.62	-402.06 %
1995	-0.54	-813.33 %
1990	0.08	-95.88 %
1985	1.82	181.02 %
1980	0.65	-44.47 %
1975	1.17	-632.88 %
1970	-0.22	-245.03 %
1965	0.15	
1960	0.00	

5. Conclusion

The discussion thus far has identified some of the causes for young Africans to emigrate outside their home countries in search of greener pastures. Those likely to migrate are those young male non-professionals who lack professional and entrepreneurial skills, those with lower levels of education, those who are socially-challenged as orphans, and those who lack job opportunities where they reside. In fact poverty is the bottom-line of mass migration. Many youth feel bored because of lack of creative industries which can engage them in sports, art, dance, entertainment, among others. Some of the environmental factors which have been connected with migration are drought, floods, poor harvests, natural disasters, epidemics, and conflict in war-torn countries. Many youth follow peer pressure to emigrate because of lack of knowledge and also wrong perception which is given to them that overseas countries are better to go to than waste away in their towns and villages. Many youth have been exposed to foreign travel because of globalisation, internet connectivity, activities of human traffickers, and also because they have relatives abroad who invite them to follow suit to emigrate in what is termed chain migration. On a national level, many migrants have been made to take risks of trying their luck elsewhere because they perceive a dead-end in obtaining employment because they complain of corruption, bureaucracy, nepotism, and high

national debt which make the cost of living to be high. These are coupled with high rate of taxes and inflation. Despite media reports of dangers which migrants face in terms of hostile reception abroad and likelihood of not making it to their destinations, the youth are willing to take the adventure to emigrate. The creation of trading blocs and political groupings such as COMESA and ECOWAS has not helped matters as they have led to porous national borders and easy mobility of migrants.

6. Recommendations

The discussion thus far points to the following recommendations:

- African governments should start working in concert to crack down on human traffickers
- The issue of massification of education should be looked into by redesigning the school curricula and emphasizing vocational skills and twinning schools to industry so that schools provide the skills employers look for
- School-leavers should be registered and encouraged to undertake projects before they graduate so that they become self-employed
- Rural areas need to be developed to grow growth-poles and increase the stay-option
- There should be even development of rural and urban areas by strengthening the capacity of local governments to absorb rural school leavers in local enterprises. The decentralisation exercise should be speeded up
- A lot of creative activities should be developed to entice the youth to stay within
- ICT should be used to empower the youth by teaching them coding or programming skills so that they can develop their own marketable programmes and innovative solutions
- Civic organisations and churches should be involved in educating the youth about the dangers and risks involved in unplanned migration abroad
- Government should improve economic and social conditions at home to reverse the trend of migration
- Schools and colleges should start teaching major African official languages to help would-be migrants integrate quickly in their destination countries

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