The Fourth Industrial Revolution and Library Practices
INTERNATIONAL CONFERENCE
23-25 October 2019
Leading Africa into the Fourth Industrial Revolution to solve future challenges

Message from Professor Tshilidzi Marwala: Vice-Chancellor and Principal, UJ

Message from Professor Saurabh Sinha: Deputy Vice-Chancellor: Research & Internationalisation, UJ

Message from Professor Maria Frahm-Arp: Executive Director, UJ Library

PROGRAMME

Profiles of Keynote Speakers

List of Accepted Abstracts

Conference Contact Details

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On course to challenge the global elite

The University of Johannesburg (UJ) is a young, dynamic university. The University was established in 2005 through a merger between the then Rand Afrikaans University, Technikon Witwatersrand and the Soweto Vista University campus. By fusing the best of its heritage institutions with visionary and bold leadership, UJ is now the national standard-bearer for transformation, equity and access.

As well as being an institution that prides itself on its accessible excellence, UJ has also established itself as an institution of global excellence and exceptional stature. The Academic Ranking of World Universities (ARWU), QS World University Rankings and Times Higher Education (THE) systems place UJ within the top five universities in South Africa.

UJ is also among the 364 pioneering institutions identified by education strategy-consulting firm, Firetail, as a new generation of “challenger” universities set to be globally influential in the next 15 years. Named as one of the “upstream fighters” in the report due to being located in a weak higher education ecosystem, our strategy to increase our global excellence and academic robustness has been borne out with UJ climbing 507 places from 2010-2011 to 2015-2016 in the URAP ranking.

UJ is the first and only African university admitted to the highly respected consortium of 28 research-intensive universities in the world, Universitas 21 – a significant endorsement of the growing international stature of UJ. Under South Africa’s National Development Plan (NDP), the Vision 2030 Awards honoured UJ in 2017 for the role the University plays in providing sound education to a diverse South African and international population.

UJ is set to make a significant mark in the global higher education arena in innovative and disruptive ways.

UJ boasts excellent, internationally recognised academic programmes based on curricula informed by cutting-edge developments in both undergraduate and postgraduate education. Our programmes prepare students for the world of work and for global citizenship.

The community we serve at UJ

UJ has close to 50 000 students across its four campuses. We are the University of choice for the working class, first generation student. We produce an output of 13 000 graduates annually and UJ is gaining a proud reputation for making a sizeable contribution to the skilled workforce of the country, with an 85.4% throughput rate. Our student profile comprises 92% black students, with 28% from the poorest schools in South Africa and 60% of our students are first generation university graduates.

We are committed to the pursuit of excellence in our teaching and research; we produce graduates who are responsible citizens and play a meaningful role in the development of South Africa. We instituted major programmes within our Academic Development and Support Unit to help our students overcome most social barriers so that they can focus on achieving academically. We pride ourselves on having one of the best student support structures in South Africa.

At our core, we are committed to facilitate economic development. We break the poverty cycle in thousands of working class families by producing work-ready graduates. Above all, by supplying the South African economy with a highly skilled workforce in critical areas, such as engineering, science, entrepreneurship, education and social science, we capacitate the economy for growth.
Tshilidzi Marwala
Vice-Chancellor and Principal of the University of Johannesburg, South Africa

Message from the Vice-Chancellor, Professor Tshilidzi Marwala

The Fourth Industrial Revolution

The Fourth Industrial Revolution is characterised by making systems as well as machines intelligent and connected. The underlying technologies of the Fourth Industrial Revolution include artificial intelligence (AI) as well as blockchain. Artificial intelligence is a paradigm where physical and social phenomena are programmed to solve complex problems. AI enables machines to learn, adapt, evolve and optimise, and has had a profound impact in diverse fields such as engineering, medical sciences and social sciences. In this lecture, Prof Marwala will explore applications of the Fourth Industrial Revolution technologies to engineering, social sciences, education and medical problems. In his presentation at our conference, he will discuss the implications of these on society as well as the underlying costs.

ABOUT PROF MARWALA

Tshilidzi Marwala is Vice-Chancellor and Principal of the University of Johannesburg. Previously, he was Deputy Vice-Chancellor for Research and Internationalisation and Executive Dean of the Faculty of Engineering and the Built Environment at the same university. He progressively held the positions of Associate Professor, Full Professor, the Carl and Emily Fuchs Chair of Systems and Control Engineering, as well as the SARCHI Chair of Systems Engineering at the Department of Electrical and Information Engineering at the University of the Witwatersrand. Before then, he was Executive Assistant to the Technical Director at South African Breweries, and a postdoctoral research associate at the Imperial College (then University of London).

Prof Marwala holds a Bachelor of Science in Mechanical Engineering (magna cum laude) from Case Western Reserve University (USA) in 1995, a Master of Mechanical Engineering from the University of Pretoria in 1997, and a PhD specialising in Artificial Intelligence and Engineering from the University of Cambridge in 2000.

He is a registered professional engineer, a Fellow of TWAS (The World Academy of Sciences), the Academy of Science of South Africa, the African Academy of Sciences and the South African Academy of Engineering. He is also a distinguished member of the ACM (Association for Computing Machinery).

His research interests are multidisciplinary and include the theory and application of artificial intelligence to engineering, computer science, finance, social science and medicine. He has supervised 47 master’s and 28 doctoral students to completion. He has published 14 books on artificial intelligence, one of which has been translated into Chinese, more than 300 papers in journals, proceedings, book chapters and magazines, and he holds four patents. He is an associate editor of the International Journal of Systems Science. His writings and opinions have appeared in the magazines New Scientist, The Economist and Time Magazine.

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Message from Professor Saurabh Sinha

Prof Saurabh Sinha is currently the Deputy Vice-Chancellor for Research and Internationalisation at the University of Johannesburg, South Africa, and is a former Vice-President: Educational Activities, IEEE.

Higher Education Leadership in the Era of the Fourth Industrial Revolution

It is a privilege to be in a university in the era of the Fourth Industrial Revolution (4IR). Universities, like the University of Johannesburg, aspire to “dynamically shape the future,” and 4IR provides a perfect segue for this – our approach to 4IR is a catalyst allowing us to graduate students who are able to think differently and distinguish themselves in this way. In particular, we have striven for learning. Learning encompasses a blend of teaching, research and innovation in an era where even the fundamentals are shifting.

Through a process lasting nearly one year, the University of Johannesburg (UJ) decided to contextualise its 2025 strategy for global excellence and stature for 4IR. The strategic or catalytic initiative has wide implication for the University’s business and in particular for the research-innovation nexus. The quest is to graduate students who are able to access and define new areas of economic activity. In addition to the physical or urban economy endeavour, South Africa, through Operation Phakisa (“hurry up”), has added the oceans economy; the digital economy has also been defined. The digital economy brings about an opportunity for creating jobs in a virtual environment and to combat poverty in a new way. However, the digital economy has the potential for deepening inequality unless the aspect of digital equity and equality is included as an “initial specification” to the 4IR education and economic scenario.

In the education scenario, inclusiveness must be an endeavour in project and programme initiatives. Fortunately, the generation of millennials and beyond is a majority in Africa and their energy, combined with 4IR, could bring about a new kind of global renewal to achieve equality. In the economic scenario, government must play a role in re-defining taxation and through economic stimulus, for instance, by incentivising 4IR as an economic stimulus with productivity gains gradually being taxed. As initiatives, progress in parallel, education-economic thinking for inclusiveness would need to be central to the graduate’s paradigm of thinking.

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ABOUT PROF SINHA

Saurabh Sinha, SMIEEE, FSAIEE, FSAAE – Prof Sinha obtained his BEng, MEng and PhD degrees in Electronic Engineering from the University of Pretoria (UP). He achieved both his BEng and MEng with distinction. As a published researcher, he has authored or co-authored approximately 110 publications in peer-reviewed journals, books and at international conferences. In addition, he is the managing editor of the South African Institute of Electrical Engineers (SAIEE) Africa Research Journal. Prof Sinha served UP for over a decade, his last service being as Director of the Carl and Emily Fuchs Institute for Microelectronics, Department of Electrical, Electronic and Computer Engineering. Together with his research group, he conducted teaching at undergraduate and postgraduate levels, and researched and performed extensive management tasks. To allow for continuation of postgraduate leadership, he was appointed as extraordinary professor at UP.

On 1 October 2013, Sinha was appointed as Executive Dean of the Faculty of Engineering and the Built Environment (EBE) at the University of Johannesburg (UJ). On 1 December 2017, Prof Sinha was appointed as Deputy Vice-Chancellor: Research and Internationalisation.
Message from the Executive Director: UJ Library, Prof Maria Frahm-Arp

Do academic libraries still have a role to play in the Fourth Industrial Revolution?

My answer to this question is not only do they have a role – they are integral to humans successfully applying all that the Fourth Industrial Revolution (4IR) has to offer society. I make this claim for three different reasons.

First, one of the most important pillars of the Fourth Industrial Revolution is data. But data is only as good as how it is catalogued. The people with years of experience and expertise in metadata management are librarians, especially cataloguers and metadata specialists. As data becomes the new currency of 4IR, this expertise will be needed more and more. A simple example is Research Data Management. While academics are now able, and even required by the National Research Foundation (NRF), to upload all their data onto some digital research data management site, they are not skilled at organising, cataloguing or marking this data with the right digital identification so that it is easy for other researchers to find and cite. This is where cataloguers come in. They can teach academics how to do this and in some cases do it for them. The research data on a Research Data Management site is only valuable if other people can see it, either in an open-access format or through password-controlled access. But if it is not correctly catalogued, identified and tagged, it has little value.

Second, academic librarians are skilled at managing a vast amount of information and finding the various needles in the information haystacks. While using Google gets us somewhere, there are many important articles, books and opinion pieces researchers miss when they rely only on Google. In the age of information overload, librarians are trained to navigate the ever-growing body of knowledge produced daily.

Third, for university graduates to flourish in the world of work, one of the most important skills they need to learn is critical thinking. Academics are very good at teaching students this skill but the companion skill – finding relevant information, which one then critically assesses – is not taught to students by academics. This is where academic librarians play a critical role. They teach students information literacy – how to find, assess, and critique information.

As we progress through the Fourth Industrial Revolution, we will see our libraries change significantly, but they will remain an integral part of any successful university or research unit.

ABOUT PROF FRAHM-ARP

Prof Maria Frahm-Arp obtained her PhD in the Sociology of Religion from Warwick University (UK). She is the author of several book chapters and journal articles. She is the winner of the UJ Humanities Teaching and Learning Award (2014) and the Vice-Chancellor’s Distinguished Teaching and Learning Award (2016). In 2017, she worked as the Vice-Dean in the Faculty of Humanities and since March 2018, she has been working as the Executive Director of the Library and Information Centre at the University of Johannesburg.
**Programme**

PROGRAMME DIRECTOR: **Prof Maria Frahm-Arp**, Executive Director: UJ Library.

23 October 2019

**DAY 1**

08:00 – 08:45  Registration + Tea/Coffee on arrival.

08:45 – 09:15  OPENING ADDRESS by **Prof Saurabh Sinha**: Deputy Vice-Chancellor, Research & Internationalisation, University of Johannesburg.

09:15 – 09:30  WELCOME ADDRESS by **Prof Maria Frahm-Arp**, Executive Director: UJ Library.

**CATEGORY A: KNOWLEDGE**

- Knowledge sharing in a society in the 4IR era.

09:30 – 09:45  Why Dissertations and Theses are Essential in the Fourth Industrial Revolution. By Anas Abdelhadi, ProQuest.

09:45 -10:00  How does an information professional adopt a digital mind-set in a digitally transforming research organisation? By Siphelele Gcukumana & Lillian Santi, Council for Scientific and Industrial Research (CSIR).

10:00 – 10:15  Taking Staff into the 4th IR. Rethinking the roles and skills of Librarians. By Chipa Thomas Maimela, University of Pretoria, South Africa.

10:15 – 10:45  **KEYNOTE SPEAKER: Carl Grant**, University of Oklahoma Libraries. Title of talk: *Transforming an academic research library into a campus engine for innovation – A case study.*

10:45 – 11:45  TEA

11:45 – 12:00  Re-imagining the library collection: Meeting the changing content needs of researchers and students. By ProQuest.

12:00 – 13:00  **KEYNOTE SPEAKER: Prof Abejide Ade-Ibijola**, College of Business and Economics: Lead of the Technopreneurship Centre of the School of Consumer Intelligence and Information Systems, UJ. Title of talk: *The Future Library: A Blueprint.*

13:15 – 13:30  Q & A Session facilitated by Prof Abejide Ade-Ibijola.

13:30 – 14:15  LUNCH


14:30 – 14:45  An exploratory study on the readiness of some selected academic libraries in Sub-Saharan Africa in the era of 4th industrial revolution. By Michael Esew, Ahmadu Bello University, Zaria & Wilhemina Naa Dedei Larnyoh, University of Ghana, Legon.

14:45 – 15:00  Embedding in a VLE for undergraduate Engineers: An experiment in next generation enablement. By Lesego Makhafola, University of Pretoria, South Africa.

15:00 – 15:15  TEA

15:15 – 15:30  Rethinking the role of university Libraries in supporting users as the 4th Industrial Revolution Approaches: The case of National University of Science and Technology (NUST) (Zimbabwe) and University of Johannesburg (UJ) South Africa. By Nomaqhawe Moyo, Mapungubwe Institute for Strategic Reflection, South Africa.

15:30 – 16:00  Q & A Session – Facilitated by Dr Martie van Deventer: Part time lecturer at the University of Pretoria (UP), Department of Information Science.

24 October 2019

**DAY 2**

08:00 – 08:30  Registration & Tea/Coffee on Arrival

08:30 – 09:30  **Isok van der Walt**, University of Pretoria, Digital Scholarship & MakerSpace Centre Manager.

09:30 – 10:15  **KEYNOTE SPEAKER: Prof Tshilidzi Marwala**, Vice-Chancellor, UJ.

10:15 – 10:30  Q & A Session – Facilitated by Prof Maria Frahm-Arp.

10:30 – 11:00  TEA

11:00 – 12:00  **KEYNOTE SPEAKER: Prof Maria Frahm-Arp**, Executive Director, UJ Library. Title of talk: *The Fourth Industrial Revolution is Changing my Job!*: *The Challenges of 4IR and Library Science.*
CATEGORY C: CONNECTING
– Digitally connecting libraries in a world full of ideas, opinions, learning and opportunities.

12:00 – 12:15 Are the Big 6 Information Literacy Skills still relevant within the Fourth Industrial Revolution? By Elize du Toit, University of Johannesburg, South Africa.
12:15 – 12:30 Technologies enabling the fourth industrial revolution: Opportunities and challenges for libraries and patrons. By Dr Patrick Ndayizigamiye, University of Johannesburg, South Africa.
12:45 – 13:00 Q & A Session facilitated by Bronwyn Rassman, EBSCO.
13:00 – 13:45 LUNCH
14:00 – 15:00 PANEL DISCUSSION – Facilitated by Prof Maria Frahm-Arp Panellists: Carl Grant, Dr Martie van Deventer, Prof Kelvin Bwalya.
15:00 – 15:15 TEA
15:30 – 15:45 The institutionalisation of Social Networking Sites (SNSs) for increased information services: A Case Study of a Corporation utilising Yammer, Facebook, Twitter and Instagram. By Wisdom Ndashe.
15:45 – 16:00 The Negative Impact of Social Media on Library and Information System (LIS): University of Jos Students approach. By Gilbert Paul Igboechesi, University of Jos, Nigeria – (via Skype/Zoom).
GALA DINNER

25 October 2019
DAY 3
08:30 – 09:00 Registration + Tea/Coffee on arrival
09:00 – 09:30 Presentation by Paul Canning, Regional Sales Manager: Europe, Middle East, Africa, Latin America, Institute of Electrical and Electronics Engineers (IEEE).
09:30 – 10:00 Presentation by Keith Mears, eBooks Online Sales Manager – EMEA (Middle East, Africa), Taylor and Francis.
10:00 – 10:30 TEA
10:30 – 11:30 KEYNOTE SPEAKER: Dr Corrin Varady, CEO: IDEA Digital Education Title of talk: The design and implementation of e-resources: Driving educational outcomes rather than access.

CATEGORY D: INNOVATION
– New ideas, creative thoughts and new imaginations.

11:30 – 11:45 AI and the Changing Role of Academic Libraries in RSA: Opportunities, Challenges, Risks (and their mitigation), and the Way Forward. By Nomoya Mahlangu, University of Johannesburg.
11:45 – 12:00 Artificial intelligence and robotics within the library space. By Angela Moeng, Christina Mafumana & Agnes Xaba, University of Johannesburg.
12:00 – 12:15 Reshaping the future of academic libraries to the fourth industrial revolution. By Matlala Emanuel & Maphoto Asania, University of KwaZulu-Natal, South Africa.
12:15 – 12:30 CLOSING
12:30 LUNCH

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CARL GRANT
Dean (Interim), University Libraries, University of Oklahoma, USA.

TITLE OF TALK: Transforming an Academic Research Library into a Campus Engine for Innovation – A Case Study

In what is referred to as “fly-over” country in the middle of the United States, the team at the University of Oklahoma Libraries has transformed a very traditional academic library into a thriving, vibrant part of the overall campus. Done over a period of five years, it started with educating the community about what was possible. The plan included rebuilding the core technical infrastructure, stunning renovations in physical and virtual spaces, research and scholarly communications, as well as exhibitions highlighting special collections.

The talk examines the societal challenges that brought about (and continue to bring) the need for such a transformation, how strategic planning, maps and prints framed the transformation, and the technological foundations that needed to be in place to build upon. We’ll examine how the library team embraced these changes and the associated tools (like virtual reality, 3D printing and the Carpentries) in order to recalibrate campus expectations of what could be done in omni-disciplinary research efforts as a result of the libraries being a key partner with researchers in colleges across the campus (and larger communities!). In addition, we’ll examine the new outreach efforts performed to show the community members at-large the tremendous value being created and accessed through the university libraries.

Finally, we’ll look at what resulted at the University of Oklahoma, including the public recognition, awards and cutting-edge research generated in partnership with the libraries, which is now reforming research and pedagogy across North America.

BIO: Dr Carl Grant is the Dean (Interim) of the University of Oklahoma Libraries where he is known for leading efforts in interviewing libraries into the research and pedagogy of the university via the utilization of advanced technologies. Dr Grant is active in numerous professional organizations, publishes frequently and speaks all over the world about the future of libraries. He holds an MLS from the University of Missouri.

PROFESSOR ABEJIDE ADE-IBIJOLA
Senior Lecturer in the Department of Applied Information Systems at the University of Johannesburg, the Lead of the Technopreneurship Centre, and the Founder and Lead of the Research Cluster on Formal Structures, Algorithms, and Industrial Applications.

TITLE OF TALK: The Future Library: A Blueprint

BIO: Dr Abejide Ade-Ibijola holds a PhD in Computer Science (Artificial Intelligence) from the University of the Witwatersrand, Johannesburg (2016). He has 10 years of Academic and Industrial Experience in creating cutting-edge technology. He is currently a Senior Lecturer in the Department of Applied Information Systems at the University of Johannesburg, the Lead of the Technopreneurship Centre, and the Founder and Lead of the Research Cluster on Formal Structures, Algorithms, and Industrial Applications at the same institution. With 74 career awards to date, Abejide continuously pursues innovation by building 4IR tools across different sectors of the society.

ISAAC VAN DER WALT
Digital Scholarship & MakerSpace Centre Manager, University of Pretoria, South Africa

TITLE OF TALK: MakerSpacers – Where are we now.

BIO: Isak van der Walt is currently Digital Scholarship & MakerSpace manager for the Department of Library Services at the University of Pretoria. He forms part of the strategic innovation unit that focuses on implementing projects that are of strategic value and importance for UP and Library Services. Isak has been a member of the University of Pretoria since 1999 where his career has been focused primarily on ICT and information services. With over 20 years of experience in the academic ICT sector, Isak has in-depth knowledge on the latest trends, demands and solutions to steer academic librarianship into the 21st century.

Isak is co-founder and project lead of the first Academic MakerSpace in South Africa and responsible for the strategic planning and trajectory of MakerSpace. He is also responsible for the implementation of a Digital Scholarship Centre at the University of Pretoria, enabling this new form of scholarly output and discovery for researchers and students. He is also part of the Research Data Management steering committee, advising on the technical aspects relating to RDM. In addition, he is also the Technical Lead for the South African Sustainable Development Hub (SASDGHub), steering their artificial intelligence project to enhance research discovery.

He is a passionate digital strategist with a love for all new disruptive technologies and services that change the way we are doing things.

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DR CORRIN VARADY
CEO: IDEA Digital Education

TITLE OF TALK: The design and implementation of e-resources: Driving educational outcomes rather than access.

This race towards digital has often solely focused on the delivery of hardware over content, which has led to some average results and institutions and students are questioning what this wave of technology has really done in bringing about a change in student achievement. While hardware is key to any digital solution, it should be considered the vehicle for quality learning materials to personalise and support each learner and allow teachers to be more effective in their classrooms. This is not easily done if the content provided continues to replicate the pre-digital methodology. Many of the e-resources that are available are repurposed and digitised notes, textbooks and presentations. Good quality content, cognitive graphic design and robust adaptive code are essential for delivering products where the learning outcomes drive the technology rather than the other way around. In institutional deployments, we need to regard three key areas to measure outcomes, namely; 1) curriculum or course performance as well as student achievement results; 2) technical and operational alignment and; 3) institutional efficacy and engagement. The research argues the goals of the educational technology sector are often to provide greater access to a more democratic education through technology, rather than measurable educational outcomes. It examines how educational competency, transformation and standards that should apply to e-resources with large-scale technology implementations are affected by global innovation trends and it explores the degree to which the local identity of the national and institutional policy impacts the success of global resource solutions to local education challenges.

BIO: Dr Corrin Varady started the global digital education company, IDEA Digital Education in 2014. As the Company’s current CEO, he has spoken at summits around the world about the importance of providing high quality digital resources to emerging-market students in order to democratise education. Corrin founded IDEA Digital Education to create and deliver STEM digital content to primary and secondary students in Africa, the Middle East and South East Asia as well as digital professional learning for teachers.

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Abstracts

LIST OF ACCEPTED ABSTRACTS

WHY DISSERTATIONS AND THeses ARE ESSENTIAL IN THE FOURTH INDUSTRIAL REVOLUTION.
By Tami King, ProQuest Account Manager, Africa.
Presenter: Anas Abdelhadi, ProQuest Regional Sales Manager.

As technology, research and information rapidly change, dissertations and theses have evolved alongside. Dissertations and theses are an essential resource for research and teaching in the age of the Fourth Industrial Revolution. Why is this type of content so important to the library and the university?

This session will explore the unique value of dissertations to the researcher and the librarian. Study of the complex and wide-ranging impact of 4IR requires access to the latest research, complete results and data, and in-depth coverage only dissertations provide. The multidisciplinary aspects of our evolving world require access to the full scope of humanities topics covered in graduate work.

In fact, dissertations are a central part of the body of research already established for 4IR topics, such as artificial intelligence, and study of the Fourth Industrial Revolution itself. Additionally, the body of dissertations-based research produced by and about the African continent is large and constantly growing. We’ll look at the depth and breadth of this scholarship.

Finally, we’ll discuss the benefit to librarians of bringing this important global resource to their universities, and the benefit of African universities including their graduate works in ProQuest Dissertations and Theses.

HOW DOES AN INFORMATION PROFESSIONAL ADOPT A DIGITAL MIND-SET IN A DIGITALLY TRANSFORMING RESEARCH ORGANISATION?
By Siphethile Gcukumana and Lillian Santi, Council for Scientific and Industrial Research (CSIR), Pretoria, South Africa.

From the steam engines around the 1760s, to the age of mass productions enabled by electricity, right to the 1950s when the third industrial revolution brought mainframe computers and automation. Libraries and information services too have been evolving. Information professionals have been dealing with technological changes for years. From dialog in the early 2000s to the web that resulted in new service models.

This paper aims to explore the journey and possibilities for information professionals in a scientific research environment as they gear to embrace the Fourth Industrial Revolution. Libraries in this environment have a history stretching back from a time when the focus was on printed collections
and reference services. After the digital revolution, the library became virtual. This saw the shift of services focused on collections to being more engaging and enabling. Today as the world transitions into the Fourth Industrial Revolution, libraries and information professionals are once again reviewing their service offerings and service delivery. If the key Fourth Industrial Revolution developments such as AI, machine learning, IoT and other areas of datafied scholarship are going to be significant to libraries, information professionals should adopt a digital mind shift and mindset.

Adopting a digital mindset will mean developing new skills, including professional and personal skills among other crucial skills. Information professionals are gearing to work in “grey areas” in between humans and machines. According to Prof Norbert Gronau, being able to still work when processes have been e-hierarchised, de-specialised and delocalised and when systems have been automated and digitised will require a digital mind shift.

**TAKING STAFF INTO THE 4TH IR – RETHINKING THE ROLES AND SKILLS OF LIBRARIANS**

_By Chipo Thomas Maimela: University of Pretoria, South Africa._

Existing truth already suggests that artificial intelligence (AI) and internet of things (IoT) are changing the world, and this will also affect the skills in any field including the library. Further predictions suggest that intelligent machines will be able to do every task better and more cheaply than humans. Several questions are being raised, specifically for the library services as to when will AI or IoT start impacting human performance, when will machines exceed human performance and when will machines start performing library jobs.

The questions can be answered by outlining a framework that focuses on the management of technology, innovation, people, and systems (TIPS). The framework unpacks how technology is directed and managed through innovative means. Innovation itself needs to be managed by people who are always drivers of the systems, which also require intensive management approaches. Using the TIPS framework in the library, the staff will always strive to manage all the AI and IoT processes. The TIPS framework will be directed towards achieving specific library tasks and in the process, the innovation will require the systematic approach, which includes agility and alignment and continuous engagement.

Although the framework indicates that the process is not linear, which means the process of adaptation is followed by adjusting to changes, implementation and innovating again, this will ultimately bring further innovative mechanisms to try and counteract any further changes that IoT and AI may bring to library staff for further development to take place.

**REIMAGINING THE LIBRARY COLLECTION: MEETING THE CHANGING CONTENT NEEDS OF RESEARCHERS AND STUDENTS**

_By Tony Nercessian, ProQuest’s Regional Sales Director (EMEA) for Primary Source content._

Information is available in more formats, via more channels than ever before. In research conducted by ProQuest, we try to better understand the academic librarian perspectives on the needs and challenges facing researchers as they discover and use information as part of their studies, teaching, and research. The findings clearly show the value of using multiple content types in research, but also highlight some fundamental challenges facing the library in light of this change.

This talk will review how the proliferation of e-resource channels has put an increased pressure on the library to facilitate this research shift away from its exclusive dependence on text, while supporting the development of crucial critical thinking and information literacy skills in students. We will look at how the demand for interdisciplinary content from both faculty and students is driven by an understanding that exposure to and use of a variety of content types promote better learning outcomes for students, helping them to build foundational knowledge and generate higher quality work. The need for diverse e-resource types is apparent, but how does the academic librarian ensure that their library collections evolve to include the most appropriate content types for each user, while simultaneously managing their expectations on increasingly tight budgets?

Finally, we’ll look at how text and data mining, a rapidly developing subset of digital humanities research, is producing some of the most innovative insights in the field. Already supporting progress in the field of STEM, we will discuss how ProQuest is enabling further exploration into the future possibilities of TDM in the humanities.

**BIBLIOMETRICS TO RESEARCH PROFILES: A CHANGING SCHOLARLY LANDSCAPE**

_Melissa Badenhorst, Sales & Marketing Director, WorldWide Information Services (WWIS), South Africa._

Bibliometrics are a range of quantitative measures that assess the impact of research outputs. Bibliometrics can be useful to faculty in the midst of tenure, but can also be useful when applying for grants, can pinpoint trends in scholarship and assist authors when considering publication opportunities. It requires an objective evaluation of activities concerned with scientific research, research development and innovation within the research landscape. Research, however, is not one-dimensional: the process is complex. Nor do research organisations have a single mission. Recently, the Institute of Scientific Information (ISI) published a report with the focus on research profiles. Through this report, they investigate the limitations created by packing research activity data into a single point metric and how it becomes more evident when moving from individuals and journals to research groups and institutions. This paper will take a practical approach in understanding the familiar types of analyses that can obscure real research performance when misused and investigate opportunities and challenges regarding the monitoring and evaluation of research output, impact and moving beyond metrics.

**AN EXPLORATORY STUDY ON THE READINESS OF SOME SELECTED ACADEMIC LIBRARIES IN SUB-SAHARAN AFRICA IN THE ERA OF 4TH INDUSTRIAL REVOLUTION.**

_By Michael Esew, PhD, cln[GE2] Academic Librarian, Kashim Ibrahim Library, Ahmadu Bello University Zaria & Wilhemina Naa Dedel Larnyoh, MA, Academic Librarian, Balme Library, University of Ghana Legon._

The emergence of computers and information technologies have changed the way and manner libraries world over render their services to users. Libraries are redesigning services and information to add value and satisfy the varied needs of their users.
This study therefore investigates the readiness of some selected academic libraries in Nigeria and Ghana to cope with the changes that the Fourth Industrial Revolution has brought to every sphere of the world, including the library.

The study adopted an explanatory research method because this is a virgin area of study. The population of the study from which samples were drawn constitutes Kashim Ibrahim Library (Nigeria) and Balme Library (Ghana).

Responses from the study were analysed using simple frequencies and percentages with corresponding charts where necessary.

The study revealed that the sampled academic libraries rendered digital library services, which served as the bedrock to which the Fourth Industrial Revolution (4IR) era could find a place in the library. The study further revealed that the use of robot and other sophisticated technologies were yet to be imbued, which could help the library provide efficient round the clock access.

In conclusion, Digital Libraries have started gaining ground in Africa and around the world, thus forming an integral part of the services rendered by academic libraries, and applying new technology to provide access to digital collections. However, what remains a thing of concern is the sustainability of these technologies to fit into the era of Internet of Things (IoT) to support the current trends.

EMBEDDING IN A VLE FOR UNDERGRADUATE ENGINEERS: AN EXPERIMENT IN NEXT GENERATION ENABLEMENT

By Lesego Makafola, Information Specialist for Chemical, Electrical, Electronic and Computer, and Material Science and Metallurgical Engineering, University of Pretoria, South Africa I Dr Martie van Deventer, Portfolio Manager Council for Scientific and Industrial Research (CSIR) (Retired).

Libraries in higher learning institutions have the task of facilitating access to information to help meet the needs of the institutions’ communities for teaching, learning and research (Department of Arts and Culture, 2015: 8). Librarians find it easier to meet this objective with the use of technology. Embedding library products and services directly into the teaching, learning and research environments used by the various user communities directly enables the blended learning experience.

Librarians who embed online can reach users at ‘the point of need’ (Paganelli & Paganelli, 2017:55). Blackboard, a Course Management System, is used to provide blended learning infrastructure. Our institution, like many others, is embarking on the process to embed library services in the available online courses.

Research was conducted to establish the role that Engineering students expect an information specialist to play in a virtual learning environment (VLE), the products and services the students expect an information specialist to provide and the extent thereof. An extensive literature review was conducted to provide the necessary context and background. The research indicated what library products and services need to be embedded. Besides very specific electronic products, the services requested include: (1) referencing help, (2) step-by-step guides, (3) assignment writing help, and (4) information specialists facilitating online discussions about resources for assignments. An experiment will be undertaken to establish to what extent the information specialist is able to deliver on the needs and expectations of the Engineering students. The experiment relies heavily on existing technology, but will also be considering emerging technologies to meet some of the requirements. Planning for the embedded program has been completed and implementation will take place during the first semester of 2019. The paper will provide the research findings and will also report on the project progress, the implementation successes and challenges experienced.

RETHINKING THE ROLE OF UNIVERSITY LIBRARIES IN SUPPORTING USERS AS THE 4TH INDUSTRIAL REVOLUTION APPROACHES: THE CASE OF NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY (NUST) (ZIMBABWE) AND UNIVERSITY OF JOHANNESBURG (UJ) (SOUTH AFRICA)

By Nomagwathu Moyi, Information Technology Manager, Mapungubwe Institute for Strategic Reflection (MISTRA) and Tapiwa Tanhuke, Senior Library Assistant, National University of Science and Technology (Zimbabwe).

This paper examines the changing role(s) of academic libraries in the context of the Fourth Industrial Revolution (4IR) ? a distinct historical phase characterised by “… extraordinary velocity, scope, and system impacts of technological advancements’. The 4IR brings about the proliferation of information, and improved access to this information, through digital tools. This requires academic libraries to evolve in order to stay relevant and meet societal expectations. Raju argues academic libraries have moved from being centres that managed physical resources to transforming resources and services into digital formats that support teaching, learning and research. The primary research for this paper examines how two academic libraries in Zimbabwe and South Africa are responding to this challenge. Through a comparative case study analysis, we explore how these two academic libraries, serving two leading university communities, are reconsidering their roles. The analysis focuses on steps taken to date as well as the state of preparedness of the respective academic libraries for the future creation and transfer of knowledge in 4IR. The comparative case study is useful because it employs the ‘logic of comparison’, comparing and contrasting phenomena as well as ‘tracing across sites’ to make sense of the context of the case subjects. The paper finds that the two academic libraries are taking tentative steps towards meeting the demands of 4IR in their respective contexts. The paper builds towards the argument that academic libraries have to be at the centre of the adoption and utilisation of new technologies to ensure that users are equipped with the skills to benefit from this technology.

‘THE FOURTH INDUSTRIAL REVOLUTION IS CHANGING MY JOB!’: THE CHALLENGES OF 4IR AND LIBRARY SCIENCE

By Maria Frahm-Arp, Executive Director, University of Johannesburg Library and Information Centre, South Africa.

The Fourth Industrial Revolution has brought about exciting changes in technology, which in different ways is leading to a transformation in what and how information is found, stored and shared.

This paper analyses the disturbances of the Fourth Industrial Revolution in the context of the academic library at the University of Johannesburg. The first section examines how the Fourth Industrial Revolution has caused disruptions in knowledge production and dissemination, particularly within the context of academic libraries in South Africa. Blockchain, big data, deep learning and artificial intelligence have in different ways led to the production of new forms of knowledge and access to knowledge. One simple example is social media. Vast amounts of new information are posted on social media sites and with the deep learning algorithms that lie behind these sites, like Facebook, package, present and distribute knowledge in ways that are becoming increasingly tailored to the interests of individual users, thus affecting how knowledge
The Fourth Industrial Revolution, an era characterised by harnessing the power of technology for the betterment of society, brings with it new and exciting dimensions of how information can be gathered, stored, manipulated and disseminated. Central in this revolution is the convergence of various technologies which afford myriad ways of interacting with information on a daily basis. The library, which is an important institutional interface between this information and the seekers thereof, needs to continually reinvent itself in order to serve the ever dynamic needs of the digital natives. Not only are digital natives the primary seekers of this information, they also make up the bulk of the students enrolled at academic institutions. Whereas traditionally an information seeker would personally visit a brick and mortar library to physically harvest information from various sources housed therein, a digital native expects this information to be available at the click of a button. Moreover, it is necessary that this clicking is devoid of any geotemporal limitations. This paper first looks at the various technologies that could enable this clicking; second, it explores how these technologies could interplay with the traditional ways through which academic institutions handle information; and third, it discusses how academic institutions can adapt to the convergence of these technologies in order to better prepare themselves to serve the digital natives in their information-seeking endeavours as they learn during this Fourth Industrial Revolution (4IR) era.

ARE THE BIG 6 INFORMATION LITERACY SKILLS STILL RELEVANT WITHIN THE FOURTH INDUSTRIAL REVOLUTION?

By Elize du Toit, Information Skilling Librarian at the University of Johannesburg Library, South Africa.

One of the main focuses of librarians has always been to equip students with the necessary skills to enable them to use and apply information in different information environments. The Big 6 format is a process of information problem solving whereby students identify and define an information problem, learn information seeking strategies, and develop skills in organising and disseminating information. As we move into the Fourth Industrial Revolution, advanced technological developments such as robotics, artificial intelligence and machine learning have come to the forefront. These new technological developments transform the way information is processed. Students now have to think about the processing of information and intended outcomes in a different way. Within the Fourth Industrial Revolution, the simple understanding of information is not enough. Students need to be able to make connections with information and digital technology in creative ways so that the intended outcome can be applied across different information environments. The workforce also now calls for digital literate individuals who can work with different new technologies. This means that being information literate is now more crucial than ever before. The question to be asked is: does core (traditional) information literacy of these technologies in order to better prepare themselves to serve the digital natives in their information-seeking endeavours as they learn during this Fourth Industrial Revolution (4IR) era.

IMPACT OF THE FOURTH INDUSTRIAL REVOLUTION ON EDUCATION

By Thabang Mafokoane, Lecturer in the Department of Civil Engineering Sciences at the University of Johannesburg, South Africa.

Education has the power to improve lives. According to the United Nations’ Sustainable Development Goal 4 (2018), a good educational system should “ensure inclusive and equitable quality education and promote lifelong learning opportunities for all”. A quality education is one that responds to societal needs, as well as local and global trends. The Fourth Industrial Revolution (4IR) is a global phenomenon that is rapidly gathering pace. A report by the World Economic Forum (2016) described how 4IR will “shape the future of education, gender and work”. Technologies such as virtual reality, robotics, augmented reality, big data, the internet-of-things, artificial intelligence and digitalisation are becoming more accessible. The speed of technological transformation is exponential and offers seemingly endless possibilities. The impact of 4IR on the education system cannot be ignored. There is a need to learn new things in different ways. Schools and universities must foster innovation and creativity. This paper discusses the impact of the 4IR on education. The implications for teaching, learning, research and service delivery are explored from basic education to higher education and library service. The paper starts by reflecting on South African society and the history of education. Global teaching, research and library service trends and innovations are then examined. The paper concludes with suggestions and challenges for education with regard to 4IR.

THE FUTURE OF LIBRARIANS AND THE LIBRARIANS OF THE FUTURE

By Maryam Abrahams, Senior Librarian, Milpark Education, Johannesburg, South Africa.

The Fourth Industrial Revolution, also known as 4IR is set to histrionically change the landscape in terms of how we as humans interact with technology, how we express ourselves, how we communicate and engage in a new world and most importantly how we do our jobs. We live in a digital age of transformative technologies – such as artificial intelligence, big data, metadata,
cryptocurrencies and automation, and where information is increasingly more available online. This trend has led to the belief that both libraries and librarians are becoming redundant. Mas (2016), in an interview in Forbes magazine, states that the digital age is the greatest opportunity in the history of libraries, and that means that this institution of huge scale is at a point in time where it is revitalising itself fundamentally.

Hochman (2016) states that the reality is that libraries and the roles that today’s librarian plays in the digital age have changed fundamentally but not many have taken notice mainly because most people with the privilege of internet access have been able to source every type of information currently offered on the web and on other platforms. The internet has become a repository of information of sorts distributed on a global scale. The fact of the matter is with all the advancement of the digital age, has allowed for the progress of libraries and librarians to be obscured, not many noticing how the two entities have evolved and why it is critical that the traditional library and the internet co-exist.

One thing is quite clear, the future of librarians and the librarians of the future require new skills and adaptable roles. It is imperative that librarians be more comfortable with changing technologies, thus being able to interact with patrons outside of the traditional library platforms.

THE INSTITUTIONALISATION OF SOCIAL NETWORKING SITES (SNSS) FOR INCREASED INFORMATION SERVICES: A CASE STUDY OF A CORPORATION UTILISING YAMMER, FACEBOOK, TWITTER AND INSTAGRAM

By Wisdom Ndashe (Independent).

Traditionally, social networking sites (SNSs) were developed as online platforms to connect people to communicate and share instant messages, pictures and videos. However, within the Library Information Sector (LIS), the advent of social media platforms such as Yammer, Facebook, Twitter, Instagram and Blogs has witnessed the promotion of services and events, and the organisation, communication and obtaining of feedback from clients about the services rendered to them. The advent of these social media platforms has presented to organisations the responsibility to maintain a strong online perception through digital marketing, partnerships and knowledge sharing and acquiring new skills trending in the global markets.

However, although the Fourth Industrial Revolution has presented an opportunity for developers to design institutionalised social media platforms, the advancement of social media has also been characterised by challenges. For instance, the open access of information is increasingly becoming a dilemma that creates numerous complexities for information professionals, for example, the difficulties to streamline information for a specific market; to depict social media protocols to fit their organisations; and to map social traffic against niche market. The challenge that remains is for LIS organisations to deploy private, customised and institutionalised social media platforms to fit their organisations and help them increase services. Using a case study of Yammer, Facebook, Twitter and Instagram utilised by a single corporation, this study will explore how LIS organisations can utilise social media platforms to their advantage, such as designing climate surveys that will assist them in the modification of market needs relevant to this digital age.

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AI AND THE CHANGING ROLE OF ACADEMIC LIBRARIES IN RSA: OPPORTUNITIES, CHALLENGES, RISKS (AND THEIR MITIGATION), AND THE WAY FORWARD

By Nomoya Mahlangu, Director: Research & Innovation, University of Johannesburg, Library, South Africa.

The library and information services sector is, in its current form, hugely impacted by the onset of artificial intelligence (AI) and the consequent digitalisation and robotics environment. Numerous library applications are available on the market to simplify and make information discoverable to the user. Whether or not these impacts are positive depends on the library’s response to the technology that comes with this new AI environment. The author argues that there are huge opportunities for libraries to coexist with AI technologies as each have both a distinct and collaborative role to play in the advancement of research and scholarship. The key for the library is to know what it is that it can do that machines cannot do on their own. The key question, therefore, is not whether libraries will survive the Fourth Industrial Revolution (4IR) milieu, but rather what is the library’s turf and how does it perform within this turf. More cogently, can libraries still offer a sustainable value proposition to its clientele, without having to play second fiddle to the AI environment, but rather through leveraging the opportunities presented by such an environment.

The paper seeks to identify opportunities presented by the onset of AI in libraries, challenges, and the risks inherent in the AI applications and the novel services introduced in libraries. It will conclude (GES) by highlighting possible solutions and the way forward for academic libraries. The qualitative research approach will be conducted. Email and telephonic questionnaire will be used to establish what new opportunities academic libraries in South Africa have identified, and to what extent these have been realised when measured against the global academic library trends. In so doing, these libraries’ level of readiness to embrace the Fourth Industrial Revolution will be evaluated. The study will also explore the challenges and the risks that these libraries are confronted with. It will conclude by presenting possible strategies to overcome the challenges and how to mitigate the risks identified.

The survey questions will be based on how these libraries have responded to issues related to some of the 2018 library global trends, such as vendor and publisher landscape, fake news, open education resources (OER) and textbooks affordability, learning analytics, management of research data, open access collection development, MakerSpace, augmented reality, cloud service and the state of the art display.

ARTIFICIAL INTELLIGENCE AND ROBOTICS WITHIN THE LIBRARY SPACE

By Angela Moeng, Library Assistant: Institutional Repositories University of Johannesburg I Agnes Xaba, General Information Librarian, University of Johannesburg Library I Christina Nomathamsanqa Mafumana, General Information Librarian, University of Johannesburg Library, South Africa.

In the near future, the library services at the University of Johannesburg will be impacted greatly by technology, thanks to the influence of artificial intelligence (AI) and robots. The mode of library operation will be guarded by AI through robotics engineering on a daily basis. Every revolution in technology has brought challenges and opportunities that require humans to make difficult decisions and complex judgement. The introduction of AI into the library space will not be
The innovations in AI and other emerging technologies are going to redefine the relationship between humans and machines. The drive of this study is highlighted as follows:

- **Purpose**: To investigate artificial intelligence and robots and their potential benefits within the library space. The immediate and remote impact of artificial intelligence as revolution catalyst in transforming educational institutions and manufacturing/industrial sector.
- **Design/Methodology/Approach**: Literature review and document analysis.
- **Finding**: The introduction of new technology can be seen as a threat in many educational institutions, including the library. Change, although inevitable in many cases, has proven to be a challenge on its own. This is attributed by the fact that humans in general do not like to change easily. Once the technology is widely accepted, it becomes an opportunity to learn and explore new inventions. Robots are seen as job takers. As the machines grow cheaper and labour more expensive, companies will opt for machines.
- **Value**: The reason for exploring the topic is to look at the advantages of using AI in improving library services for both staff and students.

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**RESHAPING THE FUTURE OF ACADEMIC LIBRARIES TO THE FOURTH INDUSTRIAL REVOLUTION.**

By Matlala Emanuel and Maphoto Asania, University of KwaZulu-Natal, South Africa.

The emergence of technology in the 21st century is undeniably influencing every human activity, whether in the public or private sector, operationally and structurally. Interestingly, the library and information services are not immune from this phenomenon. The role of academic libraries and the services they offer as being a warehousing community are rapidly changing. With online resources and new technologies, academic libraries interested in enhancing user services and providing independent access to library services and collections have begun looking at new ways of creating online communities through digitization and related electronic processes. This paper considers the critical evaluation of the situation in the existing academic libraries in the country in view of their strategic importance to academic development in general, and towards the enhancement in the quality of research activities in particular. This paper therefore seeks to uncover strategies that can be deployed to upgrade and reshape the structure and operational procedures of academic libraries in South Africa. This inquiry will involve determining how much the roles of academic libraries have changed as a result of the Fourth Industrial Revolution; what may have necessitated changed roles; and how have academic libraries responded to these changes. This paper intends to focus on the libraries of both the University of KwaZulu-Natal and the University of Zululand as case studies. This paper is a response to the observed challenges and prospects that had been provoked by the Fourth Industrial Revolution, which has also triggered new conversations on how to discharge library materials electronically.

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