UNIVERSITY OF JOHANNESBURG

INFORMATION COMMUNICATION SYSTEMS (ICS)

ANNUAL REPORT 2019

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The Future Reimagined

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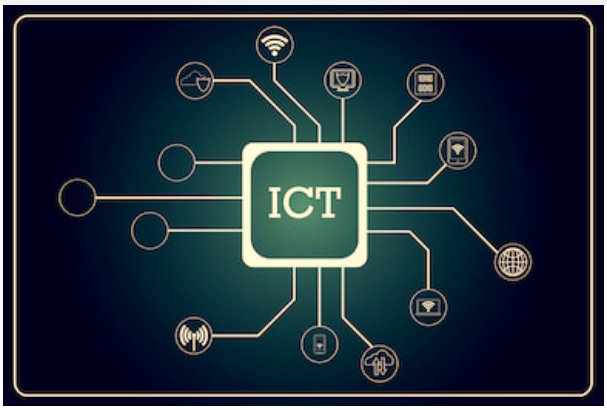
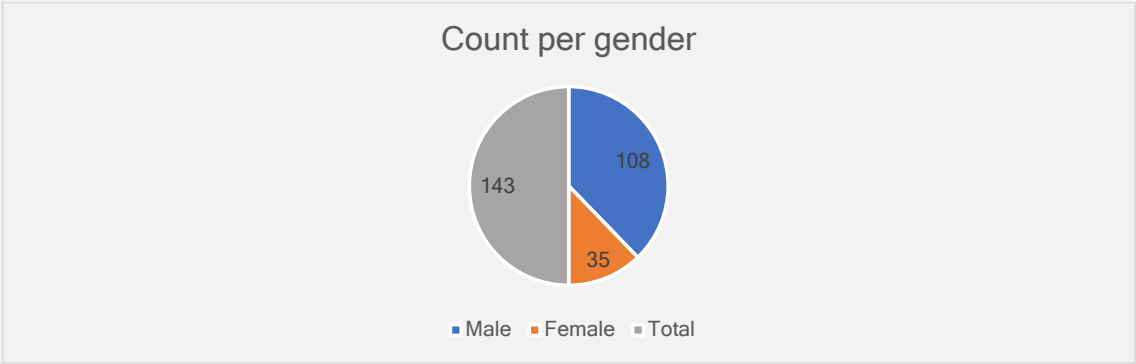
FORMATION COMMUNICATION SYSTEMS

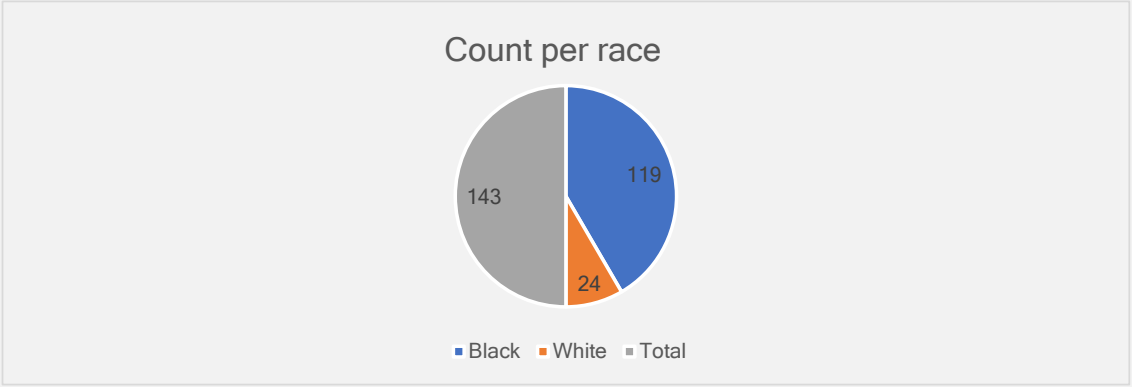
OVERVIEW



The Information Communication Systems Division (ICS) is the internal information and communication technology (ICT) service provider to the University of Johannesburg (UJ), and the institution's central ICT division. It has the task of dispensing enterprise ICT systems and services for all UJ staff, students and partners; this is done through efficient and effective planning, implementation and support of ICT innovations.

The Information Communication Systems Division (ICS) has 143 employees consisting of management, professionals as well as entry level employees. See the ICS employee profile below:





The Information Communication Systems (ICS) Division is tasked with the planning, implementation and support of core Information and Communications Technology (ICT) systems and infrastructure services within UJ. The ICS Division currently comprises the following units:

- Infrastructure and Operations Support;
- Networks and Telephony;
- Technology Architecture and Planning;
- Solutions Delivery;
- Enterprise Systems Management;
- IT Service Delivery;
- ICT Governance and Strategy.

Infrastructure and Operations Support

The Infrastructure and Operations unit ensures an up to date, stable, secure and dynamic server infrastructure for the University, which includes Microsoft Windows and Linux servers consisting of both physical and virtual machines. The environment supports business critical applications such as:

- A hybrid email infrastructure hosted on premises as well as in the O365 cloud;
- UJ web SharePoint infrastructure;

Other critical functions provided by this unit include monitoring, securing, backing up and restoring of IT systems. The unit manages the staff lifecycle process, aligned with HR processes, and provides authentication for all student systems e.g. student email and ULink.

Network and Telephony

The ICT Network and Telephony services unit designs, develops and maintains UJ's network, internet, telephony, VPN services, and network security infrastructure, which span across four campuses and remote offices, providing seamless and secure connectivity to all stakeholders. This unit is also responsible for the provisioning and support of WiFi connectivity to all libraries, lecture venues, student residences, student centres as well as the Wi-FI "HotSpot" areas located throughout the University.

The unit manages the Telephone Management System and the BULK SMS service which is used as a key communication tool to students.

Technology Architecture and Planning

The Technology Architecture and Planning unit is responsible for the design and maintenance of UJ's ICT blueprint together with the planning and implementation of the long-term architecture roadmap. This unit also consults with UJ's communities and key stakeholders to discuss and recommend fit for purpose ICT solutions including the piloting of new technology innovations. Other critical functions provided by this unit include the management of ICS facilities such as critical Data Centre infrastructure.

Solutions Delivery

The Solutions Delivery unit is involved in the development and integration of new ICT software applications that are custom built to UJ's needs, while also enhancing and maintaining current ICT applications that are already in production. This mandate is accomplished by first understanding business processes at Faculties and in support departments. Once these processes are understood and analysed, the next step is to identify gaps and/or opportunities for enhancements, in order to improve the experience of clients (who are generally students) in interacting with said areas.

Enterprise Systems

The Enterprise Systems Management unit is tasked with the deployment and maintenance of systems that support UJ's core mission of Teaching and Learning.

These systems include:

- Enterprise Resource Planning (ERP) - The Oracle eBusiness Suite
- ITS Student Information System
- Perceptive Content
- UJ's Business Intelligence (BI) platform and the Celcat timetable system.

IT Service Delivery

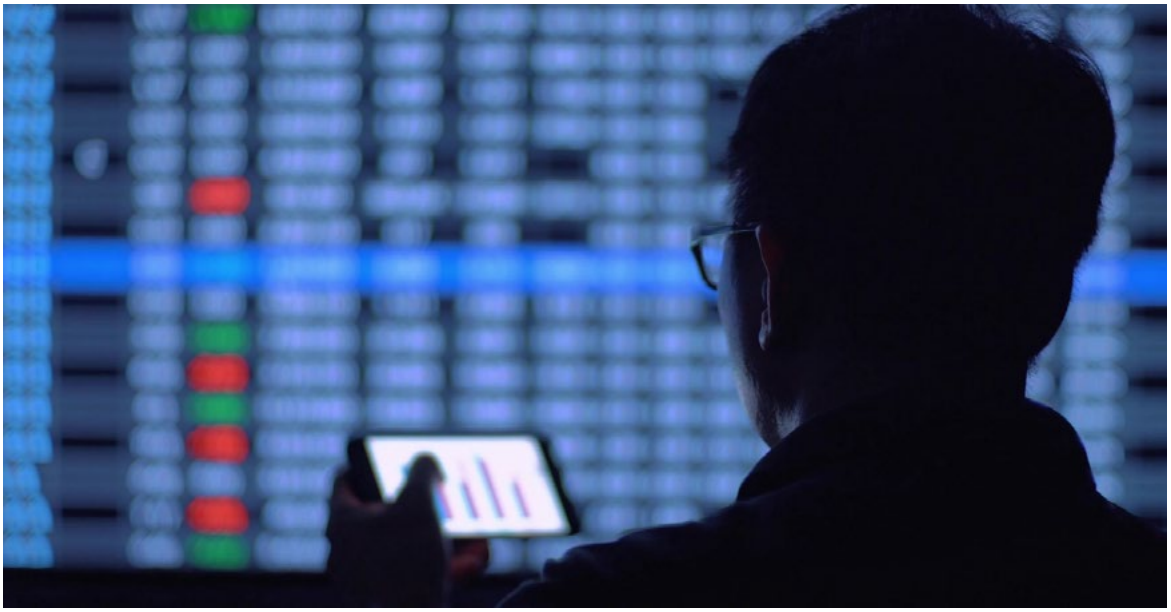
The IT Service Delivery unit acts as an interface between ICS and the UJ community. The primary focus of the unit is to provide uninterrupted client services and support. IT Service Delivery provisions the human and technology resources to enable and support UJ's teaching, learning and research as well as students and staff members respectively. The core functions of the Service Delivery unit include provisioning and maintenance of Audio Visual Services, Networking and Telephony client services, including Wi-Fi and computing services in all staff and Computer Lab environments. The function comprises multiple teams with various professional support focuses. The Service Delivery Teams include:

- The Centralised Help Desk
- Desktop and Network Support
- Audio Visual Services and Student Computing.

ICT Strategy and Governance

The ICT Strategy and Governance unit is responsible for the implementation of the ICT Strategy, Cyber security strategy and IT Governance framework for UJ, as follows:

- Providing oversight of all ICT projects, ensuring that the Project Management Office is managing and delivering all ICT Projects in an efficient and effective way, within budget, at the right time and of the right quality.
- Documentation and approval of the ICS Division's policies and procedures, in order to secure UJ's information assets as well as mitigate risks associated with the use of ICT.
- Management and coordination of both internal and external audits, ensuring compliance with policies, rules and regulations such as the Protection of Personal Information Act (POPIA) and the Electronic and Communications Act (ECT ACT).
- Management and facilitation of all ICT disaster recovery activities as well as scheduling simulations of system failures in order to test the effectiveness of disaster recovery processes. This ensures that UJ is always prepared for systems related disasters.



With responsibility to take on digital transformation and other business critical projects, the role of the ICS is more visible than before. Between maintaining infrastructure, coming up with new ways to use information and data to drive business forward, and leading digital transformation efforts, ICS still needs to maintain service levels and ensure stability of IT systems and associated infrastructure.

SUMMARY OF KEY ACHIEVEMENTS

The following key deliverables were achieved in 2019.

ICT Strategy and Governance

ICT governance implementation

ICS has implemented ICT governance through the establishment of structures and supporting processes to plan and manage ICT hardware, software and services. The implementation was planned in line with the approved ICT Governance Framework, which fosters leadership and structures to support IT decision- making, processes for control and management of IT assets, and mechanisms to measure and improve IT performance.

In support of the ICT Governance Framework, an ICT Policy Framework was also developed. The ICT Policy Framework sets out a set of procedures or goals, which are used in negotiation or decision- making to guide a more detailed set of policies and maintenance of all IT-related policies in UJ. The IT Governance Framework identified a total of ten structures to be implemented at both operational and strategic levels. ICS concluded the process of soliciting buy-in for the IT governance through a university wide engagement process in 2019, and seven out of the ten structures are implemented and operational.

An IT project management methodology was developed with the support of Prof Marnewick, the Deputy Head for Applied Information Systems in UJ, and approved by the Chief Operating Officer. This methodology provides the baseline for project governance in ICS and was developed against best practice to improve control and delivery on IT projects. The methodology will be aligned to the project management tool to standardize and integrate project management processes.

Cybersecurity strategy

The cyber threat landscape continues to evolve, with new threats emerging at an exponential rate and with ever-growing sophistication. Trends in cybersecurity incidents, the number of high-profile breaches, attacks making headlines and the changing regulatory requirements compel organisations to intensify their cybersecurity efforts. While there are changes in the threat landscape, the trends in cybersecurity are also changing to move towards deploying automated solutions and building intelligence based on data sourced through cybersecurity incident monitoring. It is the long-term objective of ICS to leverage existing technologies to build an integrated solution and so build the necessary information base to become agile in the way cybersecurity is managed in the university.

ICS, in partnership with an external service provider, conducted a security assessment of the University. The assessment was intended to measure the adequacy, effectiveness and required changes to the University practices and tools to protect University information assets. The outcome of the assessment was a cybersecurity strategy and roadmap crafted from the gaps identified in existing processes, tools and skills associated with protecting the University information assets.

The key elements of strategy implementation spanning from 2020 and beyond comprise an active cybersecurity awareness programme to increase pro-activeness and cyber vigilance of users with improved activity monitoring. It also includes plans to undertake periodic testing of UJ Systems security, implementation of controls over IT assets and improvement of governance at all levels.

IT threat management

A comprehensive programme for threat management, including prevention, detection, analysis and repair was undertaken. This was achieved through the implementation of the Qualys Vulnerability Management (VM) tool, Symantec Endpoint Encryption, and the Cofense Security Awareness tool. The Cofense Security Awareness tool focuses on phishing-specific threats, providing a human-vetted analysis of phishing and ransomware campaigns and the malware they contain, with employee training. A fully managed Security Incident Operations Centre (SOC) was implemented through an outsourced service provider to detect and report incidents 24/7.

UJ continued to perform periodic external security assessment and penetration tests to gain visibility of the state of vulnerabilities affecting our external, Internet-facing systems and applications. Multiple vulnerabilities were discovered on the University's infrastructure and websites/applications exposed to the Internet. ICS remediated the vulnerabilities with the various affected departments. Pivotal to the UJ cybersecurity programme will be to strengthen security of systems, to monitor activity and to introduce an active cybersecurity awareness programme as proactive measures to avert risk.

A combination of the imminent threats due to the changing landscape as well as regulatory compliance requirements necessitates a focus on protection of the University information and data assets at all levels. ICS future plans for cybersecurity and defense includes the implementation of the Advanced Treat Protection (ATP) solution to monitor suspicious activity on user accounts and a data loss prevention (DLP) solution. The implementation of DLP will assist in enforcing compliance requirements for data, and manage its use in email, without hindering the productivity of workers. DLP facilitate and enables the effective management of sensitive data.

IT audit management

As a way of providing assurance to the organisation, ICS has established an assurance programme as a measure aimed at validating the implementation and monitoring of controls to ensure compliance with regulatory requirements, related standards and best practice. A review of internal controls in specific areas of the IT management function was conducted by UJ internal auditors.

In 2017, a Cyber Maturity assessment (CMA) was conducted by KPMG on UJ systems. The assessment was revisited by Deloitte as part of its 2018/2019 audit scope. Deloitte conducted a high-level mapping of the methodology previously applied by KPMG to its current methodology in order to identify any differences and potential gaps. All findings were successfully resolved in 2019.

ICS plans to continue leveraging on audits as a tool for self-assessment and a process to identify inefficiencies and gaps in IT management and control. The audit strategy employed provides targeted audits based on the threat landscape facing the university. The future audit plans include testing the security of systems and access management to university information as this is critical to ICT security management.

IT risk management

Risk management is at the core of day-to-day activities in achieving the vision and mission of the University of Johannesburg. Risk assessments are ongoing, and the identified risks are mitigated through a risk management process in conjunction with the Office of the Executive Director: Financial Governance and Revenue. All ICT initiatives, under implementation and planned, are aligned to mitigation of the identified risks.

ICS plans to change the way it implements and manages security of systems through the adoption of DevOps - which is a set of practices that combines software development (Dev) and information-technology operations (Ops) which aims to shorten the systems development life cycle. This will fundamentally transform cyber and risk management from compliance-based activities that are typically undertaken late in the development lifecycle to codifying policies and best practices into tools and underlying platforms. As a result, security becomes the shared responsibility of the entire IT organization.

Network and Telephony

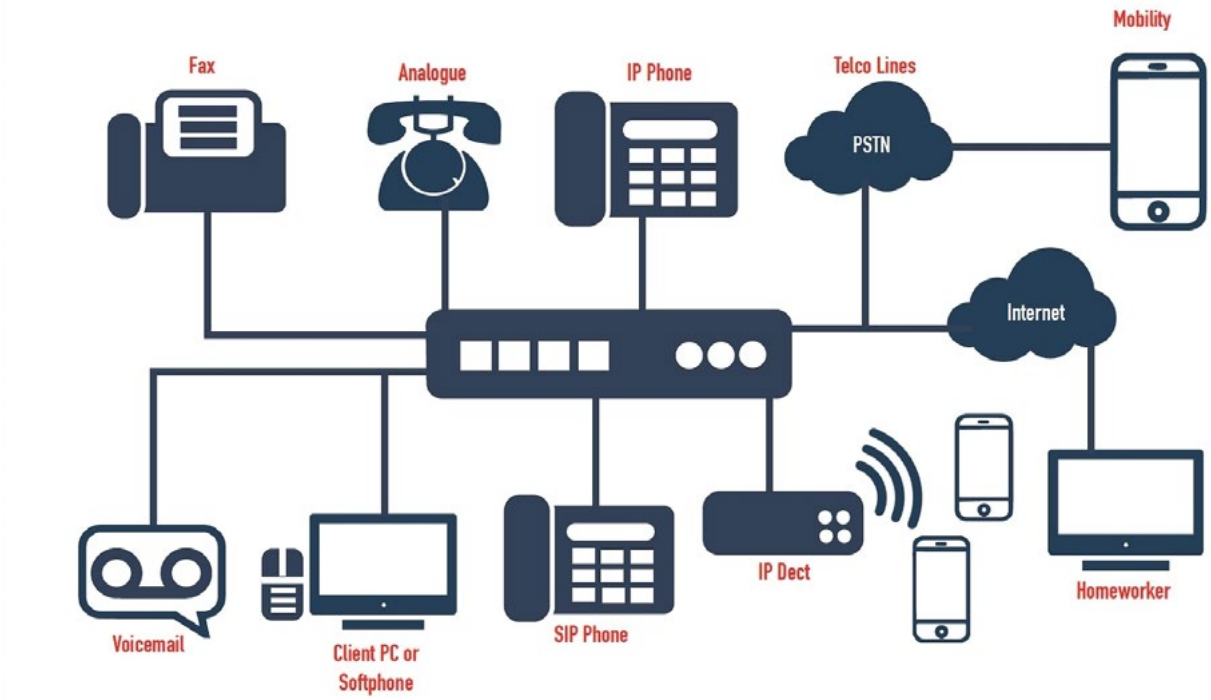
Network security – firewalls (next generation firewall)

ICS embarked on several projects with the aim of enhancing and increasing availability of network security services internally and at the perimeter level. The approach taken to successfully complete the projects included the implementation of high availability (HA) on the perimeter firewalls across all campuses, implementation of HA on the Internet Switches at DFC, APB and SWC, the increase of local Internet bandwidth from 1gbps to 10gbps, the implementation of the new Johannesburg Business School (JBS) perimeter firewall, the implementation of the telephony firewall on APB, DFC and SWC, the successful upgrading of the intercampus firewall and the implementation of proxy-less browsing for staff.

In 2019 ICS started a program to upgrade the Network Security infrastructure across all campuses including Disaster Recovery site, to be concluded in 2020:

- Upgrade of the Perimeter Firewall at APK campus;
- Upgrade of the Central Logging System at APK;
- Implementation of Distributed Denial of Service (DDoS) appliance;
- Upgrade of the DR perimeter Firewalls;
- Implementation of the Firewall Assurance System;
- Implementation of the Data Centre Firewall;

- Upgrade of the APK Labs Firewall;
- Upgrading of the Web Application Firewall (WAF);
- Implementation of the DNS Security solution.



Securing Wi-Fi environments and LAN environments

ICS implemented various projects to increase the security within the Wi-Fi environments. ICS needed to secure the network by successfully segregating the staff Wi-Fi network from the production systems network. This was accomplished by implementing the following projects:

- Staff Wi-Fi firewall at the local area network (LAN) environment;
- The successful implementation of network access control (NAC) in open areas, such as boardrooms and reception areas;
- Port security as a security measure to restrict people from plugging foreign computers or network devices on the UJ network at the lab environments and in staff open areas where machines being used are not joined to the UJ domain.

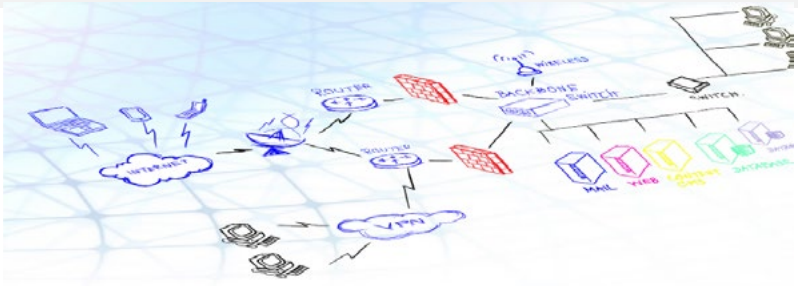
Network and telephony (upgrade)

ICS initiated projects in 2019 to upgrade the network infrastructure. These projects were successfully implemented, and they included upgrading the Data Centre core switches from Alcatel to Cisco, and successfully connecting the three new satellite campuses:

- Florida CoJEMS;
- School of Military Health at Centurion;
- Braamfontein GSA.

ICS also connected the new third SWC residence, upgraded the APB Fibre backbone network and the FADA network, and merged the old RC Towers network with the UJ network. Through GES funding, in 2019, ICS initiated various projects focusing on upgrading the Network and Wi-Fi infrastructure across all campuses. The upgrades will include replacing ageing network (includes backbone fiber upgrade), Wi-Fi devices and expanding the Wi-Fi coverage. These upgrades cover various areas within UJ i.e. Library, outdoor areas and student residences.

In order to improve and upgrade UJ telephony systems, ICS has initiated several projects focusing on the Telephony infrastructure upgrades, which includes centralizing all telephony systems to one central point, implementation of Calling Line Identification (CLI), and Unified Communications (which means a central platform for organization and also encompasses some aspects of mobility applications such as the use of softphones instead of land line handsets).

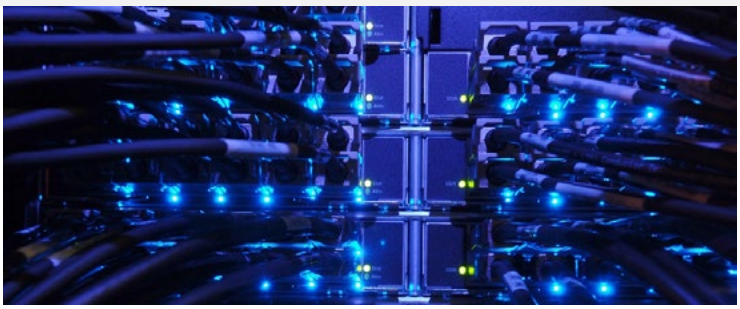


Architecture and Planning

In 2019, the Architecture and Planning Department facilitated the training of internal staff on the SPARX platform to assist it with technology architecture initiatives. The Department started with the first phase of the technology architecture to document the technology landscape for ICS.

High Performance Computing Cluster (HPCC)

HPCC is an open source data-intensive computing system platform that provides a reliable, scalable and centrally managed research computing facility to UJ's researchers. This provides the users of the cluster with more processing power and storage than would otherwise be available to them.



With the University aligning to 4IR, the cluster hardware refresh allowed HPCC to obtain graphics processing unit (GPU) compute elements for deep learning and large memory compute nodes. These nodes will allow researchers to access machine learning resources for their research projects. This will allow better and quicker turnaround times for training models.

Agile Enterprise Architecture

The establishment of an Enterprise Architecture Committee consisting of various role-players within the university is part of the architecture strategy of 2020. The principal responsibilities and functions of the Enterprise Architecture Committee are to assist in defining and supporting the Enterprise Architecture framework, infrastructure and processes which exist to ensure that enterprise projects (business or technology)

are carried out consistently and successfully, in alliance with organisational strategy. Further development of resources to assist in continuing technology architecture initiatives is key.

To build a business-appropriate and sustainable Enterprise Architecture practice, it is necessary to engage with business stakeholders to create maximum value for them while growing their awareness of the practice and its outputs within the rest of the organisation. ICS will engage with various stakeholders in order to grow and enhance the University's Enterprise Architecture capability. ICS will focus on the following areas:

- Business Capability and Value Stream Mapping;
- Business Capability Map and Value Stream Modelling;
- EA Practice - Meta-model Development, Implementation and Guidance;
- Enterprise Architecture Mentoring and Guidance.

The department will also focus on developing an Agile Architecture for the university. Agile architecture is the process of building the foundational architecture or model of an application, system or technology using an agile framework technique or approach. It calls for modelling, developing and constantly evolving the architecture of an IT component, system or infrastructure from the ground up, using agile techniques. It requires an iterative and incremental approach before being completely developed.

As with agile principles, each phase of agile architecture takes input and parts from all the team members that will eventually develop or code it. An agile architecture can be tightly or loosely coupled, based on the system, application or infrastructure being developed.

High Performance Computing

ICS plans to continue to work with various faculties on a structured High Performance Computing program, which will include closer collaboration with the research community via the DVC Research. Part of the engagement program will be on-boarding interested faculties such as the Faculty of Science to assist with their HPC needs. Cloud HPC will also be trialled to address identified gaps within the HPC portfolio.

Infrastructure and Operations

Reducing server hardware footprint in the Data Centres

The strategy in 2019 for server hardware focused on reducing our Data Centre footprint. This strategy ranged from internal hardware life-cycle management and planning to consultations with business within the University on new server requirements. The continuous interaction with business assisted in providing the required technical expertise, a cost-effective infrastructure and a reduction in the Data Centre footprint without impacting required performance. Reducing the Data Centre footprint included the final configuration of UJ's own private cloud where physical servers were virtualised, where possible. ICS expanded the virtual server hosting capabilities on both Windows and Linux platforms to accommodate larger virtual server requests, to reduce the Data Centre footprint even further. ICS, however, has a cloud first approach on all server requests, to drive the strategy towards a greener IT. The table below reflects the hardware footprint for 2019.

Table 1: Server, storage and tape footprint reduction

Description	Pre-2019	Dec-2019
Servers	60	18
Tape libraries	13	11
Storage arrays	22	14

Tape libraries were reduced from 13 to 11, and ICS is planning to reduce this number even further by backing up some of UJ data to the cloud. There are 11 servers being backed up to the Microsoft Azure Cloud environment. The reduction in hardware resulted in a saving on energy consumption in the Data Centre in

terms of both the power of the devices and the cooling. ICS has managed to secure our server authentications by forcing signed/encrypted authentications against all domain servers.

Protection Services

ICS managed and implemented the refresh project for the Protection Services video recording system hardware. ICS collaborated with Dell to make sure that the correct blend of hardware was procured to cater for Protection Services requirements. This infrastructure included 14 new network video recorders (NVR) servers with 1.2PB of cold storage cluster that provides enough resources to replace all the existing and outdated NVR servers.

ICS managed to configure the chassis networks with redundant links to the new Cisco network hardware to optimise performance and redundancy. This will aid in the final move of all APK hardware to the new Cisco equipment.

Cloud technologies

ICS has engaged two cloud service providers to assist in the assessment and upskilling of our team on the Amazon Web Services (AWS) and Microsoft Azure platforms. This will assist us in our cloud first strategy. A gradual increase in the Azure cloud usage is already visible from Figure 2 below.

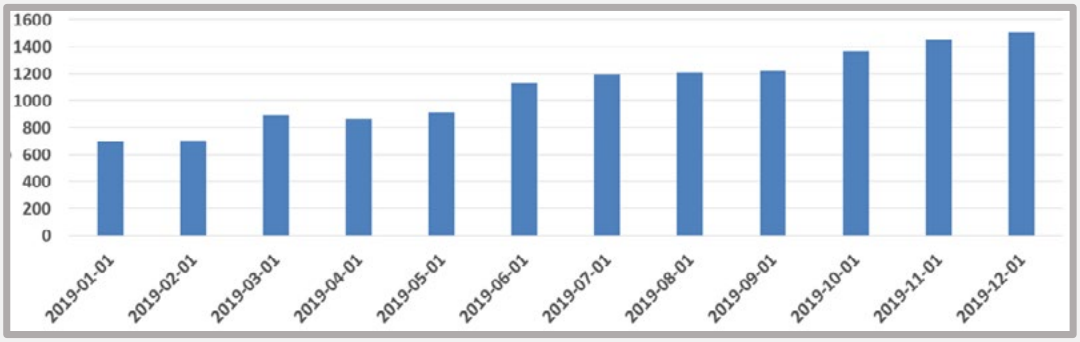


Figure 2: University of Johannesburg cloud uptake

Application structured query language (SQL) server updates

SQL server is a Microsoft database management system and supports Enterprise application systems. ICS implemented a new SQL server hardware cluster in 2019. It is running multiple SQL server databases that support multiple applications across the University. This highly available, robust environment has enhanced operational efficiencies, thereby improving productivity. The scalability of the system will be beneficial in the University's drive towards digital transformation.

Some of the critical applications in the University run on the SQL server database management system listed below:

- ImageNow (perceptive content);
- CELCAT (timetabling application);
- MAMS (Management of Assessment Marks System);
- IduConcept (budget system);
- PaperCut (printing and office automation system);
- Primary and Occupational Health Systems.

ICS had 98% system uptime in the 2019 academic year. The downtime that ICS experienced, which affected system availability, was due to Eskom load shedding. ICS has successfully engaged in a disaster recovery exercise in this environment under the supervision of Deloitte auditors.

UJ web enhancements and hosting

The web enhancement project in 2019 saw huge strides being made in user accessibility of the UJ website. Through the implementation of a mobile first approach to design, a new look and feel, reorganised content and search engine optimisation, ICS delivered a great user experience to all stakeholders. This improved the ability to find more relevant information on the site. Partnering with and training of content owners saw an increase in traffic to the site. The web infrastructure handled this influx of visitors without any downtime and offered a stable platform during the peak period of registration.

ICS has embarked on an initiative to provide a scalable web infrastructure, hosted at an external service provider, to ensure that faculties with UJ websites that are not supported by the current SharePoint platform can host their websites in a managed and secure environment. In 2019, ICS boarded five of these websites.

Solutions Delivery

Central Academic Administration (CAA)

Enhancement to Management of Marks Systems (MAMS)

MAMS is used by academics to capture assessment marks; the system in turn sums these up using predefined criteria, displays these in usable reports and ultimately releases assessment and exam marks to uLink (student portal) and ITS, which then inputs such marks to students' academic records. For 2019, the changes made were in relation to optimising the report that academics use to view student progress. There were further developments around exempting students from modules successfully completed at other institutions.

Enhancement to Submission of Assessment Papers Secured System (SAPSS)

ICS completed enhancements in the Submission of Assessment Papers Secured System (SAPSS). In 2019, the scope of enhancements included streamlining the process of submitting question papers online and management of the same by CAA.

Corporate Governance

Qualification Verification System

For Corporate Governance, ICS developed a system to enable students to request academic records online, which alleviates the pressure of having to do this process manually.

Student Affairs

Student Life and Governance System

The Student Life and Governance System is intended to enable students to apply online for registration funding from the SRC Trust Fund. The system also enabled students to apply for meal assistance online.

Privately Owned Student Accommodation (POSA)

ICS had developed a system to manage the off-campus student accommodation process, which is called privately owned student accommodation (POSA). External suppliers can now apply to be UJ accommodation service providers, and Student Affairs can process the assessing and approval and/or decline an application online. In 2019, ICS upgraded the system to make it more user-friendly for both Student Affairs and external suppliers.

Protection Services

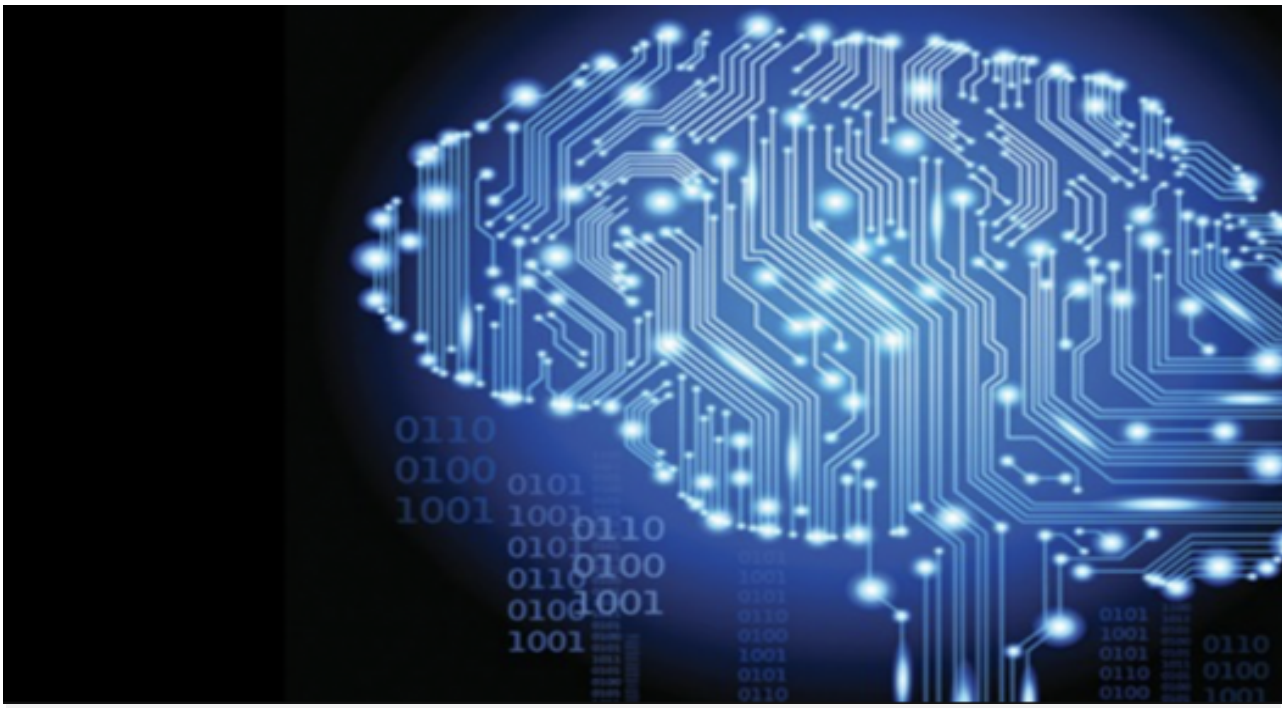
Impro Upgrade

ICS was instrumental is the upgrade of the old Access Control System to the new Portal System. To complement this upgrade, ICS developed a stand-alone system which was used at all Student Support venues to speed up the process of students actually receiving their student card.

System Integration

Financial governance and revenue (FinGov)

ICS partnered with external Service Providers to fully integrate Kofax and Amadeus to the UJ systems: Kofax being the purchased online solution to manage the process of online travel for the University; Amadeus the online solution to manage online invoices for the University.



Building solutions and capabilities

Workflow Automation

ICS is planning to automate several manual processes throughout the University, using Form Automation Tools. Some departments targeted for this exercise are the Faculty of Humanities, Business Management, CAA, and Protection Services.

System Integration Modernisation

ICS is looking to partner with an external Service Provider to modernise the way in which the core system passes data to third party systems and amongst each other. This is applicable for both internal and external third-party systems.

Central Academic Administration (CAA)

ICS will continue to support and maintain the CAA core systems (MAMS & SAPSS). New functionality per norm & to support now online learning including the upgrade of the backend technology of the system to make it more optimal and fit for use. ICS is planning to develop an online solution for CAA to manage the processes of Student Sick Notes and Academic Exclusions (F7).

Student Affairs

Privately Owned Student Accommodation (POSA)

ICS will continue to introduce new functionalities to support the process of applying (as a Service Provider) and management of such application by the UJ Student Affairs department.

Enterprise Systems

Student Management System

ITS

ICS completed multiple enhancements on the Student Management System, with the most significant the enhancement for registration of first-time entering students. This validation enabled the system to prevent first-time entering students from registering outside of the University's DOE-approved Enrolment Management Plan.

To provide assurance of the ITS system functioning optimally during high-peak periods, e.g. registration, ICS conducted ITS system stress testing with the assistance of a third-party supplier specialising in this area.

Oracle E-business Suite System (EBS)

The Oracle E-business Suite R12 is used to support core enterprise functions like HRMS, Payroll, Procurement, Finance and Asset Management. Some of the major business initiatives that ICS successfully implemented to reduce the manual effort are:

- Automation of night shift allowance process;
- Automation of overtime payment process under Payroll;
- The Integration of KOFAX system with Oracle EBS Account Payables for the automation of supplier invoices.

Business Intelligence System

The usage of Business Intelligence (BI) has grown tremendously across different departments and faculties, and is no longer limited to improving the day-to-day reporting. The capabilities of the Oracle BI tool are used to reduce manual operational efforts and to identify new business opportunities, to spot inefficient business processes and for competitive advantage. Below are some of the BI automations that resulted in effort and cost savings within various departments and faculties:

- Lecturing timetable dashboard: The dashboard is used by the Timetable Department to identify vacant venues and helps the AVU team to make the necessary AVU equipment arrangements for the available venue;
- UJ student achievement detail dashboard: The dashboard is used to pull a variety of information about student awards that have been achieved. It is also used by the CAA Department to print the certificates for achievers;
- Computer labs dashboard: The dashboard was created to assist computer labs with venue bookings for all four campuses, with complete and detailed information, including the capacity and venue fixtures.
- Fixed asset pack: The dashboard is used by the Fixed Asset Department to view the fixed asset book and reconciliations for each category for all the cost, clearing, depreciation and expense accounts.
- Management pack for strategic initiatives: These dashboards were created on HR data for ease of access to academic staff statistics.
- Management dashboard for student enrolment: The dashboard provides a single view on all the student enrolment.

- In 2019, ICS embarked on a project using BI capabilities to implement a GES 4.0 project for the department of Strategic Initiatives and Administration. The project enables the tracking of research and publications.
- In 2019, ICS documented a Data Governance Framework, which was approved by the Chief Operating Officer. The Data Governance stipulates the 10 data management capabilities adopted from DAMA DMBOK, which will be driving Data Governance within the University of Johannesburg. A few of those capabilities are as follows:
    1. Data Security;
    2. Data Quality;
    3. Data Architecture;
    4. Reference and Master Data;
    5. Document and Content Management.

Service Delivery

Multifunctional printer rollout

The University's managed print service contract with Konica Minolta had reached its end of life. To assist with the refresh strategy, the University appointed a professional consulting team to assist with the evaluation, design, and framework of technical specifications and the facilitation of the technical tender evaluation. The scope of work comprised the provisioning of services to provide, manage and control printing and photocopying facilities across all UJ campuses. This service will be used by approximately 50 000 students and 6 000 staff.

The rollout of multifunctional printers was completed in October 2019 for staff and students, and UJ has entered into a maintenance agreement with Konica Minolta South Africa for a period of three years. The main objective of the project was to cut printing costs.

Audiovisual infrastructure upgrade

Owing to aging audio-visual infrastructure in the teaching and learning venues on all UJ campuses, ICS embarked on a project to refresh the aging hardware. The project was split into three phases, based on severity and available funds.

Short-term strategy (1 June to July 2019)

- ICS replaced faulty projectors in highly utilised and critical venues across all campuses.

Medium-term strategy (1 July to December 2019)

- ICS addressed venues that had multiple technical issues, including projectors and lecterns.

Long-term strategy (1 December 2019 to February 2020)

- DHET funded repairs – ICS is in the process of upgrading and fitting 44 venues with audio-visual equipment on APB, DFC and SWC.

Smart Classrooms through Creston Fusion

Smart classrooms are technology-enhanced classrooms that foster opportunities for teaching and learning by integrating learning technology such as computers, specialized software, audience response technology, assistive listening devices, networking, and audio/visual capabilities

In 2019, ICS initiated a project to enable 80 venues on APK and SWC campuses to be remotely managed, monitored and controlled. Some of the benefits of this project include incident management through central monitoring, to enable first line support for troubleshooting AV incidents remotely, as well as online Monitoring and Reporting of AV Equipment in the 80 venues on APK and SWC. The project will be completed in 2020.

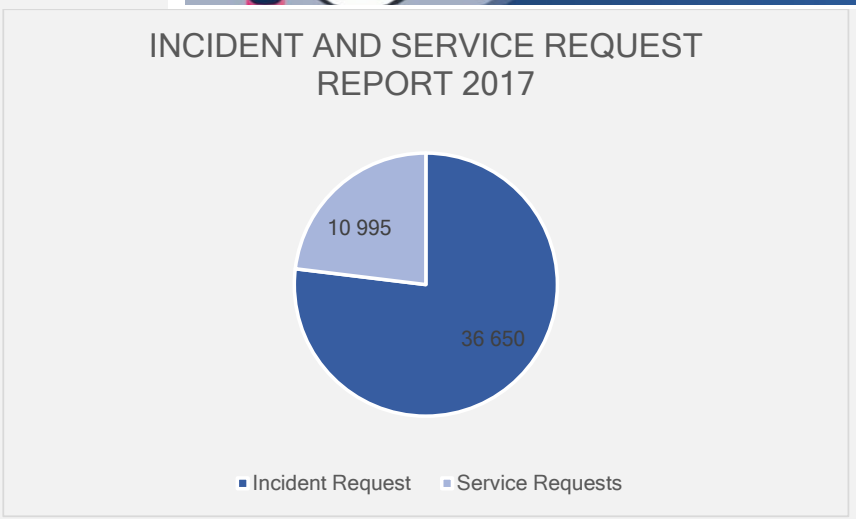
Student computing desktop replacement

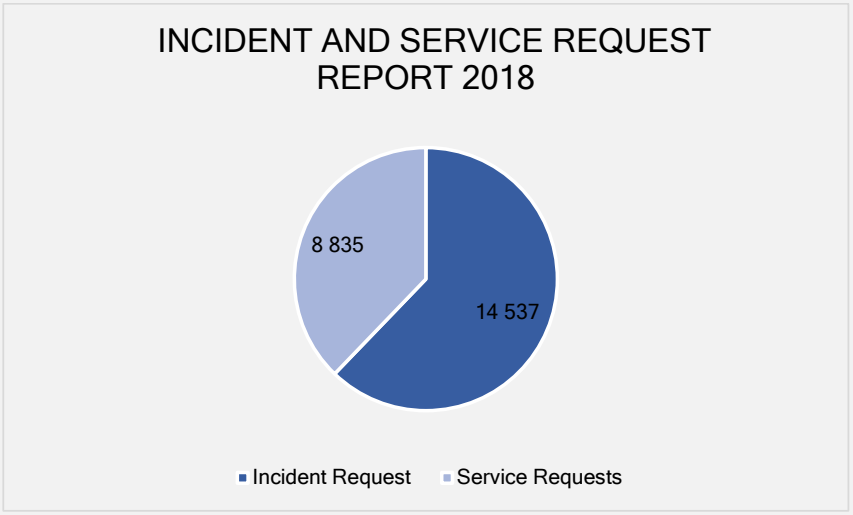
ICS has replaced a total of 2 210 computers in the student computing labs across all four campuses. This is a continuous improvement process for the student computing environment and to equip the computer labs with modern computers to meet students' expectations.

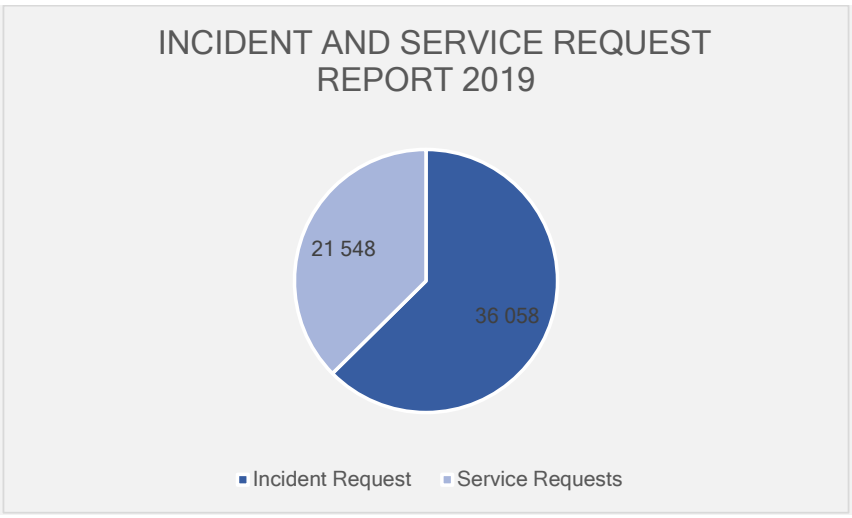
Service delivery statistics – incidents and service requests

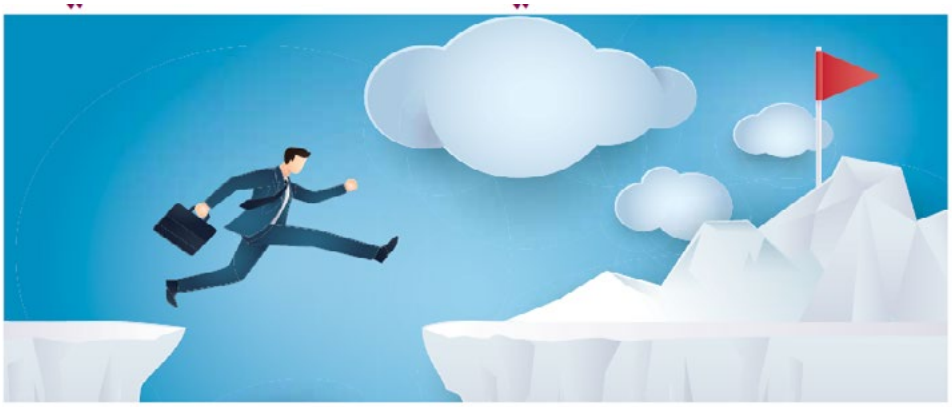
ICS has seen an increase in a number of incidents and service requests in 2019 compared to both 2017 and 2018 financial years. This is due to the introduction of a range of new services that have been implemented in the last three years as well as the age of the IT infrastructure.

ICS has embarked on various initiatives to refresh and upgrade the ageing infrastructure.









SUMMARY OF KEY CHALLENGES AND RISKS

ICS is constantly faced with challenges brought about by the ever-changing technology landscape and the operational demands on its resources, and some of these challenges and risks are noted below.

Key challenges

Maintenance backlog

Most of the IT infrastructure (audiovisual, network, Wi-Fi and end-user computing devices) have aged or reached end of life. Inadequate funding over the years is a major challenge, which has resulted in maintenance backlogs and equipment failures.

Funding constraints

Owing to the limited implementation of private cloud infrastructure or infrastructure as a service (IaaS), funding to consistently maintain and provide required server infrastructure and storage remains a challenge. This also applies to the audiovisual infrastructure funding requirements for all the teaching and learning venues.

Scarce skills set

As new technologies become available, the need increases to regularly upskill staff in use of hardware on various platforms. There is a challenge to meet rapidly increasing business demands on time due to limited budgets and limited skilled resources.

Human capital constraint

To meet the strategic objectives of the University and reduce the reliance of ICS on external consultants and service providers, the limited staff and costs constraints must be addressed.

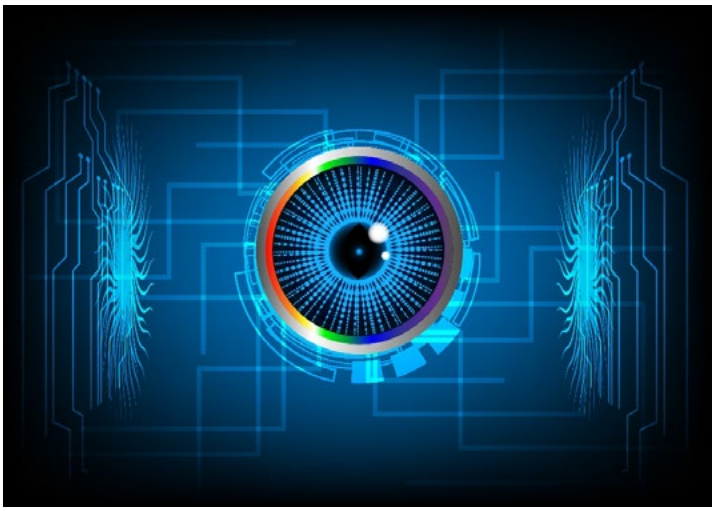
Key risks

Threat of cyber attacks

Cybersecurity continues to be a major risk to the University and has become even more significant as UJ embarks on its Fourth Industrial Revolution (4IR) journey. ICS has placed emphasis on the cybersecurity risk by embarking on an initiative to implement a cyber-security strategy that touches on policies, processes, technologies and resources.

Data Centre (DC) rebuild

The APB and DFC Data Centres need to be rebuilt with energy efficient DC equipment and design. These Data Centres have never been rebuilt, which would allow them to take advantage of newer technologies, and have also not been fire-rated.



WHAT THE FUTURE HOLDS

ICS has embarked on an initiative to develop a full digital transformation strategy for the University of Johannesburg, in order to achieve UJ's strategic vision of alignment with the Fourth Industrial Revolution (4IR). The main objective of the Digital Transformation Strategy is for ICS to position itself as a strategic enabler that will energise UJ's growth in alignment with the 2025 Strategic Objectives. ICS conducted a skills gap analysis in 2019, and the focus will be on training ICS staff on NEW generation technologies to bridge the gap.

Data - the new GOLD.

Due to the growing data assets of the university, there is increased requirement for data storage and hosting. The data need to be available and recoverable at all times. This creates a burden on the resource base in terms of infrastructure, skilled human resources and the correct tools. To alleviate this problem, ICS has put in place plans to evaluate alternatives for acquiring Disaster Recovery as a service. With the increased risks and potential instability which growing environments present, it is important that UJ is able to replicate and recover any lost data or applications without interrupting critical business processes. DR as a service will form part of a sustainable Business Continuity strategy for the university and be a critical element in the management of risk in the future.

Future of Oracle E-Business Suite and Business intelligence

ICS is working closely with HR, Finance and Procurement to look at a long-term strategy roadmap to assess the oracle cloud readiness of UJ in terms of oracle applications, and this will allow ICS to collaborate with Oracle Application Owners from Business to embark on oracle cloud future projects. Expanding the integrated source systems to cover all systems across UJ will allow one single view of the student and staff information. The aim is to improve the BI capabilities to include advanced analytics and self-service and this will enhance business with predictive reporting/dashboards.

Modernised UJ website

A new UJ web strategy is under development to accommodate the increasingly dynamic demands and requirements of the UJ web environment. It is important that the UJ web align with future trends in websites, providing an immersive user experience. More complex web functionality is made possible. A combination of wearable technology and 'internet of things' is preparing the website landscape to become more mature and personalised to each user. The responsibility of web designers will focus on ensuring that content and data are capable of being displayed on a wide variety of media (from desktops to smart watches and mobile applications). Accessibility and manageability of information on a microscopic level will be required to ensure that it can be repurposed to fit a range of displays and user interactions. An important feature will be coordinating responsive and personalised design. Web designers will be able to create and manage sites that will work on various devices and provide users with tailored browsing experiences.

Network strategy - Software Defined Network (SDN)

ICS plans to finalise the Network Strategy document initiated in 2019 which is based on the implementation of Software Defined Networking (SDN). SDN is a software-based networking technology that takes away the power of networking from hardware technologies to software by separating the network control plane from the forwarding plane to enable more automated provisioning and policy-based management of network resources

Modernised IT Service Strategy

ICS is a strategic partner and enabler of the institution's 4th Industrial Revolution (4IR) vision. ICS is required to tailor best practices to effectively manage an IT service strategy which ensures that the institution achieves its 4IR mandate. The IT Service Strategy will assist ICS in delivering better, cost-effective and efficient ICT services to all UJ stakeholders.

The deliverables and focus areas for the service strategy will include a self-service enabled environment aligned to the service catalogue, a SLA driven service-based delivery model, all service metrics measured and improved upon, services designed with Business Continuity in place, and Digital Connect aligned to the latest technology.

Future of Service Desk

In an effort to continually improve user experience, the service desk is required to provide faster and flexible services to better respond to users and their organisations. This will be achieved with the adoption of user-centric service management technologies that have intelligent capabilities, Chatbots and Mobile Applications. Through the modernised Service Strategy, the shift to a more user-centric approach will be adopted, and this will ensure that the service desk is more proactive and works harder to minimise disruption to user productivity. Automation capabilities will be expanded to ensure seamless processes for both staff, students and guests.

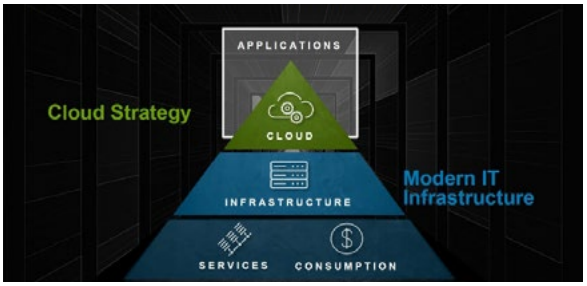
Software Defined Data Centre (SDDC)

In a software-defined Data Centre, all elements of the infrastructure – networking, storage, CPU and security - are virtualized and delivered as a service. The complication is that Data Centre roles and processes are defined by technological domains (silos), there are usually no greenfield implementations, and a lot of time and effort are spent on legacy applications and solutions.

The strategy to address these issues is to make use of Software Defined technologies to pool resources, break down physical and logical barriers and to provide infrastructure and services which are resilient, secure and repeatable. The SDDC strategy works in conjunction with the Software Defined Network Strategy as well as the university's Cloud Strategy. With the rising cost of electricity and maintenance it is essential as part of the strategy to make sure the Data Centre infrastructure is energy efficient and fit for purpose. The first step is to monitor the power usage and then to create a Carbon Footprint model to align with UJ's carbon goals.

Infrastructure strategy

As articulated in the ICS Strategy, in order to implement a cloud first strategy, ICS performed cloud readiness assessments of the current server infrastructure environment to determine which services can be moved to the cloud. A comprehensive architecture of the cloud will be compiled in partnership with a cloud solutions architect. ICS will invest in a hybrid cloud environment, which refers to a mixed computing, storage and services environment consisting of on premise infrastructure, private cloud services and public cloud services such as AWS or Microsoft Azure. The main benefit of a hybrid cloud is agility, as it is core to today's digital business to be able to adapt and change direction rapidly. Cost is a key factor for ICS in considering migrating to the cloud. A hybrid cloud poses options for greater security and control of data and delivery of a cost-effective way of scaling operations to meet increases in



demand. A hybrid cloud model improves business continuity and reduces potential downtime and resulting costs.

Improvements in governance and security of O365 applications will be a focal point for ICS with the purchase of Advanced Threat Protection (ATP) for the O365 email, SharePoint and OneDrive environments. Governance of Microsoft Teams will also be implemented. ATP will assist UJ to defend itself against sophisticated malware or hacking attacks aimed at sensitive data. The main benefit of ATP is the ability to prevent, detect and respond to new cybersecurity attacks. These new attacks are designed to avoid traditional security solutions such as antivirus, firewalls and IPS/IDS. ATP takes a proactive approach to increasingly targeted, persistent and sophisticated attacks by identifying and eliminating advanced threats before data are compromised.

CONCLUSION

Technology is forever changing, and its implementation and management require a balancing act, whereby the University can continue to be operational while innovation soars to the highest desired levels. This brings other threats to the University. The Cybersecurity Strategy and Roadmap provided key actions to support UJ's strategies and plans. ICS will embark on the operationalization of critical initiatives to improve the security posture of the University.

In order to implement effective governance over IT assets, ICS aims to effectively identify business critical assets, data assets and business processes (including associated systems). UJ needs to assign roles and responsibilities for the management of the assets and classify, develop and implement measures of control over these. Risk management will be strengthened through scheduled threat assessments, risk evaluation and the monitoring of control effectiveness against the threats. Threat management, scheduled penetration tests, and internal and external audits will be periodically conducted, and the threat/risk to UJ should be evaluated and the current control effectiveness against that threat monitored and assessed.

ICS ANNUAL REPORT 2019 – Author: Khathu Sibanda