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# Proceedings of 20<sup>th</sup> Annual IS Conference

18<sup>th</sup>-20<sup>th</sup> September 2019



Data, Information and Knowledge for Development in Africa



Editors:  
Dennis N. Ocholla and Neil D. Evans

Department of Information Studies  
University of Zululand



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# Proceedings of 20th Annual IS Conference

Theme: Data, information and knowledge  
for development in Africa

University of Zululand, KwaDlangezwa

# Proceedings of the 20th Annual IS Conference

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- Prof. Mabel Majanja
- Ms. Bongi Ntuli
- Prof. Dennis Ocholla
- Prof. Bosire Onyancha
- Dr. Shana Ponelis

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## Foreword

Distinguished guests, staff and students. It is my pleasure to welcome you all to this important event in the calendar of the University of Zululand and the Department of Information Studies, which is hosting its 20<sup>th</sup> annual conference this year. The conference was initiated 20 years ago to support and enable knowledge sharing, scholarly research publication, research mentorship and capacity building in Library and Information Sciences/Studies (LIS) at the University of Zululand. It has now expanded to be an international conference, which has had significant success in attracting leading academics, their postgraduate students and other professionals in the LIS discipline. As a result, I believe, the Department, which has 300 students including 50 postgraduates, has been ranked more than once among the three top departments (out of 48) for research output at the University of Zululand. Also, Library and Information Science is among the top indexed disciplines in SCOPUS and Web of Science in the University because of this research-driven initiative.

The purpose of the conference is to explore and share current research results and experiences of data, information and knowledge in the Fourth Industrial Revolution (4IR). The conference is divided into twenty three sessions that focus on the highlighted themes in the programme including: 157 papers consisting of 34 full papers (FP), 123 research in progress (RIP) papers, 10 posters, and one panel session. The conference is expecting 120 participants, largely postgraduate students and faculty/academics, from countries such as: Botswana, Kenya, Lesotho, Namibia, Nigeria, South Africa, Tanzania, Swaziland, Uganda, USA and Zimbabwe. In addition, 20 institutions, largely universities from Africa and particularly South Africa, are taking part in the 2019 conference.

This year's conference theme, "Data, information and knowledge for development in Africa", is unique because of the importance of digitization in our daily life and the value of e-things such e-learning, e-scholarship, e-science, e-resources, e-data, e-libraries and e-resources among others, and resonates well with the 4IR paradigm. It is also unique because of the magnitude of the event that has attracted some of the prominent information, knowledge and library and information science scholars from Africa, and the USA. For example, the conference in our midst has attracted four Keynote speakers and eight Guest Speakers from Africa and USA; consists of nine plenary sessions and 14 parallel sessions; 81 participants from 20 universities/Institutions and 11 countries. While conveying greetings from the Vice-Chancellor Prof. Xoliswa Mtose, I recognise and appreciate the presence of the Deputy Vice-Chancellor of Teaching and Learning at the University of Zululand, Prof. Mahlomaholo; the Vice-Chancellor and Provost of Academic Affairs at the University of Wisconsin Milwaukee, Prof. Johannes Britz (who is also one of the keynote speakers); other eminent keynote speakers such as Prof. Stephen Mutula (Interim

Dean and Head of the School: Management, IT and Governance at the University of Kwazulu-Natal), Prof. Trywell Kalusopa (University of Namibia) and Prof. Mpho Ngoepe (Chair of the Department of Information Science at the University of South Africa). I also recognise the eight guest speakers and chairs of sessions whose contribution to the success of this conference is very significant and much appreciated

The 4IR refers to a set of highly disruptive technologies which are blurring the lines between the physical, digital, and biological spheres, collectively referred to as cyber-physical systems. Technologies such as cognitive computing, cloud computing, the internet of things, big data, augmented/virtual reality, 3D systems, artificial intelligence and power supply, are transforming social, economic and political systems and putting huge pressure on leaders and policy-makers to respond. At the national level, during his State of the Nation Address in 2018, President Ramaphosa reiterated that “Our prosperity as a nation depends on our ability to take full advantage of rapid technological change. This means that we urgently need to develop our capabilities in the areas of science, technology and innovation.” He emphasized that government “will soon establish a digital industrial revolution commission ... to ensure that our country is in a position to seize the opportunities and manage the challenges of rapid advances in information and communication technology (ICT)”. This seems to resonate with what is required in the 4IR. The resulting new digital economy will permeate all aspects of society, including the way people interact, the economic landscape and political decision-making. 4IR technologies are considered revolutionary due to the speed, breadth and depth of the anticipated change they will bring – and will impact every aspect of our lives. Technologies for digital transformation create the opportunity for developing countries to bypass traditional phases of industrial development. However, there are challenges inherent in the 4IR including job losses and disruption and the potential for non-on-inclusive growth that have the potential to increase social instability within countries. Country and municipal responses need to be fast, agile, experimental and iterative. We realize that the associated challenges to data, information and knowledge flow – such as access, ethics, policy, standards, infrastructure, and security in the current digital economy – remain a concern in most developing countries, especially in Africa. We acknowledge that several strides have been made in finding solutions for effective access, use and sharing of data, information and knowledge, and making these a reality in Africa. We anticipate that this annual conference will provide an international open forum for academics, students, researchers, knowledge and information managers and authorities, and information and communication related professionals, largely from Africa, to converge, discuss, and share knowledge and experiences on the conference theme, with an emphasis on the progress made in Africa.

I hope that this conference will enable constructive discourse and knowledge sharing among students and staff/faculty and foster further exploration and debate in this growing IS field. I am happy to know that qualifying papers at this conference are undergoing double blind peer review with the aim of publishing then in a peer referred

conference proceedings that meets DHET standards and requirements for scholarly research output. Please make the best use of this event and visit the conference website: <http://www.lis.uzulu.ac.za/conference>.

I hope that you enjoy the next three days of lively debate and I thank all the contributors to this conference.

Prof. Mogomme Masoga  
Dean of the Faculty of Arts  
September 2019, University of Zululand

# Preface

## Data, information and knowledge for development in Africa

Development is increasingly dependent on information and knowledge for human progress in the 4IR (Fourth Industrial Revolution), and in meeting the United Nations sustainable development goals (SDGs) for 2030. As alluded to in the Foreword, technologies, such as cognitive computing, cloud computing, the Internet of things, big data, augmented/virtual reality, 3D systems, artificial intelligence and power supply, are transforming social, economic and political systems and putting huge pressure on leaders and policy-makers to respond. The theme and sub-themes of this conference seem to resonate in many ways with what is expected in the 4IR. However, there are challenges inherent in the 4IR, including disruption, job losses and inequality, that have the potential to increase social instability within countries. While recognising the challenges of the information and knowledge economy involving access, inequality, infrastructure, policy, ethics and security, we acknowledge that several strides have been made in finding solutions to these challenges and to make the theme a reality in Africa.

This conference covered the following broad themes: LIS education and e-learning, ICT4D/informatics, applied bibliometrics, e-government and e-governance, knowledge management, indigenous knowledge, digital scholarship, e-records, the fourth industrial revolution and digital economy. Papers were presented in nine plenary sessions and 12 parallel sessions. Of 110 papers presented at the conference, 34 full papers were submitted for the conference proceedings. Other papers not submitted were either incomplete, research in progress papers, or did not meet the criteria for full papers, while some authors decided to publish their papers elsewhere as journal articles or book chapters. From the 34 full papers submitted, seventeen were accepted; the rest were either rejected in the peer-review process, or were withdrawn by their authors. The papers were each subjected to double blind peer review by at least two reviewers. The papers published in this book cover gender studies, applied bibliometrics, e-government, knowledge management, e-scholarship, e-resources, informatics/ICT4D, virtual technology, e-learning, LIS education and research data management.

The first five papers focus on knowledge management. In the first, “Production patterns and dissemination avenues in knowledge management research in Eastern and Southern Africa Region, 1991-2016”, Geoffrey Gichaba Nyamasege, Omwoyo Bosire Onyancha and Tom Kwanya use bibliometric analysis to examine the production patterns and dissemination avenues in knowledge management research in the Eastern and Southern Africa (E&SA) region, as indexed in Scopus database for the period 1991-2016. The study has revealed increased KM research outputs through collaborative efforts among authors, institutions and countries, both at the local and international level, and recommend that individual countries should have

clearly defined strategies on the use and publication of research findings conducted within their territories.

In the second paper, “Knowledge transfer and retention challenges and service delivery in Nairobi City County Government (NCCG), Kenya”, Eddie M. Obwaka, Tom Kwanya and Naomi Mwai have found that NCCG staff experience the fear of job loss when knowledge is transferred; suffer from technophobia, especially those who are unable as yet to use emerging technologies; lack of sensitisation, and lack of user needs assessments as challenges for knowledge transfer and retention. They have found the study to be suitable for the NCCG and other county governments to identify obstacles to knowledge transfer and retention, and to find ways to complement the knowledge they already have.

In the third paper, “Knowledge management in SMEs in the context of the fourth industrial revolution”, Aderonke Olaitan Adesina and Dennis Ocholla argue that before the 4th industrial revolution (4IR), products determined demand, leading to mass production by large-sized enterprises, while after the 4IR, production and consumption become customised because it is demand that will create products, and this process will be led by innovative start-ups and small and medium enterprises (SMEs). The study recognises that challenges are indeed facing SMEs, but suggested they can leap into the 4IR through knowledge management strategies, which are grouped under people, processes and technology. The study proposes a framework to this effect that can be found quite valuable.

The fourth paper, by Christine Cherono Tuitoek, Joseph Kiplang’at and Tom Kwanya from Kenya, focuses on knowledge management and is titled “Transfer of tacit knowledge among staff at the Kenya National Library Service, Nairobi County, Kenya”. The three authors note that no study of this nature has focused on the public library services while such a form of knowledge-sharing is quite essential.

The fifth paper, “Knowledge sharing and self-efficacy, as determinants of job satisfaction of library personnel in public universities in South-West Nigeria, Nigeria”, by Adeola Adesoji Arinola and Chinyere Nkechi Ikonne, acknowledges that job satisfaction is crucial in all organisations, including public university libraries. The authors conclude that knowledge-sharing and self-efficacy are factors that promote job satisfaction. They recommend that for enhanced job satisfaction, library management and the university administration should collaborate to provide comprehensive education and training for library personnel on knowledge-sharing and the acquisition of self-efficacy competencies.

The sixth and seventh paper focus on e-records management. Mandisa Msomi and Trywell Kalusopa’s paper titled “Change management in the implementation of electronic health records systems (EHR) at Inkosi Albert Luthuli Hospital, South Africa” acknowledge that, for decades, most public hospitals have relied on managing records manually using different formats of classification, but hospitals in South Africa are now changing to electronic health records driven by an eHealth strategy. The paper recommends robust and functional EHR system implementation.

In the following paper, “E-records security classification and access controls in Moi University, Kenya”, Carolyn Nyaboke Musembe and Stephen Mutula recognise that while Moi University has in place a range of computerised systems that generate a variety of e-records, the e-records security management at Moi University seems not to be fully compliant with international best practices. The study recommends that the university should develop and enforce e-records management policies that integrate matters of security

The eighth paper dwells on 4IR and LIS education. In the conceptual paper, “Nurturing the physical, digital, and biological learning spaces within a higher education ecology: An African LIS perspective”, Neil Evans highlights the importance of nurturing the physical, digital, and biological learning spaces within a higher education (HE) ecology and emphasises the role of language, media and technology within the fourth industrial revolution. The paper encourages incentives for academics to become life-long learners and constantly update their knowledge and skills through a policy that supports and rewards innovative teaching. The paper proposes the continuous review and development of LIS curriculum to stay relevant.

E-voting in general, and at the universities in particular, is riddled with controversies. The ninth paper, by Sidney Nkholezeni Netshakhuma, “Analysis of the adoption of e-voting systems at the University of Mpumalanga, South Africa”, focuses on e-voting in a university environment, and noted that e-voting is rejected by the students because of their distrust in the IEC, the university electoral Committee and a negative attitude towards the e-voting system. This paper supports e-voting, but cautions that the authenticity, reliability, security and completeness of an e-voting system must be upheld.

The tenth paper, by Taiwo Aderonke Idowu, is a bibliometric study focusing on ‘Lotka’s Law and GBV Literature 2009-2018: a case study of South Africa’. Taiwo is concerned about the high frequency of gender-based violence (GBV) in South Africa, and used Lotka’s law of scientific productivity over a ten-year window (2009-2018) to establish whether the research output pattern fits the law. Taiwo implies that if Gender-based violence (GBV) is not given adequate research attention, it could jeopardise efforts to curtail the unfortunate phenomenon.

The eleventh paper, on information seeking and focusing on e-resources, is titled “Availability and use of electronic information resources (EIRs) by doctoral students in Nigerian and South African universities”. Eyaufe Obaguono Omamomo and Stephen Mutula acknowledge that the cost of acquiring EIRs by tertiary educational institutions in Africa is continually rising against decreasing budgets. However, these resources are often underutilised even among doctoral students, which confirms the low usage of EIRs and greater use of print information resources among participants. The study recommends the provision of adequate support and training in the use of EIRs by their respective libraries to make e-resources more accessible and effective.

The twelfth paper is concerned with “Adoption of cloud technology services at the National University of Lesotho Library”. Tahleho Emmanuel Tseole, from Lesotho,

recognises the growth of ICT landscape and cloud computing and recommends that library and information professionals should understand cloud computing and its components for information and access. Tahleho feels that the study provides valuable first-hand insight into the adoption and implementation of cloud computing in the context of libraries in Lesotho.

Research data management research is growing. The thirteenth paper, “Research data management challenges in Kenya: The case of private universities in Nairobi County”, is written by Everlyn M. Anduvare and Stephen M. Mutula. The study highlighted several challenges, which included among others the lack of strategies and policies to guide research data management support, the lack of integrated RDM policies, a research process that was fragmented, and limited ICT policies and infrastructures. The two authors conclude that the findings have policy, practical and theoretical implications for the effective RDM in Kenyan private universities in order to enhance scientific and scholarly communications.

The fourteenth paper, referring to big data, focuses on “Characteristics of big data produced by the Technical University of Kenya and Strathmore University”. Lucy Wachera Kibe, Tom Kwanya and Ashah Owano use contextual insights into the differences and similarities between the characteristics of big data from the perspectives of private and public universities in Kenya and establishes that both institutions generate big data that can be described in terms of Volume, Variety and Velocity (3Vs) of big data. Also, the institutions had different varieties of big data, ranging from email-based data, photos, video, audio, social media data, MS Office data, cell-phone data, financial data, web-log data, and gaming related data. The authors envisage that the outcome of this study can be used by academic institutions to leverage on the data they produce, through analytics, to improve their performance.

In the fifteenth paper on e-government and titled “Applying DeLone and McLean information systems success model in evaluation of e-government initiatives: a Literature review”, Mercy Gacheri Nkanata examines the relevant literature, and confirms that while the DeLone and McLean information systems success model is one of the most widely used for measuring information systems, its application in e-government evaluation usage is low.

In the sixteenth paper, with a focus on informatics, in “An appraisal of nursing informatics research and the influence of the Unified Theory of Acceptance and Use of Technology”, Diodemise Ese Ovwasa recognises the importance of healthcare informatics, particularly nursing informatics, in today’s dynamic health systems. Using a systematic review of literature, the study reveals that performance expectancy and effort expectancy (respectively) make valuable recommendations regarding access to NI technologies and infrastructure.

The seventeenth and last paper focuses on information access and services. Mustapha Idris, Auwalu Dansale Yahaya, Jibril Mus’ad El-Jibril and Hasiya Salihu Yusuf from Kano University of Science and Technology write on “Involvement of



District Traditional Heads in information provision for community development in Kano South Sectoral Zone, Nigeria” and make a number of recommendations for the improvement of the information services that border on the provision of information centre, remuneration of DTH workers, partnership between NGOs and DTH, the decision-making role of DTH, regular meetings of stakeholders and ownership of community radio stations for information dissemination.

On behalf of the conference organising committee, we would like to thank the conference sponsors for their support, members of the programme committee who reviewed the papers for publication, and the University of Zululand for always making its resources available to support the conference.

We hope that you will enjoy the reading.

Dennis Ng’ong Ocholla and Neil Davies Evans

# **Production patterns and dissemination avenues in knowledge management research in Eastern and Southern Africa Region, 1991-2016**

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## **Abstract**

*Using a bibliometrics analysis, this paper examines the production patterns and dissemination avenues in knowledge management research in Eastern and Southern Africa (E&SA) region as indexed in Scopus database for the period 1991-2016. The study leading to this paper used a quantitative approach as the study required numerical data to achieve its objectives. Data was collected from the SCOPUS database using a variety of keywords. The VosViewer software and Microsoft Excel were used to analyse, visualise and present the data. There were a total of 3,681 papers published on KM in Eastern and Southern Africa between 1991 and 2016. The number of publications is not consistent and varies from year to year. The minimum number of publications per year was seven (7) while 518 was the highest. The number of publications stagnated between 1991 and 1992, with a slow growth rate being observed from 1993 to 2000. There was a significant steady increase in the number of publications from 2001 to 2016. Engelbrecht, A.P., Marwala T. and Meyer T. were the most prolific authors, with an output that surpasses 30 publications, comprising roughly 5.15% of the total publications. Most of the productive authors originated from or were affiliated with South African institutions. Consequently, South Africa was the greatest contributor of the bulk of KM research output (2,753; 74.9%) of the total publications. 40.32% of the analysed publications correspond to international contribution, representing 14 foreign countries of the top 25 countries*

- 
1. Geoffrey Nyamasege (corresponding author) is a Knowledge Management Specialist at Kenya Revenue Authority.
  2. Bosire Onyancha PhD is a research professor in the Department of Information Science, University of South Africa, South Africa.
  3. Tom Kwanya PhD is an associate professor and Director, School of Information and Communication Studies, Technical University of Kenya, Kenya.

*producing KM research. The study has revealed increased KM research outputs through collaborative efforts among authors, institutions and countries, at the local and international level. The largest share of these publications goes to South Africa. The study has also revealed a steady increase in the growth rate of KM research sources, with an average number of nearly 27 publications per source. Most KM publications were published across disciplines, with most productive source titles categorised as both conference papers (1,689; 46%) and journal articles (1,653; 45%). The authors recommend that each Individual country should have clearly defined strategies on the use and publication of research findings conducted within its territory. Researchers should increase both internal and external collaboration, undertake research in the field of KM and publish their findings in high-quality open access journals in a bid to advance KM research productivity and impact in the Eastern and Southern Africa region.*

**Keywords:** bibliometric analysis, content analysis, knowledge management, Eastern and Southern Africa, Scopus.

## **1 Introduction**

The concept of Knowledge Management (KM) has been part of the economy for decades. The growth of KM as a discipline spans many years and can be traced as far back as the 1990s during the scientific and strategic management demarcations (Park & Kim, 2005), when harnessing an organisation's knowledge, sharing expertise and disseminating knowledge at the right time to the right people was recognised as a means to achieving competitive advantage (Rono, 2011; Hlupic, Pouloudi, & Rzevski, 2002). It can therefore be said that KM is not a radically new concept, since many of its principles originate from a variety of disciplines with different names (Davidova, Kokina and Zarina, 2014). Similar ideologies have emerged that have contributed to KM's growth, at first steadily but then rapidly gaining the widespread attention of researchers, practitioners and policy makers (Harman & Koohang, 2005; Nonaka & Peltokorpi, 2006; Serenko, 2013). Many institutions and organisations all over the world have likewise embraced knowledge management as a subject (Vu-Thi & Stenberg, 2017; Park & Kim, 2005).

Serenko and Bontis (2004) emphasise that the popularity of KM has increased dramatically over the last decade amongst the academics and practitioners. Though KM is perceived as a young interdisciplinary area, the field has notably received tremendous attention and is being used to support a wide-range of applications (Qiu & Lv, 2014). It has become a predominant field within the business processes and management landscape (Moustaghfir & Schiuma, 2013) hence it is considered a vital source for sustainable competitive advantage in organisations (Ramy, Floody, Ragab & Arisha, 2017).

It is not surprising, therefore, that KM practices are deeply entrenched in the economic spheres. This can be attributed to the fact that corporate knowledge and its management has intensified over the years (Kokol, Zlahtic, Zlahtic, Zorman & Podgorelec, 2015), attracting the interest of academics, economists and practitioners (Kokol, Zlahtic, Zlahtic, Zorman & Podgorelec, 2015). As a result, there has been an increasing trend of embracing knowledge management. Many organisations have since considered KM as a tool for saving organisations costs and propelling growth (Chaudhary, 2005). As such, knowledge management has been recognised as a critical organisational management tool (Rono, 2011). The adoption of knowledge management as a management strategy has promoted a knowledge-driven organisational culture, enabling organisations to gain competitive advantage.

Notwithstanding the above-mentioned developments in the KM discipline, as a subject KM has grown massively and has thus attracted significant attention from a number of disciplines over the years (Ndwandwe & Onyancha, 2011). However, KM as a research theme and an organisational strategy, has received varying concepts such as the meaning of KM (Chua, 2009). Nonetheless, being a new research discipline, KM has boasted a great deal of scientometrics research in a bid to define its identity better (Kokol, Zlahtic, Zlahtic, Zorman & Podgorelec, 2015).

## **2 Contextual setting**

This study focused on the Eastern and Southern African (E&SA) region on the African continent. This is a vast, geographically diverse region that stretches from the Red Sea in the north to the Cape of Good Hope in the south (UNICEF, 2017). This region comprises 22 countries. According to the International Food Policy Research Institute

(2017), the last 15 years have witnessed massive economic growth, particularly in the land and agricultural sector in the E&SA region. In spite of this rapid economic growth over that period, the economic outlook for the E&SA region, just like for Africa as a whole, remains optimistic, even in the face of challenging global macro-economic conditions.

In terms of research and development, the World Bank (2016) approved E&SA region Higher Education Centres of Excellence Project for the purposes of supporting the region to promote specialisation among participating universities in areas that address regional challenges by strengthening their capacities to offer quality training as well as applied research. As such, there is likely to be a steady growth of research in most of the E&SA region countries.

### **3 Review of literature**

This section reviews relevant literature covering KM publications and journal articles according to the salient themes of the topic of this study.

#### **3.1 Publication patterns and trends of knowledge management research output**

Reviewed literature indicates that KM is growing steadily and is rapidly gaining widespread attention of researchers, practitioners and policy makers (Harman & Koohang, 2005; Nonaka & Peltokorpi, 2006; Serenko, 2013), and as a result, its popularity has increased dramatically over the last decade (Serenko and Bontis, 2004). Qiu and Lv (2014) found that research on knowledge management has been published in a large number of journals with authors affiliated to institutions worldwide. These research studies have established a number of bibliometric projects which have been widely applied in different disciplines. In their study on an overview of knowledge management research viewed through the web of science, in 1993-2012 there were 12,925 publications relating to KM research in 21 languages, English being a dominant language in KM research, with 12,556 publications, representing 97.15%. They also found that there is an annual increase in the number of authors (i.e. 3,489), number of publications (i.e. 1,576) and the number of KM publication topics (i.e. 721) during the period 1993-2009.

Kumar and Mohindra (2015) in their study of KM research from 2000 to 2014 exploring the research trends, used the necessary bibliometric measures to analyse KM research trends. They found that there were an average of approximately 342 articles published every year. The highest number (583) were published in 2012, while the lowest number (128) appeared in 2000. They also found that authorship patterns and average author per article recorded a total of 10,421 authors with a total of 5,127 articles published, with most of the publications being single authored publications.

Similarly, Barik and Jena (2013), in their study on bibliometric analysis of the *Journal of knowledge management practice* 2008-2012, found that single-authored articles dominated (about 50% of the total articles published in the Journal), followed by two-authored articles and three-authored articles respectively.

The study by Akhavan, Ebrahim, Fetrati and Pezeshkan (2016) on major trends in knowledge management research, employed bibliometric and text mining analyses to investigate major trends in KM research from 1980 to 2014. They found that KM publications had increased at a slow rate from 1987 to 2006, with a steady but sudden increase in 2007.

Sedighi and Jalalimanesh (2017), in their study on mapping research trends in the field of knowledge management 2001-2010, found that the annual growth rate of KM research outputs in WoS was 10.9%. Similarly, Serenko and Bontis (2004) revealed in their study, a meta-review of knowledge management and intellectual capital literature by citation impact and research productivity rankings, that over the past decade, the number of articles on KM and IC has been increasing at the rate of 50% per annum.

### **3.2 Producers of knowledge management research output**

The publication of knowledge management research outputs follows a consistent pattern associated with the number of researchers or scholars in a particular country. According to Research Trends (2008), the share of the world's articles is dominated by countries with the most researchers and other institutions.

Kumar and Mohindra (2015) analysed KM research in their analysis on KM research for the period 2000-2014 by using a bibliometric approach. The study found that 107

countries contributed a total of 5,127 KM articles; the top ten countries with the highest research output (i.e. USA, England, Taiwan, Spain, China, Canada, Germany, Australia, France and Italy) contributed 4,159 articles, accounting for roughly 81.12% of the total research output. The study also revealed that the largest number of publications were produced in English, accounting for 94.77%, followed by Spanish, German, Portuguese, French and others.

Jena, Swain and Sahoo (2012) analysed the journal *Annals of Library and Information Studies* (ALIS), 2002-2010. The study found that there were a total of 476 authors representing 12 different countries. Similarly, Wadhwana and Chikate (2016) in their study on the bibliometric analysis of contributions in the journal *Library Progress International* given its international level of distribution, the results revealed that only 24% of the authors were “foreigners”: 76% were local or Indian authors. Thanuskodi (2011), in his bibliometric analysis of the journal *Library Herald* 2006-2010, revealed that most of the articles contributed (124; 89.85%) were from India, while a small number of articles contributed (14; 10.15%) were from “foreign sources”.

Barik and Jena (2013) conducted a bibliometric analysis of the *Journal of knowledge management practice* from 2008-2012. The study found out that during the period under study, authors from 38 countries published their articles in the journal. On the other hand, Kokol, Zlahtic, Zlahtic, Zorman and Podgorelec (2015) in their study on the bibliometric analysis of research trends on knowledge management in organisations during the period, 1977-2014, found that the top ten countries accounted for 65.1% of all the published research outputs. The study also revealed that the most productive institutions were in the developed and most productive countries.

Qiu and Lv (2014) revealed in their bibliometric study on an overview of knowledge management research viewed through the web of science, 1993-2012, that there was an annual increase in the number of countries or regions participating in KM research during the period 1993-2006. The period 2007-2012 reported a fluctuation of the annual number of countries or regions. During the 20-year period, three publication types were found in the 12,925 selected publications, namely journals, books and series. In this case, journal articles were mostly used, with the journal of KM at the top by the number of the publications.

### 3.3 Avenues of sources disseminating knowledge management research output

Popular journals are frequently referred to and scholars prefer to publish in those journals simply because of the cordial relationships enjoyed within the field of research and the journal (Ram & Paliwal, 2014). Kumar and Mohindra (2015) in their bibliometric analysis on knowledge management research, analysed publications in terms of their growth, geographical distribution, most productive journals, top authors, highly cited papers, etc. The study found that a total of 5,127 articles were published in 1,070 journals in the field of KM. The study also revealed that the top 20 most productive journals contained (1,564; 30.5%) of the total articles. The maximum number of articles (269; 5.25%) were published in KM journal.

## 4 Methodology

The present study employed bibliometrics and content analysis as the research design to collect data. The study targeted all articles on knowledge management published between 1991 and 2016 and indexed in the Scopus database. because it is the largest abstract and citation database of peer-reviewed literature which includes scientific journals, books and conference proceedings. The period 1991 to 2016 was considered because this is the period scientific research output in the Eastern and Southern Africa region recorded rapid growth (Park & Kim, 2005; World Bank, 2016; Rono, 2011; Hlupic, Pouloudi & Rzevski, 2002).

A search was conducted within titles, abstracts and keywords fields. Search #1 involved a search for terms, in Table 1, using the OR Boolean operator. Similarly Search #2 followed the strategy used in Search #1 but involved keywords, in Table 2. The two searches were then combined using the AND Boolean operator, i.e. Search #3 = Search #1 AND Search #2.

Table 1: List of names of countries in E&SA regions used to search and retrieve data from Scopus database

|             |          |            |          |              |
|-------------|----------|------------|----------|--------------|
| Angola      | Botswana | Djibouti   | Eritrea  | Ethiopia     |
| Kenya       | Lesotho  | Madagascar | Malawi   | Mauritius    |
| Mozambique  | Namibia  | Seychelles | Somalia  | South Africa |
| South Sudan | Sudan    | Swaziland  | Zimbabwe | Tanzania     |
| Uganda      | Zambia   |            |          |              |



| Table 2: List of keywords used to search and retrieve data from the Scopus database |                             |                            |
|-------------------------------------------------------------------------------------|-----------------------------|----------------------------|
| Knowledge Management                                                                | Information Management      | Knowledge Sharing          |
| Artificial Intelligence                                                             | Knowledge Economy           | Knowledge Transfer         |
| Organisational Learning                                                             | Intellectual Capital        | Knowledge                  |
| Knowledge based Organisation                                                        | Knowledge Culture           | Knowledge Audit            |
| Knowledge Strategy                                                                  | Knowledge Worker            | Knowledge Retrieval        |
| Knowledge Capture                                                                   | Knowledge Creation          | Knowledge Elicitation      |
| Knowledge Acquisition                                                               | Knowledge Engineering       | Tacit Knowledge            |
| Explicit Knowledge                                                                  | Knowledge Management Model  | Intellectual Capital/asset |
| Organization culture                                                                | Computer science            | Management science         |
| Library science                                                                     | Information science         | Information retrieval      |
| ICT/Internet                                                                        | Learning organization       | Project management         |
| Information need                                                                    | Business process            | Software development       |
| Knowledge structure                                                                 | Knowledge flow              | Contextual knowledge       |
| Knowledge organization                                                              | Human Capital               | Social knowledge           |
| Organizational memory (OM)                                                          | Knowledge Infrastructure    | Knowledge work             |
| Knowledge conversion                                                                | Organizational performance  | Software engineering       |
| Knowledge Integration                                                               | Document management         | Social network             |
| Customer knowledge                                                                  | Knowledge visualisation     | Knowledge search           |
| Knowledge modeling                                                                  | Knowledge engineering       | Knowledge discovery        |
| Socialization                                                                       | Knowledge mapping           | Competitive Intelligence   |
| Knowledge Management Process                                                        | Intangible asset            | knowledge base             |
| Knowledge dissemination                                                             | Community of Practice (CoP) | Content management         |
| Knowledge life cycle                                                                | Knowledge asset             | Data mining                |
| Knowledge representation                                                            | Knowledge network           | Knowledge managers         |
| Knowledge codification                                                              | Expert system               | Implicit knowledge         |
| Risk management                                                                     | Innovation                  | Knowledge flow             |
| Knowledge Management Systems                                                        | Knowledge methods           | Knowledge repository       |
| Management                                                                          | Knowledge society           | Knowledge exchange         |
| Knowledge market                                                                    | Knowledge broker            | Knowledge education        |
| Knowledge based system                                                              | Learning organisation       | Story telling              |
| After action review                                                                 | Lessons learnt              | Intellectual property      |
| Information systems / management systems                                            | Knowledge sharing platform  | Knowledge soliciting       |
| Knowledge retention                                                                 | Knowledge codification      |                            |

The search results were saved in csv format, which is compatible with VosViewer software that was used to analyse the data. The VosViewer is a software tool for constructing and visualising bibliometric networks for such items as journals, researchers, or individual publications. The networks may be based on citations, bibliographic coupling, co-citation, or co-authorship relations. This study applied the

co-authorship option to analyse the data in order to generate production networks for authors, institutions and countries. The frequencies of authored papers per author, institution and country were generated using VosViewer software, while the number of publications per year as well as publication sources was obtained based on an analysis of the data using Microsoft Excel.

## 5 Results and discussions

The results of the study are presented in this section according to the salient themes of the topic of this study.

### 5.1 Publication pattern and trend of knowledge management research in E&SA region, 1991-2016

Figure 1 shows the pattern and trend of KM publications per year for the period under analysis. A total of 3,681 publications were published during the period under study. The number of publications per year varied from 7 to 518. It was observed that the number of publications stagnated between the years 1991 and 1992. A very slow growth rate was observed from 1993 to 2000. However, there was a significant steady increase in the number of publications from 2001 to 2014, with a sudden significant surge in the year 2015. Notwithstanding the variance in the number of publications, the results reveal a positive trend in the entire period under study.

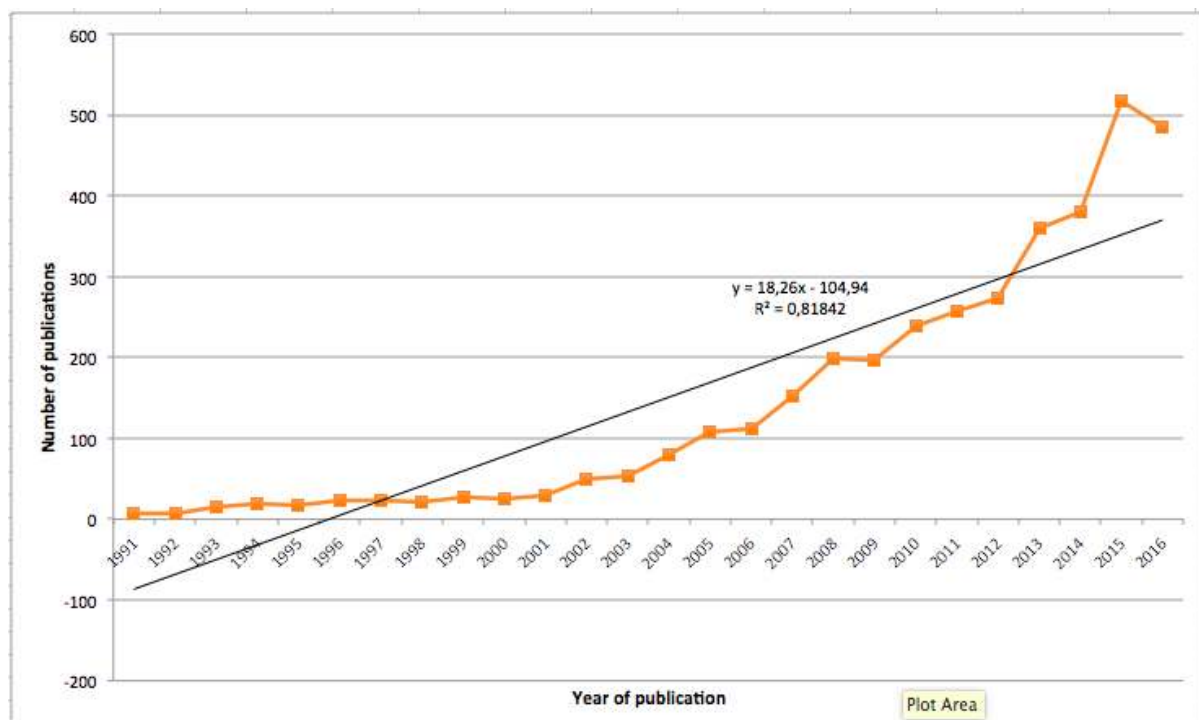


Figure 1: Trend of publication of KM research in Eastern and Southern Africa,  
1991-2016

This finding is important in the field of knowledge management because it reveals a growing trend of publications per year and the number of researchers interested in the field of KM. Evidently, the finding implies a growing trend towards multi-authored publications, hence attracting an increase in KM research productivity.

## **5.2 Producers of knowledge management research in E&SA region, 1991-2016**

This thematic topic presents the findings on the researchers or producers (i.e. authors, institutions and countries) of KM research in E&SA region in order to, among others goals, explain the geographical distribution of KM research in the region.

### 5.2.1 Distribution by authors

| Table 3: Top 25 authors of KM research in Eastern and Southern Africa, 1991-2016 |                           |                    |           |                           |
|----------------------------------------------------------------------------------|---------------------------|--------------------|-----------|---------------------------|
| No.                                                                              | Author Name               | No of publications | % of 3681 | Country of affiliation    |
| 1                                                                                | Engelbrecht, A.P.         | 89                 | 2.42      | South Africa              |
| 2                                                                                | Marwala, T.               | 60                 | 1.63      | South Africa              |
| 3                                                                                | Meyer, T.                 | 37                 | 1.01      | South Africa              |
| 4                                                                                | Keet, C.M.                | 20                 | 0.54      | South Africa              |
| 5                                                                                | Aldrich, C.               | 19                 | 0.52      | South Africa              |
| 6                                                                                | Nelwamondo, F.V.          | 19                 | 0.52      | South Africa; USA         |
| 7                                                                                | Twala, B.                 | 18                 | 0.49      | South Africa              |
| 8                                                                                | Britz, K.                 | 17                 | 0.46      | South Africa              |
| 9                                                                                | Mavetera, N.              | 17                 | 0.46      | South Africa              |
| 10                                                                               | Abraham, A.               | 16                 | 0.43      | Sudan; USA                |
| 11                                                                               | Kroeze, J.H.              | 14                 | 0.38      | South Africa              |
| 12                                                                               | Pillay, N.                | 14                 | 0.38      | South Africa              |
| 13                                                                               | Schmitt, U.               | 14                 | 0.38      | South Africa              |
| 14                                                                               | Von Solms, R.             | 14                 | 0.38      | South Africa              |
| 15                                                                               | Winschiers-Theophilus, H. | 14                 | 0.38      | Namibia                   |
| 16                                                                               | Xing, B.                  | 14                 | 0.38      | South Africa              |
| 17                                                                               | Meshesha, M.              | 13                 | 0.35      | Ethiopia                  |
| 18                                                                               | Pretorius, M.W.           | 13                 | 0.35      | South Africa              |
| 19                                                                               | Van Belle, J.P.           | 13                 | 0.35      | South Africa              |
| 20                                                                               | Buckley, S.               | 12                 | 0.33      | South Africa              |
| 21                                                                               | Folly, K.A.               | 12                 | 0.33      | South Africa              |
| 22                                                                               | Mbohwa, C.                | 12                 | 0.33      | South Africa              |
| 23                                                                               | Ngulube, P.               | 12                 | 0.33      | South Africa              |
| 24                                                                               | Oerlemans, L.A.G.         | 12                 | 0.33      | South Africa; Netherlands |
| 25                                                                               | Bright, G.                | 11                 | 0.30      | South Africa              |

Table 3 shows, in descending order, the percentage of publications that the authors participated in, along with the country of affiliations over the period under study. The rank list of the prolific authors on KM productivity has been derived on the basis of the number of publication contributed as well as authors' affiliations. The most productive authors, Engelbrecht, A.P., Marwala T. and Meyer T. have an output that surpasses 30 publications, comprising roughly 5.15% of the total publications. This represents a strong pattern of author productivity and may be attributed to the number of publications per author.

Our data also shows that the total sum of 22 authors of the top 25 authors originate in South Africa or are affiliated to institutions from South Africa. This may be attributed to the fairly stable KM research patterns and trends in South Africa and/or institutions from that country.

## 5.2.2 Distribution by institutions

| No. | Affiliation                                        | No. of publications | % of 3681 | Country of affiliation |
|-----|----------------------------------------------------|---------------------|-----------|------------------------|
| 1   | University of Pretoria                             | 428                 | 11.63     | South Africa           |
| 2   | University of Cape Town                            | 377                 | 10.24     | South Africa           |
| 3   | University of Johannesburg                         | 251                 | 6.82      | South Africa           |
| 4   | University of KwaZulu-Natal                        | 245                 | 6.66      | South Africa           |
| 5   | Universiteit Stellenbosch                          | 231                 | 6.28      | South Africa           |
| 6   | University of South Africa                         | 193                 | 5.24      | South Africa           |
| 7   | University of the Witwatersrand                    | 187                 | 5.08      | South Africa           |
| 8   | The Council for Scientific and Industrial Research | 177                 | 4.81      | South Africa           |
| 9   | Tshwane University of Technology                   | 116                 | 3.15      | South Africa           |
| 10  | North-West University                              | 112                 | 3.04      | South Africa           |
| 11  | University of Botswana                             | 100                 | 2.72      | Botswana               |
| 12  | Nelson Mandela Metropolitan University             | 95                  | 2.58      | South Africa           |
| 13  | Makerere University                                | 82                  | 2.23      | Uganda                 |
| 14  | Meraka Institute                                   | 79                  | 2.15      | South Africa           |
| 15  | Addis Ababa University                             | 77                  | 2.09      | Ethiopia               |
| 16  | Rhodes University                                  | 75                  | 2.04      | South Africa           |
| 17  | University of the Western Cape                     | 71                  | 1.93      | South Africa           |
| 18  | University of the Free State                       | 50                  | 1.36      | South Africa           |
| 19  | Cape Peninsula University of Technology            | 47                  | 1.28      | South Africa           |
| 20  | University of Nairobi                              | 46                  | 1.25      | Kenya                  |
| 21  | University of Mauritius                            | 44                  | 1.20      | Mauritius              |
| 22  | Durban University of Technology                    | 43                  | 1.17      | South Africa           |
| 23  | Khartoum University                                | 30                  | 0.81      | Sudan                  |
| 24  | Namibia University of Science and Technology       | 29                  | 0.79      | Namibia                |
| 25  | University of Zimbabwe                             | 28                  | 0.76      | Zimbabwe               |

The rank list of the institution-wise KM productivity has been derived on the basis of the number of publications from each institution. Of the all the institutions where KM research output originated, we see in Table 4 that the top 25 institutions produce 3,213 publications in the period under study. The University of Pretoria is the leading

source of KM publications, with nearly 12% of the total output, and the University of Cape Town, with over 10%. Following them, the most productive institution would be the University of Johannesburg and the University of KwaZulu-Natal, with nearly 7% contributions to output respectively.

Our data also shows that most of E&SA region's KM research productivity is carried out in higher institutions of learning. Out of the top 25 institutions producing KM research, approximately 80.4% of the total publications can be traced to higher institutions of learning, which is much higher than the research output from research centres or the corporate sector.

### 5.2.3 Distribution by countries

| Table 5: Top 25 countries producing KM research in Eastern and Southern Africa, 1991-2016 |                   |                    |           |
|-------------------------------------------------------------------------------------------|-------------------|--------------------|-----------|
| No                                                                                        | Country/Territory | No of publications | % of 3681 |
| 1                                                                                         | South Africa      | 2753               | 74.79     |
| 2                                                                                         | United States     | 320                | 8.69      |
| 3                                                                                         | United Kingdom    | 267                | 7.25      |
| 4                                                                                         | Kenya             | 232                | 6.30      |
| 5                                                                                         | Ethiopia          | 136                | 3.69      |
| 6                                                                                         | Germany           | 125                | 3.40      |
| 7                                                                                         | Netherlands       | 125                | 3.40      |
| 8                                                                                         | Botswana          | 123                | 3.34      |
| 9                                                                                         | Uganda            | 123                | 3.34      |
| 10                                                                                        | Sudan             | 101                | 2.74      |
| 11                                                                                        | Tanzania          | 101                | 2.74      |
| 12                                                                                        | Australia         | 98                 | 2.66      |
| 13                                                                                        | Canada            | 85                 | 2.31      |
| 14                                                                                        | Italy             | 76                 | 2.06      |
| 15                                                                                        | France            | 75                 | 2.04      |
| 16                                                                                        | Mauritius         | 67                 | 1.82      |
| 17                                                                                        | Namibia           | 67                 | 1.82      |
| 18                                                                                        | Sweden            | 66                 | 1.79      |
| 19                                                                                        | Zimbabwe          | 65                 | 1.77      |
| 20                                                                                        | Belgium           | 59                 | 1.60      |
| 21                                                                                        | India             | 58                 | 1.58      |
| 22                                                                                        | Malawi            | 51                 | 1.39      |
| 23                                                                                        | China             | 47                 | 1.28      |
| 24                                                                                        | Switzerland       | 44                 | 1.20      |
| 25                                                                                        | Brazil            | 39                 | 1.06      |

The rank list of the country-wise KM productivity has been derived on the basis of the number of publications from each country. In the period under study, 40.32% of the

publications analysed correspond to the international individual contributions and or collaborative efforts. This rate represents a total of 14 main foreign countries out of the top 25 countries producing KM research, namely: United States, United Kingdom, Germany, the Netherlands, Australia, Canada, Italy, France, Sweden, Belgium, India, China, Switzerland and Brazil. There are noteworthy growth patterns and trends of KM production within E&SA region. For instance, South Africa alone produced nearly 75% of the total publications, followed by Kenya with 6.3% of the total publications analysed over the period under study.

However, if we relate this productivity or distributions by country indicator between the main foreign countries and local countries in the region of this study, we find that KM research reflects a more stable trend in the main foreign countries than in the local countries within the period of this study, as a result of their international contributions and collaborative efforts.

### **5.3 Avenues or sources disseminating knowledge management research in E&SA region 1991-2016**

This thematic topic presents the findings according to the document types and proceeds to provide the distribution of publications according to the avenues or sources which publish KM research that is produced in E&SA region during the period under investigation.

### 5.3.1 Document types in KM research

#### 5.3.1.1 KM research production for all document types in KM research

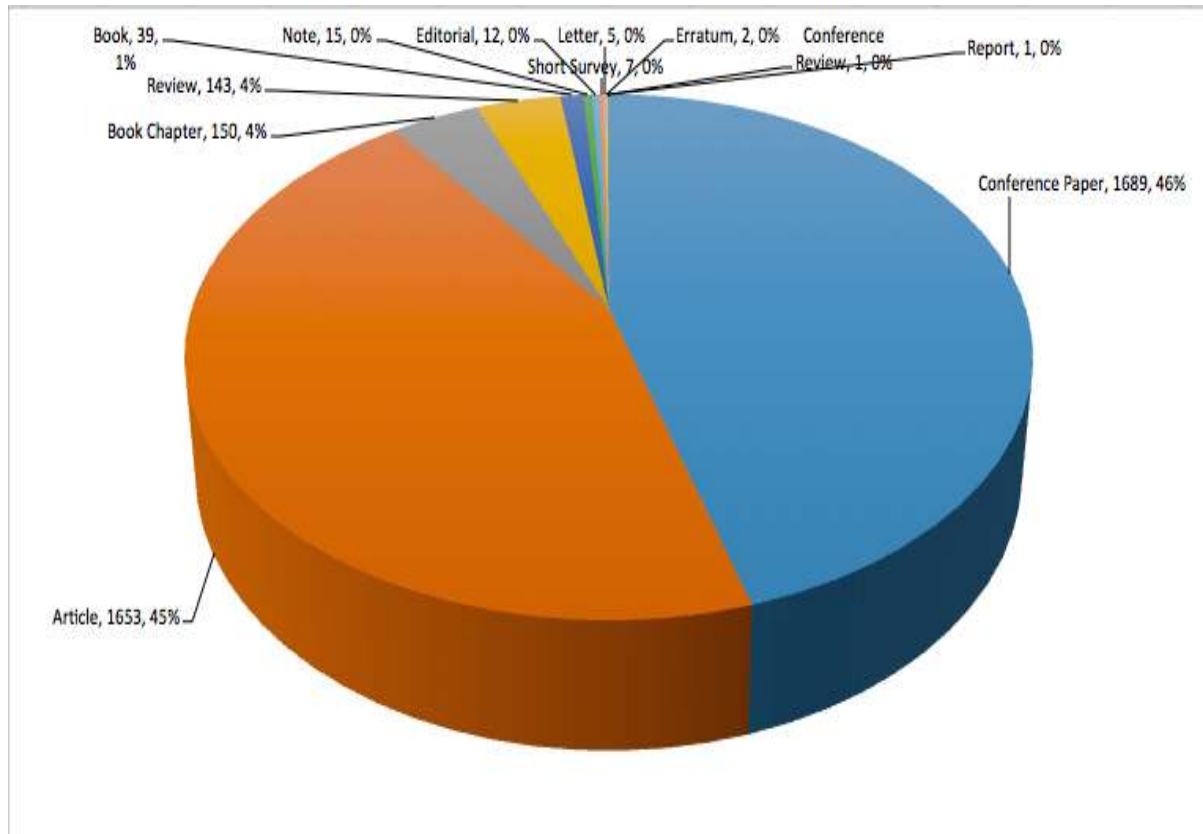


Figure 2: Document types in KM research in Eastern and Southern Africa, 1991-2016

Figure 2 shows the document types in which KM research is published. The document types include articles, book chapters, books, notes, editorial, letters, short surveys, errata, reviews, conference reviews, reports and conference papers. The predominating document type is conference papers (1,689 publications), followed by journal articles (1,653 publications). Even though the conference papers predominate in the KM research, it is important to note the low number of reviews (i.e. 4%) and the conference paper reviews (i.e. <0.5%) on the subject.

During the period under study, over 99% of the research output was in the form of conference papers (46%), articles (45%), book chapters (4%), reviews (4%), books (1%) and conference reviews (0%). However, the findings of the study revealed variations in the production of publications by document types over the years under



study (see Figure 3 for the dynamics of KM research production for articles and conference papers).

The varying trends in document types could have implications for research by enriching the thematic profile of KM productivity. This may be attributed to the multi-disciplinary nature of KM. In addition, there are cross-cutting debates about KM in every sector, resulting in KM research outputs being listed in several document types (see Figure 2).

### 5.3.1.2 KM research production for articles and conference papers

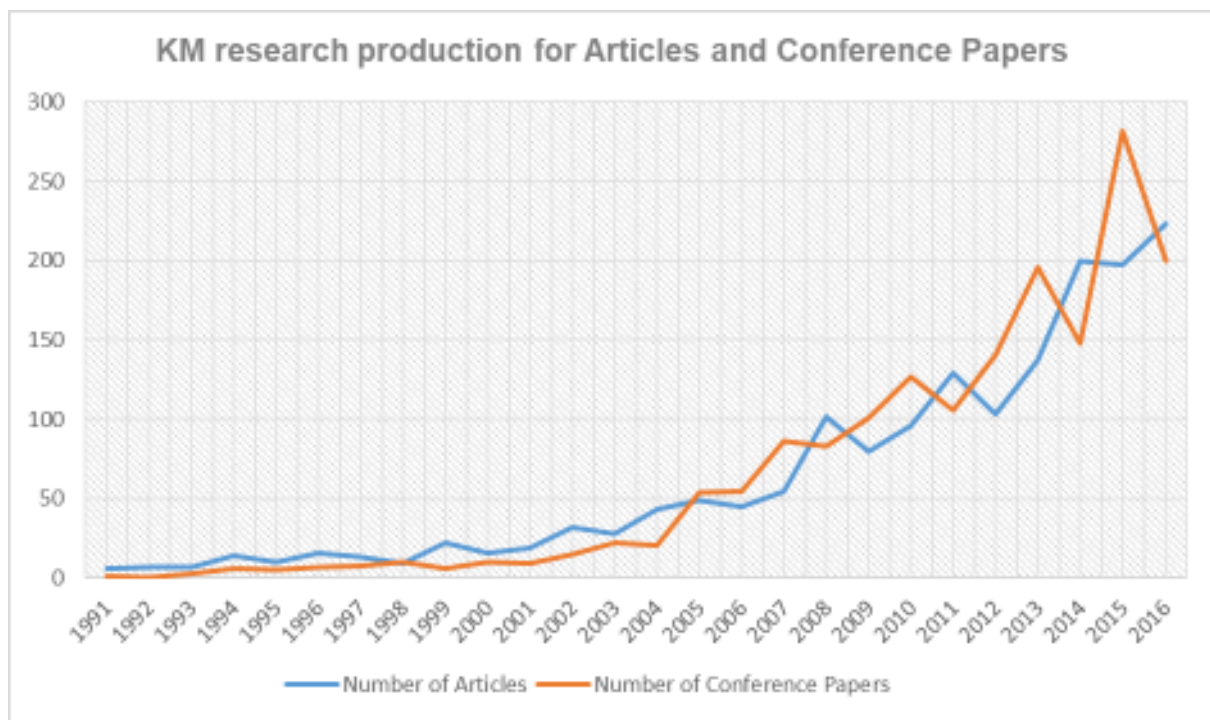


Figure 3: The dynamics of KM research production for articles and conference papers

The dynamic distribution and publications presented in Figure 3 show the dynamics of KM research production separately for journal articles and conference papers. The results reveal a strong positive trend for articles as document type between the years 1991 and 2004, and a strong negative trend in the same period and a rapid increase in the year 2005 onwards for conference papers as document type as compared to article document types. The analysis in Figure 3 is unique because the researcher wanted to understand the trends in detail on KM research production as shown from Figure 2 that related to articles and conference papers for the entire period under

investigation as these were the most highly preferred document types in KM research.

### 5.3.2 Sources publishing KM research

| Table 6: Top 25 Sources publishing KM research produced in Eastern and Southern Africa, 1991-2016                    |                     |           |
|----------------------------------------------------------------------------------------------------------------------|---------------------|-----------|
| Source Title                                                                                                         | No. of publications | % of 3681 |
| Lecture notes in computer science (including subseries lecture notes in artificial intelligence and lecture notes in | 194                 | 5.27      |
| ACM international conference proceeding series                                                                       | 78                  | 2.12      |
| Mediterranean journal of social sciences                                                                             | 33                  | 0.90      |
| IEEE Africon conference                                                                                              | 28                  | 0.76      |
| Physics and chemistry of the earth                                                                                   | 28                  | 0.76      |
| Electronic library                                                                                                   | 27                  | 0.73      |
| Advances in intelligent systems and computing                                                                        | 25                  | 0.68      |
| Communications in computer and information science                                                                   | 25                  | 0.68      |
| International journal of information management                                                                      | 17                  | 0.46      |
| Water SA                                                                                                             | 17                  | 0.46      |
| Computers and security                                                                                               | 16                  | 0.43      |
| Ceur workshop proceedings                                                                                            | 15                  | 0.41      |
| IFIP advances in information and communication technology                                                            | 15                  | 0.41      |
| Plos one                                                                                                             | 15                  | 0.41      |
| South African journal of industrial engineering                                                                      | 15                  | 0.41      |
| International journal of medical informatics                                                                         | 13                  | 0.35      |
| Perspectives in education                                                                                            | 13                  | 0.35      |
| South African journal of science                                                                                     | 13                  | 0.35      |
| Information development                                                                                              | 12                  | 0.33      |
| Minerals engineering                                                                                                 | 12                  | 0.33      |
| Aslib proceedings new information perspectives                                                                       | 11                  | 0.30      |
| Journal of engineering design and technology                                                                         | 11                  | 0.30      |
| Journal of information and knowledge management                                                                      | 11                  | 0.30      |
| African journal of library archives and information science                                                          | 10                  | 0.27      |
| Corporate ownership and control                                                                                      | 10                  | 0.27      |

The total number of sources where a total of 3,681 publications were published came to 139. A rank of the top 25 sources/journals publishing KM research was listed on the basis of the number of publications contributed as shown in Table 6. Outstanding

among them is the output in Lecture notes in computer science (including subseries lecture notes in artificial intelligence and lecture notes in bioinformatics), where roughly 5.3% of the total publications appears. The rest of the sources are at a great distance in terms of the volumes of KM research output, and nearly 95% of the sources show fewer than 78 publications per source title involving KM research in E&SA region, over the study period.

#### **5.4 Summary, discussions and conclusions of the major findings**

The study yielded a total of 3,681 KM publications published between 1991 and 2016. It was observed that the number of publications is not consistent and varies from year to year. The minimum number of publications per year was seven (7) while 518 was the highest. The number of publications stagnated between 1991 and 1992, with a slow growth rate from 1993 to 2000. There was a significant, steady increase in the number of publications from 2001 to 2016. There was a sudden significant surge in the year 2015, accounting for roughly 14.1% of the entire sample with a small reduction in the number of publications comprising roughly 0.9% in 2016. These results support the findings by Kumar and Mohindra (2015); Akhavan, Ebrahim, Fetrati and Pezeshkan (2016) and Sedighi and Jalalimanesh (2017), which found significant positive patterns and trends in KM publications due to the subject's increased attention and relevance, thus demonstrating its ongoing value in scholarly communication.

The most productive authors, Engelbrecht, A.P., Marwala T. and Meyer T., have outputs that surpass 30 publications, comprising roughly 5.15% of the total publications. Most of these publications are recent research outputs, thus denoting that the leading authors are still publishing in the domain. This represents a strong pattern of author productivity. Productive authors is a critical indicator associated with productivity. In contrast, if we relate this indicator with the overall KM research output pattern and trend depicted in Figures 1 and 3, it is difficult to attribute the increased number of publications to single authors.

Our data also shows that the total sum of 22 authors from the top 25 originate in South Africa or are affiliated to institutions from South Africa. This may be attributed to the researchers' individual or collaborative efforts with world-wide institutions, solid research policy as well other support provided for in the country of origin or affiliation.

This finding contradicts Qiu and Lv (2014)'s observation that research on KM has been published with author-affiliations from world-wide institutions.

We have further noted that author-productivity is prevalent during the period under study. This demonstrates fairly stable KM research trends in South Africa and/or affiliated institutions. The authorship and productivity indicators reflect a coherent relationship throughout the period under study, consequently, constituting the bulk of KM research output. Previous studies such as Qiu and Lv (2014) have reported that authors affiliated to world-wide institutions largely publish research outputs in different journals.

With respect to the institutions producing KM research in the E&SA region, our data shows that the majority of the institutions with affiliations to South Africa led in the KM research output. This finding indicates that these institutions originate from South Africa and are among the most highly ranked universities in Africa.

According to Sooryamoorthy (2009), different ranking systems such as the Times Higher Education World University Ranking (THE), Webometrics Ranking of World Universities (WRWU) and Shanghai's Academic Ranking of World Universities (ARWU) have been used to assess the top institutions worldwide. These aforementioned ranking systems reveal that South African institutions take the top ten positions in sub-Saharan Africa, a situation that may be attributed to a solid research policy, the intensity of research collaboration/productivity and other support provided for in the country of origin or affiliation. Previous studies such as Serenko, Bontis, Booker, Sadeddin, & Hardie (2010); Kokol, Zlahtic, Zlahtic, Zorman, and Podgorelec (2015) have reported that the most productive institutions come from the most productive countries. These institutions dominate the KM research field.

Similarly, in the period under study, 40.32% of the publications analysed correspond to the international contributions and collaborative efforts. This rate represents a total of 14 main foreign countries of the top 25 countries producing KM research. However, if we relate this productivity or distributions by country indicator between the main foreign countries and local countries in the region of this study, we find that KM research reflects a more stable trend in the main foreign countries than in the local countries within the period of this study, as a result of their international contributions

and collaborative efforts. Previous studies such as Sooryamoorthy, R. (2009) assert that productivity or distribution increases with an increase in the nature and degree of collaborations. For instance, the higher the number of authors, institutions and/or countries involved in KM research production or distribution, the more stable the field of KM becomes. Thus, KM productivity or distribution is an important factor in this growth and stability in the field of KM.

There are noteworthy growth trends of KM production within E&SA region. For instance, South Africa alone produced nearly 75% of the total publications, making it the top country with KM research output. Kenya followed closely with 6.3% of the total publications in the period under study. This may be attributed to the growing number of publications published in or affiliated to South Africa. The country also leads other countries in Africa in terms of research performance.

In terms of document types, the most productive source titles were categorised as both conference papers (1,689 publications) and journal articles (1,653 publications). Our data shows that the publication dynamic of articles had shown a strong positive and stable trend/growth between 1991 and 2004 as compared to the publication dynamic of conference papers which showed a strong negative trend in the same period and a rapid increase in the year 2005 onwards, making the production more stable as compared to the dynamics of article production in the same period. This analysis of document types pointed out that having a large number of conference papers attest to ongoing research in the discipline, and consequently its rapid development. Previous studies such as Kokol, Zlahtic, Zlahtic, Zorman, and Podgorelec (2015) reported a large number of conference papers produced which was attributed to both the formation of the body of knowledge and the growth rate in the KM discipline.

In terms of avenues or sources publishing KM research, there were a total of 139 sources that published 3,681 publications. The average number of publications per source is roughly 27. The number of publications per source denotes the growth and productivity of KM research (or the lack thereof). The growth rate of sources of KM research has been increasing steadily, with most KM publications being published across disciplines. This may be attributed to the availability of a variety of sources for researchers to publish their papers.

## **5.5 Recommendations**

In order to increase the production of these publications, there is a need to organise local and international conferences in E&SA region regularly, during which researchers and other scholars can have an opportunity to present their findings, exchange ideas and identify other researchers from the region with whom they can collaborate.

Reputable avenues or sources publishing KM research outputs represent key research outlets for scientific communication. In this regard, it is highly recommended that authors, researchers or publishers should publish their findings in recognised channels so as to improve the visibility and impact of these publications. They should particularly consider using quality Open Access (OA) journals.

In addition, in order to increase the production of KM research outputs, it is highly recommended that practitioners and institutions other than the academics responsible for this study's finding of approximately 80.4% of the total publications, should conduct KM research in their business processes and management landscape in order to contribute to this growing body of knowledge, since their research output is not visible in the field.

Finally, we recommend further research to assess, among others, the types of channels used to publish KM research and the subject content of KM research, major producers as well, and carry out the impact analysis of KM research in E&SA region and beyond.

## **5.6 The study's implication and novelty**

The findings of this study can influence the development of knowledge production and collaboration policies between countries as well as the institutions of higher learning.

Countries and institutions can use the findings of this study to develop policies on collaboration, knowledge sharing and transfer, and knowledge management training programmes.

Even though knowledge management is being embraced throughout the region, little is known about its production patterns and dissemination avenues. Therefore, this

study sought to examine the production patterns and dissemination avenues in knowledge management research in Eastern and Southern Africa (E&SA) region as indexed in Scopus database for the period 1991-2016 using bibliometric research techniques. The study revealed increased knowledge management research outputs through contributions and collaborative efforts among authors, institutions and countries, both at the local and international levels. Most of these publications were published across disciplines, with the most productive source titles categorised as both conference papers and journal articles.

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# **Knowledge transfer and retention challenges and service delivery in Nairobi City County Government (NCCG), Kenya**

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## **Abstract**

*This paper discusses the knowledge transfer and retention challenges that result in knowledge loss in Nairobi City County Government (NCCG) and how this affects service delivery by the county government. The NCCG provided the contextual insight to the study leading to this pape, which adopted a convergent parallel mixed methods research design. The target population comprised 12,363 Nairobi City County government workers, of which 746 were sampled. The researcher used a multi-stage (stratified, information-oriented purposive and random) sampling technique to get the actual respondents. Quantitative and qualitative data was E-collected using questionnaires and key informant interviews respectively. Quantitative data was analysed using statistical analysis using SPSS and presented by means of descriptive statistics, while qualitative data was analysed thematically using ATLAS.ti. The findings of the study indicate that NCCG staff experience the fear of job loss when knowledge is transferred; technophobia, especially for those who are unable to use emerging technologies; lack of sensitisation, and lack of user needs assessments as challenges for knowledge transfer and retention. The results of the study can be used by the NCCG and other county governments to identify hindrances to knowledge transfer and retention. This may lead to appropriate mitigations to make sure they leverage on knowledge they have.*

**Keywords:** Knowledge retention, knowledge transfer, Nairobi City County government, service delivery, Kenya

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## Introduction

A major challenge facing organisations in the 21st century is the question of how to retain the knowledge and expertise acquired by employees at a time when there is less likelihood of career longevity in the workforce. Dychtwald, Erickson and Morison (2006) attest to the fact that skills, knowledge, experience, and relationships are lost every time knowledge workers resign, get suspended or retire. Replacing this job-related knowledge, skills, and abilities of departing employees is straightforward in some cases. However, it can be much more difficult to replace knowledge gained from extensive experience or elite expertise (Pobst, 2014). The value of knowledge has grown with the emergence of the information age and the knowledge economy, which have transformed knowledge into an asset and made it the basic economic resource (Beazley, Boenisch & Harden, 2002). When employees resign or retire, they often leave with valuable organisational, customer and project knowledge. Sutherland and Jordaan (2004) argue that the ability to retain organisational knowledge is a key characteristic of a successful organisation in the knowledge economy. Knowledge transfer is normally discussed in relation to the concept of “best practices transfer” (Lu, Mao & Wang, 2010). Parise, Cross, and Davenport (2006) defined knowledge transfer as the reproduction of internal practices that are performed in superior ways in the organisation. In this definition, “practice” is taken to be the routine use of knowledge. According to Carlie and Rebentisch (2003) knowledge transfer is an area of knowledge management concerned with the movement of knowledge across the boundaries created by specialised knowledge domains. In other words, it is the conveyance of knowledge from one place, person or ownership to another.

Knowledge retention is the capture of critical knowledge and expertise that is at risk of loss when employees leave an organisation (Dewah, 2012). Dewah further indicates that knowledge retention aims at retaining as much of the departing employees’ expertise and knowledge as possible. Levy (2011) states that, through knowledge retention, an expert’s most valuable knowledge become an organisational asset.

The pressure on the government to increase the number of policies related to knowledge management processes and service delivery has increased in the last few years (OECD, 2001). Ismail and Yusof (2009) suggest that knowledge management

can play an important role in increasing efficiency in decision making and public service delivery.

## **Contextual setting**

This paper is based on a study which investigated knowledge transfer and retention strategies in Nairobi City county government. The aging workforce in the public utility industry is a well-known and documented phenomenon in the literature. Nairobi City County government, like many governance institutions around the world, is faced with a major generational change in its workforce. Established as City Council of Nairobi (CCN) in 1952, it was set to deliver services to the residents of Nairobi and maintain its City status. CCN derived its legal mandate from the Local Government Act (Cap 265) of the Laws of Kenya amongst other acts of Parliament that augment its diverse core functions and priorities (Mwenzwa & Misati, 2014). These priorities are contained in the various policy and planning documents such as the national development plans; Poverty Reduction Strategy Paper; Economic Recovery Strategy (ERS) for Wealth and Employment Creation; Kenya's Vision 2030; and Millennium Development Goals (MDG's) in the long term (Mwenzwa & Misati, 2014).

With the Kenya Constitution of 2010 framework, the Nairobi City County government has been established under the Urban Areas and Cities Act of 2011. Nairobi City County is mandated to provide and manage basic social and physical infrastructure services to the residents of Nairobi. These services include basic education, housing, health, water and sewerage, refuse and garbage collection, planning and development control, urban public transport and fire services among others (Olima, 2013). The County has several departments, each with well-defined roles, and has been collapsed to ten (10) sectors. According to Phaladi (2011), many of its scientists, technicians, artisans or engineers, who were born between 1946 and 1964, are occupying mission-critical specialist and managerial positions in the organisational structure, and are retiring within the next 5 to 10 years. This large wave of retirements will threaten the long-term survival of the County.

When employees leave, intellectual capital is lost. This makes it difficult for public institutions to sustain their past performance levels. When an institution faces extensive loss in its workforce, it has lesser control over potential knowledge loss

unlike situations where it can influence the worker to remain. Whenever experts and workers retire or resign, their knowledge, skills, experience, judgment and professional networks walk out of the door with them (Phaladi, 2011). In the recent past, Nairobi County government has had high staff turnover due to retrenchment of workers, suspension or dismissal, resignations and retirement of experts. In 2018 alone, 731 employees retired (Mwaura, 2018). More alarming is a report by Mwaura (2018) that only 15 of Nairobi County government employees are under 30 years of age. He further stated that approximately 60% of Nairobi City County government employees are aged and due for retirement. Harvey (2012) points to the fact that examples of successful strategies in the field of knowledge transfer and retention are scarce. Burmeister and Deller (2016) claim that the nature and antecedents of the knowledge transfer and retention process are not yet well understood and the need for additional research is pressing. Based on this, the theme is of relevance for further research. Thus, this study contributes to the bridging of the gap by investigating the challenges hampering knowledge transfer and retention at Nairobi City County government as well as their effect on service delivery in the County.

## **Purpose of the study**

The aim of this research was to explore knowledge transfer and retention challenges and how these affect service delivery by the county government in Nairobi and propose appropriate mitigation measures. Specific objectives of the study were:

- To establish knowledge transfer and retention challenges in Nairobi City County Government.
- To establish the relationship between knowledge transfer and retention challenges and service delivery in Nairobi City County Government.

## **Literature review**

The empirical and theoretical literature reviewed in this section addresses the research questions already defined above in the sections that follow.

## **Knowledge transfer and retention challenges**

Cahir, McNeill, Bosanquet and Jacenyik-Trawöger (2014) claim that the challenges of knowledge transfer and retention are driven by two forces that are shaping today's

workforce, namely, an ageing population and the increasing complexity of knowledge needed in technologically advanced societies. These two forces together cause an acute skills shortage. The challenge facing many organisations, both private and public, is not only the loss of some of their most experienced employees, but also the fact that many of these knowledge workers and managers are taking with them new types of critical expertise and experiential knowledge that did not exist a generation ago (Timonen & Ylitalo, 2013). In the new economy, organisations are facing not only a labour shortage but also a knowledge shortage. DeLong and Johnson (2005) emphasise the fact that the problem for management is not only one of a head-count; it is a question of retaining sophisticated, context-dependent knowledge possessed by an employee who is leaving.

Nidhra *et al.* (2013), in their research on knowledge transfer challenges and mitigation strategies in global software development, established that the biggest challenges of knowledge transfer to an institution are changes in staff. They state that the situation leads to the loss of tacit knowledge by the organisation. They further indicate that when staff members are changed in the middle of a project, it results in additional delays and conflicts in the development process.

Kroll, Mäkiö and Assaad's (2016) study established the following challenges to knowledge transfer: knowledge transfer and retention process mismatches; differing technical knowledge and domain vocabularies; incompatible knowledge environments, as well as differences in expertise, infrastructure, tools and methodologies of knowledge retention and transfer.

Tuitoek (2014) in her study of the transfer of tacit knowledge among staff at the Kenya National Library Service, Nairobi, identified the following challenges to knowledge transfer and retention:

**Knowledge hoarding:** People will hoard their knowledge if they think sharing it will result in punishment. Fear of competitors stealing their ideas also leads to knowledge hoarding.

**Generational gap:** Generational gap can be defined as the difference in the values and attitudes between one generation and another, especially between younger persons and their parents.

**Hierarchical structures:** In more hierarchical organisations, managers have control over information and knowledge flow and may desire to restrict access to critical information by lower-level employees. This could lead to significant organisational barriers to knowledge sharing.

**Competitiveness and job insecurity:** When people acquire new knowledge, they believe that it is the key to their success and are likely to guard instead of sharing it. Many employees do not want to share the expertise they get through many years of hard work due to competition. These employees feel that if they can solve problems they will be valued and will also maintain self-respect.

**Organisation's culture:** Culture is rooted in the core values of an organisation. Therefore, in an organisation with a knowledge-sharing culture, people share ideas and insights because they see it as natural rather than something they are forced to do.

**Physical barriers:** Physical barriers refer to a large number of physical factors ranging from noise and bodily movements to ill-health of either or both participants in a communication process (Kohl & Cook, 2013). Physical barriers are obstacles such as the lack of a conducive environment, geographical distances, staff shortage, noise, lack of time for interaction and physical disabilities.

**Attitudinal challenges:** Attitudes consist of the beliefs and feelings people have about specific ideas, situations and people, which influence their behaviour.

## **Relationship between knowledge transfer and retention challenges and service delivery**

The county government strives to deliver services that are as effective as possible, especially the basic services. By providing these services, the county governments are able to cater for infrastructure, cost of living and a business-friendly environment. However, Héliot and Riley (2010) argue that nowadays the public has been sceptical about services rendered in the public service especially county government officers and politicians who run such public institutions. This distrust is based on the exclusion and lack of knowledge by the public on the inner and core functions of the county governments. The public is rarely involved in matters regarding the formulation of policies and how the policies are implemented. This can be due to the culture of

secrecy within government organisations. This may explain the origin of the Swahili word “sirikali” used to describe the government. The word can be loosely translated as “top secret” (Ondari-Okemwa & Smith, 2009). Héliot and Riley (2010), however, explain that the practices of knowledge transfer can be used as a way of developing new faith in organisations. There are benefits of utilising visual techniques in knowledge retention for the coordination, simplification, highlighting, and navigating the complex web of knowledge that institutions possess (Wexler, 2001). Wexler points out that knowledge retention can be used to capture the skills and experiences of experts in the organisation. Knowledge retention programmes in government can provide an overview of skills that employees possess. According to Ondari-Okemwa and Smith (2009), the Government of Kenya is yet to integrate knowledge transfer and retention into solving major issues arising in service delivery.

Finally, the literature review reveals that challenges to knowledge transfer and retention do exist. Based on the literature, it is clear that organisations are facing challenges in the transfer and retention of knowledge such as: knowledge transfer and retention process mismatches; differing technical knowledge and domain vocabularies; incompatible knowledge environments; as well as differences in expertise, infrastructure, tools and methodologies of knowledge retention and transfer. It is evident from the literature that the key success factor for service delivery is to transfer and retain knowledge.

## **Methodology of the study**

This study used a mixed methods research design. According to Creswell and Poth (2017), mixed methods research encompasses gathering, evaluating, and deducing quantifiable and qualitative data in a solitary study or in a chain of studies that explore the same underlying occurrence. This research specifically adopted a convergent parallel mixed methods research design. The author *collected and analysed both qualitative and quantitative data independently and concurrently*. The target population of this study consisted of 12,363 employees of the Nairobi City County Government. The research adopted a multi-stage sampling technique. The first sampling was obtained through stratified sampling. The strata were top-level management, middle-level management and lower-level employees. From the strata, the authors conducted the second stage of sampling to determine the actual



respondents. The authors used information-oriented purposive sampling to get a sample from top-level management. Thereafter, a simple random sampling technique was used to get the actual respondents from the middle-level management and lower-level management. The sample size for the study was seven hundred and forty-six (746). Of these, 40 were from top-level management, 322 from middle-level management and 384 were from lower-level employees. The sample for top-level management was forty (40) directors of all the departments in the county government. The sample size for middle-level management and lower-level employees was arrived at by the use of the Tara Yamane 1973 formula. The actual sample size for middle-level management and lower employees was seven hundred and six (706). Primary data was collected through structured questionnaires and interviews. Structured questionnaires were administered to middle-level management and lower cadre employees while interviews were conducted with top-level management. Quantitative data was analysed using statistical analysis with the aid of SPSS and presented using descriptive statistics, while qualitative data was analysed thematically using ATLAS.ti.

## Findings of the study

This section provides the findings on knowledge transfer and retention challenges in the Nairobi City County Government and the relationship between knowledge transfer and retention challenges and service delivery.

The research involved a total sample size of 746. The research response rate per category is shown in Table 1. The overall response rate from the interviews and questionnaires was 587 (78%). Of the 322 questionnaires administered to middle-level management, 263 (81.68%) were duly filled in and returned, while of 384 administered to junior-level employees, 300 (78.13%) were duly filled in and returned. Of the 40 interviews scheduled with the top-level management of Nairobi City County Government, only 24(60%) were actually conducted.

| Table 1: Response rate |             |                     |                   |
|------------------------|-------------|---------------------|-------------------|
| Category               | Sample size | Number of responses | Response rate (%) |
| Top level Management   | 40          | 24                  | 60                |

|                         |     |     |       |
|-------------------------|-----|-----|-------|
| Middle Level Management | 322 | 263 | 81.68 |
| Junior Employees        | 384 | 300 | 78.13 |
| Total                   | 746 | 587 | 78    |

### **Challenges of knowledge transfer and retention for service delivery**

The respondents were asked to indicate the major challenges they faced in transferring and retaining knowledge for service delivery in the Nairobi City County government. The codes that emerged from the questionnaires of the middle-level management and junior employees were: fear of job loss when knowledge is transferred, technophobia, especially for some who are unable to use social media and computers; inadequate funding; a lack of support from top management and performance contracting. The codes below show the challenges faced on knowledge transfer and retention for service delivery:

- Job loss: 316 times in 302 primary documents
- Performance: 31 times in 31 primary documents
- Technophobia: 487 times in 400 primary documents
- Inadequate funding: 410 times in 400 primary document
- Lack of support from top management: 141 times in 157 primary documents

From the findings, technophobia was the most highlighted challenge (487 times in 400 primary documents), then inadequate funding (410 times in 400 primary documents). The least-named challenge was performance (31 times in 31 primary documents). These responses are summarised in Figure 12. The figure shows the challenges of knowledge transfer and retention for service delivery by identifying 5 major codes and their respective relationships.

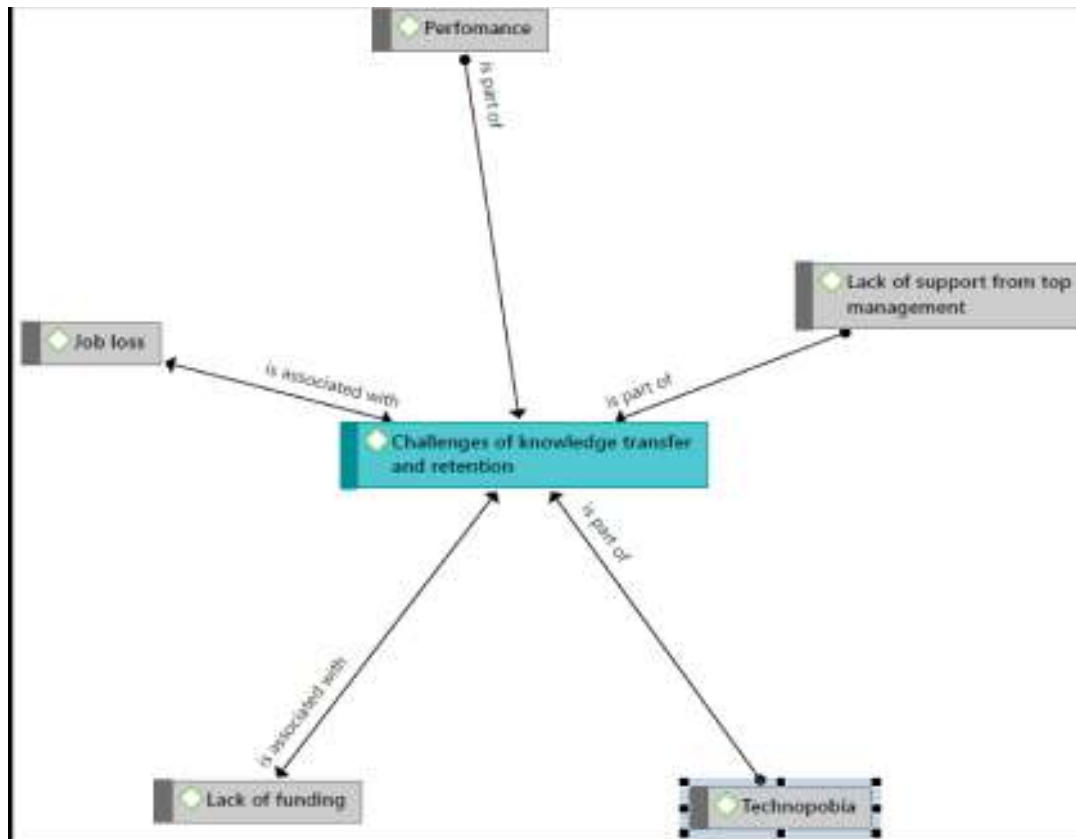


Figure 1: Challenges faced on knowledge transfer and retention for service delivery

### **Excerpts from interviews on challenges of knowledge transfer and retention for service delivery**

The majority of the top management, 18 (75%), stated that the challenges of knowledge transfer are mostly related to performance contracting, because some employees have a fear that knowledge that is shared will be used by the other person for a competitive advantage. Also, they indicated that this could be linked to the fear of job loss. They also indicated that there are inadequate funds to help in setting up infrastructure for knowledge retention. The minority, 6 (25%), indicated that their organisations catered for most of the items where staffs are now trained and do job rotation to assist in knowledge retention. They also indicated that there are policies being put in place to assist in knowledge retention, especially when the employees are retiring. The following are excerpts from the respondents on the challenges of knowledge transfer and retention at NCCG:

*The resistance by the staff when transferring knowledge may be attributed to the fear of job losses and the fear of monitoring staff performance.*

*When we introduced knowledge transfer and retention strategies at the inception, there was staff resistance to change. This could have been due to technophobia. The staff frequently forgot their passwords and there was fear of entering wrong data into systems and technology devices. This was due lack of sensitization.*

Lack of user needs assessment analysis to ascertain the users' requirements contributed negatively to knowledge retention here

## **Correlation analysis of challenges of knowledge transfer and retention on service delivery**

From the questionnaire the middle-level and lower-level employees were asked to rate the challenges of knowledge transfer and retention. A correlation analysis of the data was computed using SPSS version 25. The variables for challenges inherent in knowledge transfer and retention (knowledge hoarding, lack of trust, lack of motivation, inappropriate communication channels, fear of job loss, lack of knowledge on subject and technophobia) were computed and combined using the SPSS version 25 to form the independent variable. This was then subjected to a Pearson correlation analysis to show their relationship with service delivery. Table 2 shows the correlation analysis.

Table 2 indicates that accessibility, timeliness, quality, accountability, efficiency, and cost of service had a correlation coefficient of  $r = .647^*$ ,  $r = .776^{**}$ ,  $r = .678^{**}$ ,  $r = .605^{**}$ ,  $r = .576^{**}$ , and  $r = .251^*$  respectively. The significance level is also 0.000, 0.000, 0.000, 0.000, 0.000 and 0.009 respectively. Further interpretation of the findings is given in Table 3.

| Table 2: correlation analysis of challenges of knowledge transfer and retention on service delivery |                        |                   |                |         |                    |            |                                  |                                                              |
|-----------------------------------------------------------------------------------------------------|------------------------|-------------------|----------------|---------|--------------------|------------|----------------------------------|--------------------------------------------------------------|
|                                                                                                     |                        | Accessibilit<br>y | Timeline<br>ss | Quality | Accoun<br>tability | Efficiency | Cost<br>of<br>the<br>serv<br>ice | Challeng<br>es of knowled<br>ge transfer<br>and<br>retention |
| Accessib<br>ility                                                                                   | Pearson<br>Correlation | 1                 |                |         |                    |            |                                  |                                                              |
|                                                                                                     | Sig. (2-<br>tailed)    |                   |                |         |                    |            |                                  |                                                              |
|                                                                                                     | N                      | 536               |                |         |                    |            |                                  |                                                              |

|                                                                                                                               |                        |        |        |        |        |        |      |     |
|-------------------------------------------------------------------------------------------------------------------------------|------------------------|--------|--------|--------|--------|--------|------|-----|
| Timeline<br>ss                                                                                                                | Pearson<br>Correlation | .782** | 1      |        |        |        |      |     |
|                                                                                                                               | Sig. (2-<br>tailed)    | .000   |        |        |        |        |      |     |
|                                                                                                                               | N                      | 536    | 536    |        |        |        |      |     |
| Quality                                                                                                                       | Pearson<br>Correlation | .652** | .867** | 1      |        |        |      |     |
|                                                                                                                               | Sig. (2-<br>tailed)    | .000   | .000   |        |        |        |      |     |
|                                                                                                                               | N                      | 536    | 536    | 536    |        |        |      |     |
| Account<br>ability                                                                                                            | Pearson<br>Correlation | .826** | .802** | .945** | 1      |        |      |     |
|                                                                                                                               | Sig. (2-<br>tailed)    | .000   | .000   | .000   |        |        |      |     |
|                                                                                                                               | N                      | 536    | 536    | 536    | 536    |        |      |     |
| Efficienc<br>y                                                                                                                | Pearson<br>Correlation | .605** | .797** | .755** | .658** | 1      |      |     |
|                                                                                                                               | Sig. (2-<br>tailed)    | .000   | .000   | .000   | .000   |        |      |     |
|                                                                                                                               | N                      | 536    | 536    | 536    | 536    | 536    |      |     |
| Cost of<br>the<br>service                                                                                                     | Pearson<br>Correlation | .069   | .274   | .569** | .507** | .183   | 1    |     |
|                                                                                                                               | Sig. (2-<br>tailed)    | .547   | .162   | .002   | .002   | .367   |      |     |
|                                                                                                                               | N                      | 536    | 536    | 536    | 536    | 536    | 536  |     |
| Challeng<br>es of<br>knowled<br>ge<br>transfer<br>and<br>retention                                                            | Pearson<br>Correlation | .647** | .776** | .678** | .605** | .576** | .251 | 1   |
|                                                                                                                               | Sig. (2-<br>tailed)    | .000   | .000   | .000   | .000   | .000   | .009 |     |
|                                                                                                                               | N                      | 536    | 536    | 536    | 536    | 536    | 536  | 536 |
| ** . Correlation is significant at the 0.01 level (2-tailed).<br>* . Correlation is significant at the 0.05 level (2-tailed). |                        |        |        |        |        |        |      |     |

**Table 3: Interpretation of the correlation of challenges of knowledge transfer and retention on service delivery**

| Variable                                                                               | Correlation results     | Interpretation                                     |
|----------------------------------------------------------------------------------------|-------------------------|----------------------------------------------------|
| Relationship between accessibility and challenges of knowledge transfer and retention  | R = .647** , sig = .000 | Strong positive, strongly significant relationship |
| Relationship between timeliness and challenges of knowledge transfer and retention     | R = .776** , sig = .000 | Strong positive, strongly significant relationship |
| Relationship between quality and challenges of knowledge transfer and retention        | R = .678** , sig = .000 | Strong positive, strongly significant relationship |
| Relationship between accountability and challenges of knowledge transfer and retention | R = .605** , sig .000   | Strong positive, strongly significant relationship |

|                                                                                             |                                   |                                                      |
|---------------------------------------------------------------------------------------------|-----------------------------------|------------------------------------------------------|
| Relationship between efficiency and challenges of knowledge transfer and retention          | R = .576 <sup>**</sup> , sig .000 | Strong positive, strongly significant relationship   |
| Relationship between cost of the service and challenges of knowledge transfer and retention | R = .251, sig .009                | weak positive, and strongly significant relationship |

## Regression analysis for challenges of knowledge transfer and retention on service delivery

The authors used SPSS version 25 to code, enter and compute multiple regression so as to establish the causal effect of one variable on the other. R-square ( $R^2$ ) is a statistical term used to express how good one term is at predicting another. If  $R^2$  is 1.0 then given the value of one term, you can perfectly predict the value of another term. If  $R^2$  is 0.0, then knowing one term does not help to know the other term at all. More generally, a higher value of  $R^2$  means that you can better predict one term from another. The rule of thumb is that usually an  $R^2$  of more than 50% is considered as significant. The regression analysis for the challenges of knowledge transfer and retention on service delivery was 0.545, representing 54.5%. This implies that the independent variables had an influence on the dependent variables at NCCG. Table 4 shows the regression analysis results.

| Table 4: regression analysis of challenges of knowledge transfer and retention on service delivery |                   |          |                   |                            |      |
|----------------------------------------------------------------------------------------------------|-------------------|----------|-------------------|----------------------------|------|
| Model                                                                                              | R                 | R Square | Adjusted R Square | Std. Error of the Estimate | Sig. |
| 1                                                                                                  | .691 <sup>a</sup> | .545     | .5288             | .50834                     | .000 |
| a. Predictors: (Constant), challenges of knowledge transfer and retention                          |                   |          |                   |                            |      |

Table 4 indicates that challenges of knowledge transfer and retention greatly influence the service delivery offered by NCCG by 54.5%.

## Discussion of the findings

The objective of the study was to identify the challenges of knowledge transfer and retention and their effect on service delivery. The respondents were asked to indicate

the major challenges they faced in transferring and retaining knowledge for service delivery at Nairobi City County Government. The findings indicated:

### **Fear of job loss when knowledge is transferred or retained.**

Most of the respondents (316 times in 302 primary documents) identified the fear of job losses as one of the challenges affecting knowledge transfer and retention. The findings were further linked to a correlation with service efficiency, which gave a strong, positive relationship (.576). This shows that fear of job loss affects knowledge transfer and retention, which in the end affect the productivity of employees. This was in agreement with Weir and Hutchings (2005), who indicated that in most institutions, individuals fear losing their jobs. When fear is present, people do not contribute to transferring critical information and would be suspicious regarding their institutions' true intentions. A study by Usoro *et al.* (2007) examined the role of fear of job loss within virtual communities of practice and found that people who experience fear of losing their jobs in the context of knowledge transferral are afraid that the information they provide might be inaccurate or that their contribution might be unimportant. Studies have shown that trust plays a pivotal role in knowledge transfer. Trust among co-workers is an important cultural element for successful knowledge management (Issa & Haddad, 2008). Similarly, Snowden (2000) regards trust as a fundamental aspect of knowledge sharing and one of the most crucial requirements for knowledge transfer. This is also in agreement with the correlation of the findings with the quality of service at NCCG, which indicated a strong, positive and significant relationship (.678). The fear of job losses led to a lack of knowledge transfer and retention, which further affects the quality of service because employees are not willing to share what they know or to document it.

### **Technophobia**

Most of the respondents (487 times in the questionnaires) indicated that they were unable to use social media and information technology (IT) in their daily work. This shows that NCCG service delivery is affected by the challenges of knowledge transfer and retention. According to Zawawi *et al.* (2011), a lack of integration of IT systems/ processes; technical support; maintenance of integrated IT systems; people's reluctance to use IT systems and the lack of training are the main barriers in knowledge transfer. Organisations have been taking steps to combat the loss of

knowledge by investing in technologies that help facilitate knowledge transfer and retention, but not in NCCG. This was also evident from the correlation analysis which indicates a strong and positive relationship between challenges of knowledge transfer and retention and the accessibility of services (.647). The fear of technology makes employees experiencing a challenge in sharing knowledge, especially in this digital era. Also, it makes it hard for people to document their knowledge, hence accessibility is affected.

### **Performance contracting**

The respondents indicated that the performance contracting is used to measure their outcome (s31 times in 31 primary documents). This was also evident from the correlation that indicated a strong positive and strong relationship between the challenges and accountability of service (.605). The employees are accountable for any work they do, which is stipulated in their performance contract. This affects the knowledge transfer and retention because no one wants to share what they do in order to remain competitive. Liebowitz and Yan (2004) showed that it is more difficult to transfer knowledge in public sector organisations because most people believe that their knowledge would become obsolete once they transfer it. Others associate knowledge with power and their promotion opportunities, and as such they cannot share it.

### **Lack of support**

A striking finding was related to the lack of support (235 times in 243 primary documents), especially in terms of reward systems and infrastructure facilities. This was linked to the correlation between challenges and timelines of service which gave a positive and strong relationship (776). Asrar-ul-Haq and Anwar (2016) pertinently said that the presence of rewards and motivation facilitates knowledge sharing and transfer, while the absence of rewards and motivation hinders the sharing and transfer of knowledge. Thus, when individuals are not motivated to transfer knowledge and there is no reward for them, they tend to hide the knowledge they possess and do not reveal or share it with others.

The study established that the retention of highly skilled and experienced staff was not a priority in the NCCG as some were fired or resigned due to political difference. This means that critical knowledge seeped away from NCCG through resignations.



Brown and Duguid (2001) referred to this external unwanted movement of knowledge as knowledge leakage. This is in addition to knowledge that NCCG loses through retirements and death. Dewah (2012) noted that the performance gap left by experts compromises the quality of services in the organisations. Halawi, Aronson, and McCarthy (2005) extrapolate that when employees leave, municipalities lose valuable knowledge that needs to be managed, since it has been reported to be the most critical asset in an organisation.

The findings of this study suggest that there is a gap in knowledge transfer and retention in Nairobi City County Government. Nevertheless, there is a positive relationship between service delivery variables and challenges of knowledge transfer and retention.

## Conclusions

From the findings of the study the authors conclude that NCCG faces challenges in terms of knowledge transfer and retention for service delivery. The challenges include: a fear of job loss when knowledge is transferred, technophobia, especially for some who are unable to use social media, a lack of funding, lack of support, fear of job loss and performance contracting. These challenges greatly affect service delivery with a correlation of positive and significant relationships in all the variables of service delivery (accessibility,  $r = .647^*$ , timelines,  $r = .776^{**}$ , quality,  $r = .678^{**}$ , accountability,  $r = .605^{**}$ , efficiency,  $r = .576^{**}$ , and cost of service  $r = .251^*$ ). This means all the variables used to measure service delivery demonstrated a positive correlation. This indicates that knowledge transfer and retention challenges greatly, negatively affect service delivery.

The authors recommend the following to address the challenges of knowledge transfer and retention at NCCG.

- **Training.** The staff indicated that some of them were technophobic. One of the ways to deal with this is to train them in information communication and technology to build their confidence. They will know that through technology, it is easier to share knowledge and protect their privacy. ICT plays a major role in ensuring that knowledge sharing works. The absence of a good system could hinder and demotivate eager knowledge champions.

- Build knowledge transfer into the organisation's DNA. Some managers have integrated knowledge transfer into the fabric of the organisation through processes that explicitly require giving clear attention to sharing expertise. This is done so that each employee knows that even if they share knowledge their performance will not dwindle but be better because of the sharing of best practices and failure stories.
- **Having organisational rewards.** Rewards encourage the staff to share knowledge and there is not a doubt that reward could be an initiating factor to more knowledge sharing and knowledge implementation.

Due to limited time, only one county government was used in this study .Since the study was undertaken in Nairobi City, further studies of this nature could be conducted in the forty six remaining counties. These could be used to develop a roadmap of how to tackle knowledge transfer and retention challenges. It can be stated that this study has unearthed useful evidence to assist the county government in its knowledge transfers, retention and service delivery endeavours.

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# **Knowledge management in SMEs in the context of the Fourth Industrial Revolution**

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## **Abstract**

*Prior to the Fourth Industrial Revolution (4IR), products determined demand, leading to mass production by large-sized enterprises. It is however proposed that after the 4IR, production and consumption will become customised because it is demand that will create products, and this will be led by innovative start-ups and small and medium enterprises (SMEs). SMEs are attested to be the main drivers of export, economic growth and employment. It is theorised that the ability to gather, combine and use the knowledge embedded in people and technologies to create a range of unique products will become an increasingly important competitive advantage that SMEs can exploit in the wake of the 4IR. Also revealed is the fact that the fourth industrial revolution will primarily affect customer expectations, product enhancement, collaborative innovation, and organisational forms; all of which are traditionally enabled and supported by knowledge management. Consequent upon the highly probable intense impact of the 4IR on organisations, this paper has reviewed the literature on how knowledge management can be practised by SMEs. Owing to the industrial nature of the subject and object of focus, the paper adopted an integrative review of both industry-based and academic articles. Hence, a manual search of both purposively selected industry-based articles and academic reviews were carried out on various websites and databases, with the emphasis on the terms: knowledge management, SMEs and 4IR or Fourth Industrial Revolution. The study randomly reviewed 17 industry-based and 10 academic articles, bringing the total number of reviewed articles to 27. The study revealed that SMEs are faced with challenges, but*

*can leap into the 4IR through highlighted knowledge management strategies, grouped under people, processes and technology. The study also proposed a framework to this effect.*

**Keywords:** Knowledge, knowledge management, SMEs, 4th industrial revolution.

## **Introduction**

The emergence of the fourth industrial revolution (4IR), an era of comprehensive networking and computerisation of all areas of production, is changing the methods of acquiring, processing, storing, retrieving and using knowledge. It is an era of a paradigm shift marking the transition of work from a real physical world to a virtual world. This enables companies, not only to organise their production processes more efficiently, but also, for example, to manufacture customised products within the framework of, and at the same cost as, automated manufacturing. From the foregoing, it is apparent that work processes and the approach to knowledge management will change, and entirely new business models will emerge. While there are great expectations of the possibilities that will arise from the 4<sup>th</sup> industrial era, especially in the initial phase of socio-technical change, there is, however, a high level of uncertainty about the social consequences of these new technologies (Wilkesmann and Wilkesmann, 2018:239), particularly for SMEs (OECD, 2018). SMEs contribute to more than one third of GDP in emerging and developing economies and account for 34% and 52% of formal employment respectively (OECD, 2018: 5). In the last decade, employment in SMEs has steadily increased at the global level. Over 2003-16, across 132 countries, the number of total full-time employees in SMEs has nearly doubled, from 79 million to 156 million (International Labour Organisation (ILO), 2017:17). This is a pointer to the huge contribution of SMEs to job creation, making it essential that SMEs are intensively nurtured to operate effectively in the 4IR. However, research projects on how SMEs can explore knowledge management to implement in the 4IR era are limited.

The purpose of this study is to identify, compile, and develop a framework from reviewed knowledge management activities that SMEs can prioritise for optimum performance and competitive advantage in the 4IR era. To achieve this, the study answered the following questions: What is the relationship between 4IR, work

processes and knowledge? What factors can SMEs leverage on in the 4IR? What are the challenges SMEs face that can impede their integration into the 4IR? What knowledge management strategies can SMEs adopt to ease their integration into the 4IR? What knowledge management enabling framework can be proposed to sustain SMEs in the 4IR?

### **Fourth Industrial Revolution (4IR), work processes and knowledge**

It has been suggested that the 4IR will probably eliminate most human jobs (Frey and Osborne 2017:268), but the question is: if the knowledge that generates innovation, the attendant competitive edge and improved performance is tacit in nature (Pereira, Ferreira and Alves, 2012: 175; Williams, 2011:52), do robots and robotics possess the knowledge that will render humans dispensable in organisations? This author, going by the attested submission that tacit knowledge is human embedded, argues that the 4IR is still dependent on tacit knowledge. Frey and Osborne (2017: 268) depict a scenario in which a large percentage of human work will be substituted by machines. They report that as at 2016, up to 47 per cent of workers in the United States are in occupations that will likely have some individual activities automated over the next 10 to 20 years. Bonin *et al.* (cited in Schroeder, 2016a:13) corroborating this, report that 42% of such jobs, in the German context, and 12 per cent of all jobs, are subject to a high probability of automation. Contrary to these findings, and in support of the position of this author, Schröder (2016a:14) reports that the 4IR can unfold its potential only by means of the practical knowledge, expertise and compliance of employees. The author further notes that employees' qualifications and experience have to be deployed in the 4IR for continuous improvements.

According to Schröder (2016:13), workers' practical knowledge that cannot be coded cannot be replaced by smart technologies. Schröder's standpoint was in line with that of Wilkesmann and Wilkesmann (2018: 250), who in their study assert that even if digital systems follow the idea of swarm intelligence, as shown in the case of intelligent automation, the application itself temporarily remains at the stage of reproducing and automating routine work, and is not able to create innovations itself. Fraunhofer and Ingenics (cited in Bonekamp and Sure, 2015: 35) submit that the intelligence of technological systems is still mapped out by human beings and will not replace the ability of human beings to react flexibly and creatively to unforeseen

events, and that the practical knowledge or know-how of production workers and their reflective and adaptive capacities, paired with machine precision and speed, will make the 4IR effective. As such, technologies can only take over repetitive work, activities that are controlled, and clearly defined and stable as a process (Fraunhofer in Schroeder 2016a:14). Summarily, Visser (in Koigi, 2018, para. 10) concludes that “... one thing robots cannot be, is human.” The above discussion suggests that the work processes in the 4IR are highly dependent on knowledge, especially the knowledge possessed by employees.

### **Success factors for SMEs in the 4IR**

The above arguments present a standpoint that SMEs can leverage on; that is, the experiential, or tacit knowledge of its employees. Before the 4<sup>th</sup> industrial revolution, it is the products that determine demand, leading to mass production by large-sized enterprises. It is, however, proposed that in the 4IR, production and consumption will become customised because it is demand that will create products, and this will be led by innovative start-ups and small and medium enterprises (SMEs). Schiuma, Durst and Wilhelm (2012:638) explain that SMEs need to explore KM, particularly the management of knowledge embedded in employees, and more so in the era of the fourth industrial revolution. From the foregoing, it is safe to conclude that the ability to gather, combine and use the knowledge embedded in people and technologies, to create a range of unique products, will become an increasingly important competitive advantage that SMEs can leverage on in the wake of the 4IR. Also revealed is the fact that the fourth industrial revolution will primarily affect customer expectations, product enhancement, collaborative innovation, and organisational forms, all of which are traditionally enabled and supported by knowledge management.

Kaeser (cited in Phillips 2019:para. 8) explains that the 4IR is dependent on knowledge, and according to the World Economic Forum (2017:n.p.), the fourth industrial revolution will affect new business models and different skills and talents, all of which are enabled and supported by knowledge management. The forum highlighted some of the most prevalent aspects that knowledge management will need to support in the 4IR, such as: identifying and leveraging the skills and competencies that robots cannot “learn”; identifying and “contracting” sources of knowledge or crowd resourcing; localising global knowledge; smart organisations and



continuous access to knowledge and creating employee-centric hubs; sourcing of relevant data and ensuring that data are clean prior to analysis; ascertaining the relevance and the value of capturing and sharing experience; social innovation and the sustainability of knowledge; social networks and empowering the global employee; ensuring that devices are connected to the Internet of Things and that knowledge can be created from the connectedness of devices; and ensuring the safety and privacy of employees.

Desouza and Awazu (2006:32) note that SMEs, in particular, need KM, and can compete on their know-how, which requires that they use knowledge, more than traditional resources, to their advantage. The authors suggest that while most SMEs do not have the financial means to spend on resources, such as land, labour, and capital, they can, however, do more with less, by leveraging on knowledge, which has been identified above to be critical to work processes in the 4IR.

### **Knowledge management challenges of SMEs in the 4IR**

This study defines knowledge management as a system of *processes, people, and technology* working together to increase the performance of organisations through learning (Seleim and Khalil 2011:588). In other words, knowledge management can be said to be a dynamic connection of structural and capital factors, organisational learning, innovation, skills, competencies, expertise and capabilities. Liebowitz (2016: 1) adds that knowledge management is 80% people and processes and 20% enabling technology. From the discussions above, it is evident that the dimension of knowledge management will change radically in the 4IR, and this poses a challenge to corporate organisations, particularly small and medium scale enterprises.

Schroeder (2016a: 5) and Schiuma, Durst and Wilhelm (2012:638) observe that KM strategy in most SMEs is not comprehensive enough. Hylton (cited in Ho, 2012: 2) notes that SMEs are as much in need of knowledge management as large enterprises. The author suggests that the world is changing rapidly, resulting in the proliferation of competitors for profit, which in turn puts enormous pressure on companies, either large or small, to innovate and develop products rapidly. It was further highlighted that innovation and rapid development require fast-tracked use of knowledge, which must be managed efficiently, effectively and securely. Today, we live in a knowledge-driven global economy, where knowledge is a commodity that

provides sustainable competitive advantage. This requires that SMEs need to know their knowledge assets and how to manage and make use of them to get maximum returns (Lee *et al.* 2005: 3 - 4).

In a German study, Schroeder (2016a: 11 - 12) reports that four out of ten SMEs do not have a comprehensive 4IR strategy, compared with two out of ten large companies; and as decried by OECD (cited in Cusmano, Koreen, and Pissareva, 2018: 5), "... SMEs are lagging behind in the digital transition". The organisation further reports that a large number of SMEs have not been able to reap the benefits of the technological transition due to: limited adoption of digital technologies; a lack of investment in complementary knowledge-based assets, such as R&D, inadequate or unskilled human resources, organisational changes, process innovation and lack of cloud computing, which is the renting of computer power from an external provider so that smaller firms can use Big Data, without the barriers associated with the high fixed costs of ICT investment. The OECD Going Digital project alerts that the lag has implications for SMEs' capacity to turn technological change into innovation and productivity growth (OECD 2017b: 15). It is also suggested that SMEs in developing countries need to take optimal advantage of the 4IR, in spite of the lack of finance, lack of skilled employees, limited technological resources and key employees leaving the organisation (Seseni and Mbohwa 2019:3014). Schroeder (2016b:11) suggests that, since there is great innovation potential for SMEs, their framework conditions need to be promoted, so that they can compete in the era of comprehensive networking that the 4IR is. From the foregoing, it is safe to conclude that while SMEs currently have challenges that can impede their full integration into the 4IR platform, they can harness knowledge management activities in order to leapfrog into the 4IR. The data gathered from the review are as presented in the methodology section.

Consequent upon the highly probable intense impact of the 4IR on organisations, it is critical to consider how knowledge management is practised by SMEs, in the context of the 4IR. For instance, given that knowledge management can be described as the deliberate and systematic coordination of an organisation's people, technology, processes, and organisational structure, in order to add value through reuse and innovation, what happens to knowledge management in SMEs in a world where employees are to be replaced by robots? How will SMEs manage knowledge in an

era where tacit knowledge appears less valuable since decisions will be made rationally and scientifically?

## Methodology

The interrelationship between the subject (KM in the 4IR) and the object of interest (SMEs) in the present study have not been sufficiently explored, as revealed by online search attempts using the keywords in online databases such as Scopus and Taylors and Francis. The author explored Google search engine, and discovered that there were available industry-based articles written by SME practitioners, that could provide some insights into the required knowledge management strategies that can assist SMEs in the 4IR. Hence, this review adopted an integrative review of literature comprising both practitioner and academic articles. The integrative review method allows for the incorporation of diverse methodologies that capture the context, processes and subjective elements of a research topic. According to Whittemore and Knafl (2005:552), integrative reviews can include non-experimental research; such as case studies, observational studies, and meta-analyses, but may also include *practice applications, theories, and guidelines*. Russell (2005: 4) reports that in an integrative review, the accessible population is all published reports related to the topic of interest; hence, the data collection involves a systematic search of all the reports that are relevant to the topic. Therefore, the target population can be said to be all the relevant studies that pertain to the topic. This implies that this study set out with no targeted population or sample. Rather, the content analysis of eligible articles was carried out to identify and extract relevant themes that pertain to knowledge management.

These terms included knowledge management, SMEs AND 4IR OR fourth industrial revolution, and must feature distinctly in the title, keywords and abstracts; as the case may be.

A manual search of both purposively selected industry-based articles from various websites, and academic reviews, using Google Scholar, was carried out with emphasis on the search terms defined above. For the extraction of themes, knowledge management is conceptualised as a system of *processes, people, and technology*; hence themes relating to people, processes and technology were picked.

The study randomly reviewed 17 eligible industry-based and 10 academic articles, bringing the total number of reviewed articles to 27. The extracted data was analysed using narratives, tables and charts.

The data extracted from each article were:

- The author(s)
- Study location
- Sector of SMEs
- Themes for knowledge management strategies

## **Findings and discussion**

This section presents the summary of findings from the reviewed existing literature and the extracted themes.

What is the relationship between 4IR, work processes and knowledge?

The review revealed that the 4IR, though highly technology-based, is dependent on knowledge, particularly tacit knowledge, which induces innovation, and is not possessed by robots. Literature also indicated that with the combination of people, technology and work processes, organisational participation in the 4IR will be boosted. In other words, while the 4IR will change the way work processes are done, knowledge remains a central factor that SMEs can leverage on, using people and technologies, to perform optimally (Kaeser cited in Phillips 2019:para. 8; World Economic Forum, 2017: n.p; Fraunhofer and Ingenics cited in Bonekamp and Sure, 2015: 35).

What are the challenges SMEs face that can impede their integration into the 4IR?

From the review, the following, among others, are identified as challenges that can prevent SMEs' integration into the 4IR.

- Lack of comprehensive KM strategy
- Lack of comprehensive 4IR strategy
- Limited adoption of digital technologies
- Lack of investment in complementary knowledge-based assets
- Inadequate or unskilled human resources
- Lack of process innovation
- Lack of cloud computing
- Lack of finance
- Limited technological resources
- High employee turnover

Source: (Schroeder 2016a:5; Schiuma, Durst and Wilhelm 2012:638; Schroeder, 2016a: 11 – 12; Seseni and Mbohwa 2019:3014).

The findings in the following section apparently corroborate the fact that these are challenges that can hinder the progress into 4IR integration.

What knowledge management strategies can SMEs adopt to ease their integration into the 4IR?

This section presents the thirteen overarching themes that were extracted from the 27 articles reviewed and that illustrated some demographic details such as the geographical and sectoral distribution of the study. The tabulated and charted results are: the summary of data extraction; generation of overarching themes on KM strategies, which was done using the frequency counts of extracted themes; description of emerging themes on KM strategies; sectoral distribution of SMEs; geographical distribution of SMEs; and the themes for KM strategies and enabling frameworks. The analyses of the extracted data are presented using Tables 1-6. The summary of the extracted overarching themes is presented in Table 1.

Table 1: The summary of data extraction

| S/No. | Source                                                 | Adoption of ICTs/ knowledge-based learning | Automation | Collaboration/co-aggregating/CoP | Information/knowledge gathering and sharing/Research | Digitisation | Networking and connectivity | Cloud computing | Innovation | Hiring/Motivation of digitally skilled workforce | Flexible Organisational Structure | Training and re-skilling | Reassessment of business models | Optimisation |
|-------|--------------------------------------------------------|--------------------------------------------|------------|----------------------------------|------------------------------------------------------|--------------|-----------------------------|-----------------|------------|--------------------------------------------------|-----------------------------------|--------------------------|---------------------------------|--------------|
| 1     | Chan (2019)                                            |                                            |            | x                                |                                                      |              |                             |                 | x          |                                                  |                                   |                          |                                 |              |
| 2     | Zambon, Egidi, Rinaldi and Cividino (2019, p. 1)       |                                            | x          |                                  |                                                      | x            | x                           |                 | x          |                                                  |                                   |                          |                                 |              |
| 3     | Safar, Sopko, Bednar and Poklemba (2018, p. 634)       |                                            | x          |                                  |                                                      | x            |                             | x               |            |                                                  |                                   |                          |                                 |              |
| 4     | Digital Technology Council of Australia (DTCOA) (2018) |                                            |            |                                  | x                                                    | x            | x                           |                 | x          |                                                  |                                   |                          |                                 | x            |
| 5     | Futcher (2018, p. 69)                                  |                                            |            | x                                | x                                                    | x            |                             | x               |            |                                                  |                                   |                          | x                               |              |
| 6     | Yu (2018)                                              |                                            |            |                                  |                                                      |              |                             | x               |            |                                                  |                                   |                          |                                 |              |
| 7     | Koigi (2018)                                           |                                            |            |                                  |                                                      |              | x                           |                 |            |                                                  |                                   |                          |                                 |              |
| 8     | Ethozgroup (2018)                                      |                                            |            |                                  |                                                      | x            |                             |                 |            |                                                  |                                   |                          |                                 |              |
| 9     | Halse and Ullern (2017)                                |                                            |            |                                  | x                                                    |              |                             |                 |            |                                                  |                                   |                          |                                 |              |
| 10    | Wilkesmann and Wilkesmann (2018, p. 243)               |                                            |            | x                                |                                                      |              |                             |                 |            |                                                  |                                   |                          |                                 |              |
| 11    | Trento, Bannò and D'Allura (2018, p. 155)              |                                            |            |                                  |                                                      |              |                             |                 | x          |                                                  |                                   |                          |                                 |              |
| 12    | von Reiche (2019)                                      |                                            |            |                                  |                                                      |              |                             |                 | x          |                                                  |                                   |                          |                                 |              |
| 13    | Umrani and Johl (2018, p. 4)                           |                                            |            |                                  |                                                      |              |                             |                 | x          |                                                  |                                   |                          |                                 |              |
| 14    | Dassisti et. al (2017, p. 53)                          |                                            |            |                                  | x                                                    |              |                             |                 |            |                                                  |                                   |                          |                                 |              |
| 15    | OECD (2017a)                                           | x                                          | x          |                                  |                                                      | x            |                             |                 |            |                                                  |                                   | x                        |                                 |              |
| 16    | Kleindienst and Ramsauer (2016, p. 114)                | x                                          | x          |                                  |                                                      | x            |                             |                 |            | x                                                |                                   |                          | x                               |              |
| 17    | Orizi (2018)                                           |                                            |            |                                  | x                                                    |              |                             |                 | x          |                                                  |                                   |                          |                                 |              |

| S/No. | Source                         | Adoption of ICTs/ knowledge-based learning | Automation | Collaboration/co-aggregating/CoP | Information/knowledge gathering and sharing/Research | Digitisation | Networking and connectivity | Cloud computing | Innovation | Hiring/Motivation of digitally skilled workforce | Flexible Organisational Structure | Training and re-skilling | Reassessment of business models | Optimisation |
|-------|--------------------------------|--------------------------------------------|------------|----------------------------------|------------------------------------------------------|--------------|-----------------------------|-----------------|------------|--------------------------------------------------|-----------------------------------|--------------------------|---------------------------------|--------------|
| 18    | Schroeder (2016a)              |                                            |            |                                  |                                                      |              |                             |                 |            | x                                                | x                                 |                          | x                               |              |
| 19    | SME Magazine Asia (2019)       |                                            | x          |                                  |                                                      | x            |                             |                 |            |                                                  |                                   |                          |                                 |              |
| 20    | Hashim (2017, pp 33-34)        | x                                          | x          |                                  |                                                      |              |                             |                 | x          |                                                  |                                   | x                        |                                 |              |
| 21    | North Sea Region (2018, p. 14) |                                            |            | x                                | x                                                    | x            | x                           |                 |            | x                                                |                                   |                          | x                               |              |
| 22    | <i>Phillips (2019)</i>         |                                            |            |                                  | x                                                    |              |                             |                 | x          |                                                  |                                   |                          |                                 |              |
| 23    | College (2018)                 |                                            |            | x                                | x                                                    |              |                             |                 | x          |                                                  | x                                 |                          |                                 | x            |
| 24    | Teggroup (2018)                | x                                          |            |                                  |                                                      |              |                             | x               |            |                                                  |                                   |                          |                                 |              |
| 25    | Bizhub (2017)                  |                                            |            |                                  |                                                      |              | x                           |                 |            |                                                  |                                   |                          |                                 |              |
| 26    | Bolick (2019)                  |                                            |            | x                                |                                                      |              |                             |                 | x          |                                                  | x                                 |                          |                                 |              |
| 27    | Thaw (2018)                    |                                            |            | x                                |                                                      |              |                             |                 | x          |                                                  |                                   |                          |                                 |              |
|       | <b>Total</b>                   | <b>4</b>                                   | <b>6</b>   | <b>7</b>                         | <b>8</b>                                             | <b>9</b>     | <b>5</b>                    | <b>4</b>        | <b>8</b>   | <b>4</b>                                         | <b>3</b>                          | <b>2</b>                 | <b>3</b>                        | <b>2</b>     |

The study extracted 13 overarching themes from the review. Table 2 presents the frequency count of each overarching theme.

**Table 2: Extracted overarching themes on KM strategies**

| S/N | Overarching theme                           | Frequency count |
|-----|---------------------------------------------|-----------------|
| 1   | Digitisation                                | 9               |
| 2   | Information/knowledge gathering and sharing | 8               |
| 3   | Innovation                                  | 8               |
| 4   | Collaboration/co-aggregating/CoP            | 7               |
| 5   | Automation                                  | 6               |
| 6   | Networking and connectivity                 | 5               |
| 7   | Adoption of ICT                             | 4               |
| 8   | Cloud computing                             | 4               |
| 9   | Hiring of digitally skilled workforce       | 4               |

The study extracted 13 overarching themes from the review. Table 2 presents the frequency count of each overarching theme.

The overarching themes in Table 2 support the fact that adopting these strategies can help SMEs to overcome some of the identified challenges. The selected overarching themes are hereby discussed in alphabetical order (Table 3), as knowledge

management activities that SMEs can include in their operations to enhance their integration into the 4IR.

| Table 3: Description of overarching themes as KM strategies |                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------------------------------------|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| S/N                                                         | Overarching theme                | Description as KM strategies                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 1                                                           | Adoption of ICT                  | ICTs are essential to facilitate business processes for SMEs, as they enable improved external communication and quality of services through the use of Internet-based technologies (computers, Internet, websites, mobile phones, other wireless communications devices and computer networks). ICTs provide the channels for acquiring, storing, sharing, collaborating, categorising, dissemination and reuse of knowledge in faster and more convenient ways, both within and between organisations (Omona, van der Weide and Lubega 2010: 91). SMEs need to buy into the adoption of SMEs to survive in the 4IR                                                                                                                                                                                                                                                                           |
| 2                                                           | Automation                       | The concept of automation, a prominent feature in the smart industry, is described by Groover in Schumacher, Sihn and Erol (2016:3) as “the technology by which a process or procedure is accomplished without human assistance”. Fernández-Macías (2018: 14) understands automation to mean the replacement of (human) labour input by (digitally-enabled) machine input for some types of tasks within production and distribution processes. The process of automation serves to make physical objects and information available at the right time, at the right place and in the right quantity. SMEs need to buy into this for effective knowledge management in the 4IR.                                                                                                                                                                                                                 |
| 3                                                           | Cloud computing                  | Cloud describes the use of a collection of services, applications, information, and infrastructure, which comprises pools of computation, network, information, and storage resources (Dave, Dave and Shishodia 2013:619). The advent of cloud computing has opened numerous avenues that are not fully harnessed in the management of knowledge. Cloud computing involves the development of many existing technologies and approaches to computing into something different. Cloud separates application and information resources from the underlying infrastructure, and the mechanisms used to deliver them. It enhances collaboration, agility, scaling, and availability, and potentially reduces cost through optimised and efficient computing. Safar <i>et al.</i> (2018:626) emphasise software and cloud solutions as new technology that determines future business environments. |
| 4                                                           | Collaboration/co-aggregating/CoP | This includes collaboration of all organisational components, such as smart technologies (smart mobility, logistics, buildings, products and grids), and not just humans as we have in communities of practice (Figurska and Sokół 2014: 237).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |



|   |                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5 | Digitisation                          | <p>According to Fernández-Macías (2018: 14), digitisation refers to the use of sensors and rendering of devices to translate parts of the physical production process into digital information (and vice versa) to enhance the process, storage and communication of digital information. By digitising a process, one can understand, control and manipulate it much better. It is important to point out here that the concepts of digitisation and automation are two distinct, but merging concepts (Schumacher, Sihn and Erol 2016: 5). It becomes clear that one cannot exist without the other, as any kind of automation nowadays requires digital elements to work without human interference (Fernández-Macías 2018:14) and any kind of digitisation requires elements to automatically handle and display information (Schumacher, Sihn and Erol 2016:5). Digitisation enables dematerialisation of information; limitless transfer of information between two points; transfer of information through copying; nearly no costs for reproduction of information; simultaneous utilisation of same information; convergence of transfer media for information; universality of information through conversion; additional control of information; enabling of data manipulation; existence of different levels of data; classification and indexation of information; higher degree of interaction between user and information.</p> |
| 6 | Flexible organisational structure     | <p>It is suggested that organisational structures should be designed for flexibility (as opposed to rigidity) so that knowledge sharing and collaboration across boundaries are encouraged in organisations and across their supply chain. Gold, Malhotra and Segars (2001: 188 - 189) opine that it is the combination of the KM structural dimensions of organisational structure and incentive systems that make up an organisation's overall knowledge management structure. According to the authors, the formal organisational structures can promote or obstruct relationships among employees in an organisation. They recommend that organisational structures must be flexible to inspire sharing and collaboration across boundaries and give the firm the flexibility to adapt to the ever-changing environment</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 7 | Hiring of digitally skilled workforce | <p>According to Ciobanasu (2013: 50), KM is based on three important pillars: knowledge workers – individuals with thinking, learning and acting capabilities; processes, which follow an innovative approach for optimal performance of certain tasks or functions and products. systems. There needs to be a connection between people, processes, culture and technology. The balance leads to collaboration and teamwork. It is therefore essential that SMEs invest in the recruitment of a skilled workforce.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

|    |                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8  | Information/<br>knowledge<br>gathering and<br>sharing | The exchange of information among organisational employees is a vital component of the knowledge-management process (Cabrera and Cabrera 2002: 687). Knowledge sharing has been identified as a major focus area for knowledge management. Information/knowledge gathering and sharing connect level of the individual knowledge workers in whom knowledge resides, and the level of the organisation, where knowledge gets its economic and competitive value (Hendriks 1999: 91).                                                                                                                                                                                                                                                                                                                                                                                                   |
| 9  | Innovation                                            | Innovation is a knowledge-intensive process that has a definite knowledge culture and relevant requirements for knowledge management support (Paukert, Niederée, and Hemmje, 2004:1). An increasing amount of research on innovation and strategic management puts knowledge in the center of interest; and knowledge is discussed as the element of a recombination process to generate innovation, which helps to maintain a competitive position (Mardani <i>et al.</i> , 2018: 13 & 50 - 51).                                                                                                                                                                                                                                                                                                                                                                                     |
| 10 | Networking and<br>connectivity                        | Networking and connectivity builds a virtual community for the sharing of knowledge (Camison 2008). The developed pool of collective knowledge exceeds individual knowledge and is fully accessible by all members. Information technology (IT) breakthrough in information processing and connectivity boost knowledge management tremendously and connectivity enables the exploitation of the knowledge potential of disconnected organisations (Davenport and Prusak, 1998).                                                                                                                                                                                                                                                                                                                                                                                                      |
| 11 | Optimisation                                          | Process optimisation can be defined as reaching an optimal form of a process, that is the best possible in given circumstances. It has to do with the process logic (what is done and why) and the individual tasks and their effectiveness (how it is done). It enables companies to increase the effectiveness of their functioning and to flexibly match the changing business environment. Process optimisation makes it possible for organisations to increase their ability to achieve their goals. As suggested by Figurska and Sokóâ (2014: 238), if a company is able to achieve its goals better and quicker than competitors, its competitiveness increases. They note that the optimisation of organisational processes supports the development of organisations and their employees, as both can function as a better integrated system (Figurska and Sokóâ 2014: 245). |

|    |                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 12 | Reassessment of business models | The World Economic Forum (2019, para. 6) reports that fewer than 10% of companies' business models are economically viable in order to compete effectively in a hyper-connected world; implying the 4IR, in terms of customer value, revenue growth rates and market valuation. The forum suggests that the most successful business model today is the digital platform business model, which is predicted to mediate up to 30% of global economic activity by the year 2030. Corroborating this assertion, Kim (2016:22) reveals that platform business models are efficient and innovative. A platform is a business model that creates value by facilitating exchanges between two or more interdependent groups, usually consumers and producers. In order to make these exchanges happen, platforms harness and create large, scalable networks of users and resources that can be accessed on demand. Safar <i>et al.</i> (2018: 626) notes that SMEs presently have the challenge of implementing new technologies, and in modifying and adapting their business models. Hence, some business models have been proposed for the 4IR environment, which can also be explored by SMEs (Glova, Sabol and Vajda, 2014:1125). These include value and process/structural models. |
| 13 | Training and re-skilling        | In a survey performed on a group of 909 employees working in the creative sector of SMEs, in 2013, the development of employee competence was reported to determine the successful development of the growth and innovation of companies (Figurska and Sokół 2014: 243).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

All the above strategies are opined to be supportive of knowledge management in the era of the fourth industrial revolution, and as reported by the sources cited in the discussion, they can also induce optimum performance and competitiveness for SMEs. The study reviewed literature on SMEs from different sectors as presented in Table 4.

| Table 4: Sectorial distribution of SMEs |                 |        |      |                                                                                      |
|-----------------------------------------|-----------------|--------|------|--------------------------------------------------------------------------------------|
| S/N                                     | SME Sector      | Number | %    | Source                                                                               |
| 1                                       | ICT Sector      | 2      | 7.4  | Chan (2019); Thaw( 2018)                                                             |
| 2                                       | Industrial SMEs | 2      | 7.4  | Zambon, Egidi, Rinaldi and Cividino (2019); Safar, Sopko, Bednar and Poklembe (2018) |
| 3                                       | Manufacturing   | 5      | 18.5 | DTCOA (2018); Futchter (2018); Yu (2018); Koigi (2018); Ethozgroup (2018)            |

|   |         |    |      |                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---|---------|----|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4 | Generic | 18 | 66.7 | Halse and Ullern (2017); Wilkesmann and Wilkesmann (2018); Trento, Bannò, and D'Allura (2018); von Reiche (2019); Umrani, and Johl (2018); Dassisti et al. (2017); OECD (2017a); Kleindienst and Ramsauer (2016); Orizi (2018); Schroeder (2016a); SME Magazine Asia (2019); Hashim (2016); Northsea region (2018); <i>Phillips (2019)</i> ; College (2018); Teggroup (2018); Bizhub (2017) Vietnam Investment review (2017); Bolick (2019) |
|   | Total   | 27 | 100  |                                                                                                                                                                                                                                                                                                                                                                                                                                             |

The study reviewed literature on knowledge management strategies applicable to both SMEs in different sectors (66.7%) and specific in ICT, manufacturing and Industrial sectors. It can be implied that the findings from this study can be applied by all SMEs, irrespective of the sector. The geographical location of the source of the review on knowledge management in SMEs is illustrated in Table 5.

| Table 5: Geographical distribution of SMES |                                           |     |      |  |                                                                                                                                    |
|--------------------------------------------|-------------------------------------------|-----|------|--|------------------------------------------------------------------------------------------------------------------------------------|
| S/N                                        | Location                                  | No. | %    |  | Sources                                                                                                                            |
| 1                                          | AFRICA<br>(South Africa)                  | 4   | 14.8 |  | Futcher (2018); Koigi (2018); Phillips (2019); College (2018)                                                                      |
| 2                                          | ASIA<br>(Malaysia, Vietnam and Singapore) | 6   | 22.2 |  | SME Magazine Asia (2019); Hashim (2016); Bizhub (2017) Vietnam Investment review (2017); Chan (2019); Yu (2018); Ethozgroup (2018) |
| 3                                          | OCEANIA<br>Australia                      | 1   | 3.7  |  | DTCOA (2018)                                                                                                                       |

|   |                                                    |   |      |                                                                                                                          |  |
|---|----------------------------------------------------|---|------|--------------------------------------------------------------------------------------------------------------------------|--|
| 4 | EUROPE<br>(Germany,<br>Northsea<br>Area and<br>UK) | 4 | 14.8 | Orizi<br>(2018);<br>Schroe<br>der<br>(2016a<br>);<br>Norths<br>ea<br>region<br>(2018)<br><br>;<br>Teqgro<br>up<br>(2018) |  |
|---|----------------------------------------------------|---|------|--------------------------------------------------------------------------------------------------------------------------|--|

|   |              |    |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |
|---|--------------|----|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| 5 | Non-specific | 12 | 44.4 | <p>Zambo<br/>n,<br/>Egidi,<br/>Rinaldi<br/>and<br/>Cividin<br/>o<br/>(2019);<br/>Safar,<br/>Sopko,<br/>Bednar<br/>and<br/>Poklem<br/>ba<br/>(2018);<br/>Halse<br/>and<br/>Ullern<br/>(2017);<br/>Wilkes<br/>mann<br/>and<br/>Wilkes<br/>mann<br/>(2018);<br/>Trento,<br/>Bannò<br/>and<br/>D'Allura<br/>(2018);<br/>von<br/>Reiche,<br/>(2019);<br/>Umrani<br/>and<br/>Johl<br/>(2018);<br/>Dassisti<br/><i>et al.</i><br/>(2017);<br/>OECD<br/>(2017a)<br/>;<br/>Kleindi<br/>enst<br/>and<br/>Ramsa<br/>uer<br/>(2016);<br/>Thaw<br/>(2018)</p> |  |
|---|--------------|----|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

|  |       |    |       |  |  |
|--|-------|----|-------|--|--|
|  | TOTAL | 27 | 99.99 |  |  |
|--|-------|----|-------|--|--|

Of the location-specific reviews, the largest percentage came from Asia, followed equally by Africa and Europe. SMEs in Africa, represented by South Africa, are faced with many challenges that can inhibit their growth, but are encouraged to buy into the adoption of the following knowledge management strategies for inclusivity in the 4IR: connectivity, data collection for social change, mobility and traffic congestion, innovation, optimisation, inter-organisational value chain innovativeness and supportive partner knowledge, collaboration, abolishment of bureaucratic practices and structures, adoption of knowledge-based learning paradigms and designs, knowledge of systemic programme management, incorporation of collaborative virtual networks of partners, cloud computing, collaboration, digitisation, reassessed business models, proactive goals about change, and increased knowledge gathering (Futcher 2018; Koigi 2018; Phillips 2019; College 2018).

In order to overcome the challenges discussed in this section, studies have shown that certain enablers must be in place for the successful implementation of knowledge management, especially in the context of the 4IR. Eze *et al.* (2013:229 - 230) proposed a framework for sharing knowledge. The authors mention that for knowledge to take place, employees in SMEs must trust each other, the organisation must formalise their operations, appropriate knowledge technology must be in place, and there should be empowering leadership, motivation, and an effective reward system. Seseni and Mbohwa (2016: 3) also developed a framework that proposes: organisational culture, sufficient time, management support, teamwork, effective communication, employee motivation and trust. Farooq (2018:255), in an Indian study, highlighted the following: organisational structure: rewards systems, motivation, interpersonal trust, management support, information and communication technology, knowledge sharing and business performance relationship. Seseni and Mbohwa (2019:3014, 3020) brought to the fore the following: trust, teamwork, motivation, management support and sharing knowledge; Schroeder (2016a: 5) suggests that SMEs should create flexible organisational structures and boost their employees' interdisciplinary thinking. The above-mentioned frameworks have the following in common: trust, motivation, reward system, organisational structure, management support, and knowledge sharing.

| Table 6: KM strategies enabling frameworks                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Effective communication</li> <li>• Empowering leadership</li> <li>• Flexible organisational structures</li> <li>• Information and communication technology</li> <li>• Trust</li> <li>• Knowledge sharing and business performance relationship</li> <li>• Management support</li> <li>• Employee motivation</li> <li>• Organisational culture</li> <li>• Rewards systems</li> <li>• Teamwork</li> </ul> |

What knowledge management enabling framework can be proposed to sustain SMEs in the 4IR?

### **Proposed KM model for SMEs in the 4IR**

The proposed model will be based on the summation of Liebowitz (2016:1), who noted that knowledge management is 80% people and processes and 20% enabling technology. The study, therefore, grouped the extracted overarching themes (in the order of highest to lowest frequency count), under the three KM components of people, processes and technology as illustrated in Table 7.

| Table 7: Extracted Themes as KM Components |     |
|--------------------------------------------|-----|
| People-oriented                            | Pro |



|                                                                                                                                    |  |
|------------------------------------------------------------------------------------------------------------------------------------|--|
| <ul style="list-style-type: none"><li>• Collaboration/co-aggregating/CoP</li><li>• Hiring of digitally skilled workforce</li></ul> |  |
|------------------------------------------------------------------------------------------------------------------------------------|--|

Hence, the proposed framework is as presented below:

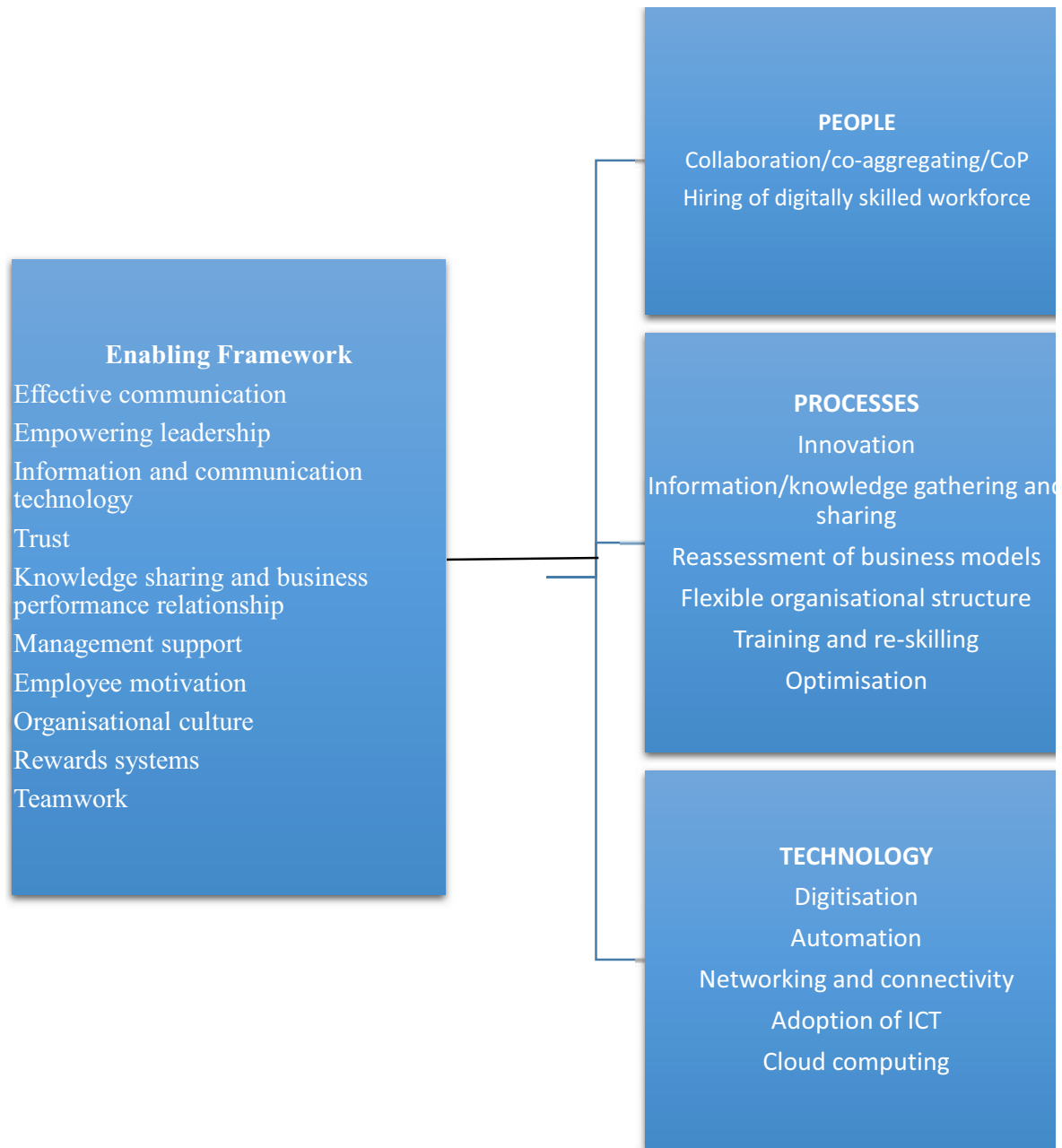


Figure 1: Proposed KM model for SMEs in the 4IR

## Conclusion

The 4IR is an era of a shift from a real physical world to a virtual world: organisations not only need to systematise their production process more efficiently, but also create customised products. This has its attendant effect on knowledge management and business models. In the 4IR, driven by demand, production and consumption will become customised and small and medium enterprises (SMEs) will be key

contributors (OECD 2018: 5). SMEs contribute to more than one third of GDP in emerging and developing economies, making it essential to give SMEs due attention for improved performance. In the knowledge-driven global economy, knowledge is a commodity that provides a sustainable competitive advantage. This requires that SMEs need to know how to manage and make use of their knowledge assets, in order to get maximum return, particularly given the expected impact of the 4IR on organisations, which makes it critical to consider how knowledge management is practised by SMEs. There is a plethora of knowledge management tools and solutions in the market; however, they are targeted at very large multinational organisations, with little aimed at SMEs. In addition, specific studies on the required KM strategies that SMEs can employ for successful operations in the 4IR are not easily available or accessible. Therefore, this study sought to reduce these gaps and the dearth of literature on the practice of knowledge management by SMEs in the context of the 4IR.

The reviewed literature revealed that merging knowledge management strategies with SMEs' work processes will enhance their performance in the 4IR environment. The study also highlighted that currently SMEs are faced with challenges, such as limited adoption of digital technologies; a lack of investment in complementary knowledge-based assets, such as R&D, inadequate or unskilled human resources, organisational changes, process innovation and lack of cloud computing; all of which can deter their integration into the 4IR. Furthermore, the study identified knowledge management strategies that SMEs can explore to blend into the 4IR. The study also noted that, people, processes and technology are the three knowledge management structures required for organisational performance and improved competitiveness, which SMEs can include in their operations in the 4IR environment. Therefore, this study differs from existing literature on the subject of knowledge management in SMEs in the 4IR, by blending the people, processes and technology structures, and using this to propose a KM framework for SMEs in the 4IR. From the review, as presented in the framework, digitisation and automation appear to be the first step on the ladder under the technology cluster, while collaboration, followed by the hiring of a skilled workforce, leads the people segment; and under processes, both innovation and information/knowledge gathering and sharing are most essential.

The study integrated both industry-based articles (via organisational websites) and academic articles (via databases), and submits that SMEs, in spite of the challenges, can adopt the proposed 4IR knowledge management framework, to leapfrog into the 4IR.

Findings from the study imply that the concept of the 4IR does not mean complete automatic job loss by humans to robots. That is, organisations, such as SMEs, do not have to fold up in the 4IR era. Literature findings imply that while routine tasks can be automated for performance by robots, innovative jobs are highly dependent on human-embodied knowledge, and as such, the management of knowledge, both tacit and explicit, will continue to be required. Furthermore, findings suggest that SMEs have the people advantage and can leverage on this, in addition to technologies, to perform optimally in the 4IR. SMEs would only need to adopt appropriate knowledge management strategies, as identified by this study, to achieve this task.

The following are the recommendations from this study:

SMEs should leverage on the tripod stand of people, processes and technology by:

- Employing a workforce with digital skills; encourage collaboration and the formulation of communities of practice.
- Ensuring technology-enabled and driven work processes through the adoption of relevant technologies, networking and cloud computing.
- Adopting a more flexible and innovative organisational structures, making training and re-skilling a consistent practice, and reassessing their business models to favour the comprehensive networking nature of the 4IR.

Policy-makers and stakeholders in the SME sector should provide enabling environment and infrastructures, such as improved national bandwidth, affordable networking tools, and stable power, especially in the developing country context, for SMEs to operate in the 4IR era.

The study suggests that future studies investigate the method(s) of implementation of each strategy by SMEs, in order to stay relevant and competitive in the 4IR.

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## **Transfer of tacit knowledge among staff at the Kenya National Library Service, Nairobi County, Kenya**

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## **Abstract**

*This paper explored the transfer of tacit knowledge among staff at the Kenya National Library Services (KNLS), Nairobi County. KNLS plays an important role in planning the development of library infrastructure throughout the country. KNLS's mandate is to foster a reading culture through the provision of information services to all clientele countrywide, in all formats, to enhance social, political and economic development. Effective knowledge management results in better quality services and enhances employee performance and satisfaction. The purpose of this study was to explore the transfer of tacit knowledge among staff of Kenya National Library Service to enhance service delivery, productivity and business continuity. The specific objectives of this study were to explore knowledge management practices at the Kenya National Library Service; determine the kinds of tacit knowledge; explore communication channels used to transfer tacit knowledge; identify challenges and experiences in transferring tacit knowledge; and propose a framework to enhance the transfer of tacit knowledge at KNLS. The Theory of Communities of Practice by Etienne Wenger et al. (2002) informed the study. The study adopted a qualitative approach. The population of the study was stratified into departments. Purposive sampling was employed to select respondents. Key informants in the study were senior members of management. Data was collected through face to face interviews and analysed using content analysis software. Data has been presented using qualitative techniques; where necessary, the study employed the use of tables, graphs and charts. No study known to the authors has investigated the transfer of tacit knowledge among staff at the KNLS. This study is original in terms of its scope and methodology.*

**Keywords:** Knowledge management, knowledge management practices, tacit knowledge, knowledge sharing, transfer of tacit knowledge

## **Introduction**

In today's life environment, knowledge is the driver of social, economic and political development. It is a key resource and the main source of creativity, innovation and competitiveness. The management of tacit knowledge in organisations today is regarded as a fundamental activity of obtaining, growing and sustaining intellectual

capital. Grant (1996) noted that knowledge management is strategically important for organisations to gain a competitive advantage over their competitors and to add value to their products. Drucker (1993) predicted that knowledge would replace land, labour, capital and machines in economic production. Today, organisations are busy trying to capitalise on their organisational intellect to maintain competitive advantage through knowledge management practices. Armstrong (2006) points out that the foundation of industrialised economies has shifted from natural resources to intellectual assets. He further stated that executives have been compelled to examine the knowledge underlying their business and how that knowledge is used. Hansen, Nohria and Tierney (1999) remarked that for hundreds of years, owners of family businesses have passed on their commercial wisdom to children; master craftsmen have painstakingly taught their trades to apprentices; and workers have exchanged ideas and knowhow on the job.

Knowledge management deals with how people acquire, exchange, and disseminate knowledge. Rowley (1990) points out that knowledge management is concerned with the exploitation and development of knowledge assets with a view to furthering organisational objectives. Grey (1997) defines knowledge management as an audit of intellectual assets that highlight unique sources of critical functions and potential bottlenecks which hinder knowledge flows to the point of use. He further opined that knowledge management protects intellectual assets from decay; seeks opportunities to enhance decisions, services and products by adding intelligence; increases value through flexibility. Therefore, knowledge is an intellectual asset and knowledge management is a tool which utilises intellectual assets to broaden the organisation's objectives.

In the 19th century, libraries were known as the only information suppliers. In the 20th century, libraries have undergone enormous changes dictated by advances in information technologies; socio-economic developments such as the growth of private libraries, cyber cafés, information consultancy and brokerage firms; and high levels of user expectations. All these changes have resulted in competition for a qualified, competent and skilled work-force to deal with the current and future demands in information processing and knowledge dissemination. Teng and Hawamdeh (2002) suggested that knowledge management can be applied in non-

profit making organisations to improve communication among staff and between top management. Mchombu (2007) argues that knowledge management in libraries improves work efficiency, productivity and the ability to manage change. He further pointed out that knowledge management practices enable organisations to attract, retain and motivate committed talent. In libraries, knowledge management facilitates the institutions to maximise the use of available collective wisdom, experience and brainpower of human capital assets. Kim (1999) pointed out that knowledge management practices aim to draw out the tacit knowledge people have, what they carry around with them, what they observe and learn from experience, rather than what is usually explicitly stated.

## **Problem and purpose of the study**

There is a relatively low volume of literature that deals with tacit knowledge transfer and almost none when it comes to the transfer of tacit knowledge in public libraries in Kenya. This study attempts to fill this gap by investigating the transfer of tacit knowledge at the KNLS, Nairobi County. This study specifically investigated the transfer of tacit knowledge among library staff of KNLS with a view to identifying the inherent challenges and proposing a framework to enhance the transfer of tacit knowledge in the organisation. The specific objectives of this study were to explore knowledge management practices at the KNLS; determine the kinds of tacit knowledge held by KNLS staff; explore communication channels used to transfer tacit knowledge by KNLS staff; identify challenges experienced by KNLS staff in the transfer of tacit knowledge; and propose a framework to enhance the transfer of tacit knowledge at KNLS.

## **Theory and literature review**

A theory is a set of explanatory concepts (Silverman, 1993). A theory is a system for explaining phenomena, which states constructs, and laws that inter-relate the constructs to one another (Mugenda & Mugenda, 1999). Cozby (2001) argues that theories have four purposes in scientific research, namely: description, explanation, prediction and control. He further notes that theories generate new knowledge and new hypotheses about behaviour which could be confirmed or contested through

research. This can reveal weaknesses in a theory and force researchers to modify or develop a new and more comprehensive theory.

Several theories have been used in the study of tacit knowledge management. One of these is the knowledge spiral model proposed by Nonaka and Takeuchi (1995). These researchers attributed the success of Japanese companies to their effectiveness in creating knowledge. The core assumption of this model was that tacit knowledge has to be mobilised and converted. The model does not only explain knowledge creation but also describes knowledge transfer. Nonaka and Takeuchi (1995) identified four specific conversion processes: socialisation, externalisation, combination and internalisation (SECI). The model explains that tacit knowledge can be transformed into explicit knowledge and vice versa. The model also emphasises that tacit knowledge cannot be easily codified; once it is codified it loses its tacit nature. Therefore, tacit knowledge might be lost in the process of codification. Related to SECI is the knowledge transfer theory (Szulanski, 1996) which presents knowledge transfer as a sequential process which encompasses four steps between the sender and the receiver: initiation, implementation, ramp-up and integration.

Another theory relevant to tacit knowledge management is the Communities of Practice (CoP) theory (Wenger, McDermott & Snyder, 2002). The theory was introduced by Jean Lave and Etienne Wenger in 1991. They first used the term 'Communities of Practice' to describe learning through practice and participation which they named 'situation learning'. They suggested that most of the learning for practitioners occurs in social relationships in the workplace rather than in a classroom setting. In this theory, the structure of the community was created over time through a process of legitimate peripheral participation. Building on the situation learning theory, Wenger expanded the concept of CoP in 1998, and focused on socialisation, learning and the individual's identity development instead of expanding the concept based on the apprentice-expert relationship (Wenger, 1998). This was based on a case study on how medical claims processing clerks interacted with each other to share information. He described a community of practice as an entity bounded by three interrelated dimensions: mutual engagement, joint enterprise and a shared repertoire.

In 2002, Wenger, McDermott and Snyder in the study, 'cultivating communities of practice', shifted their focus from individual learning and identity. They focused on providing a tool for organisations to manage 'knowledge workers'. Wenger, McDermott and Snyder (2002) revised the three characteristics of CoP and named them, 'domain', 'community' and 'practice'. Wenger, McDermont and Synder (2002) defined communities of practice as groups of people who share a concern, asset of problems, or a passion about a topic and who deepen their knowledge and expertise in the area by interacting on an on-going basis. They suggested that organisations can engineer and cultivate CoP as a managerial tool for improving an organisation's competitiveness.

This study was built on the work of Wenger, McDermont and Synder (2002), the theory of communities of practice. Jain (2009) in a study 'Knowledge management in e-government' stated that no technology or database can capture all the knowledge required in an organisation. The study revealed that communities of practice were proved to be the most powerful tools for learning, sharing and for intellectual interaction and experience. Therefore, COP can be used to capture, share and transfer tacit knowledge from retiring older employees, experts, to younger or new employees. This transfer process ensures that knowledge is retained in the organisation even when employees depart from the organisation. The next section reviews literature in the research domain.

## **Data, information and knowledge**

Data is the sum of raw, scattered, unrelated, unprocessed issues, facts and events, numbers and symbols without meaning (Semertzaki, 2011). Porat (1977) stated that information is data that has been organised and communicated. Data is the basis for the creation of information, while information is analysed and organised data. Lee (2000) defines knowledge as a set of organised statements of facts or ideas, presenting a reasoned judgment or an experimental result, which is transmitted to others through some communication medium in some systematic form. Davenport and Prusak (1998) define knowledge as a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. They further emphasise that knowledge originates and is applied in the mind of knowers. Semertzaki (2011)

defined knowledge as the baby of mental operations; the outcome of the thinking procedure of a person based on experience, education, cultural and socio-economic background; information gathered and elaborated in the brain. Therefore, information becomes knowledge when it is interpreted by individuals and given context.

## **Tacit and explicit knowledge**

Human knowledge exists in tacit or explicit forms (Polanyi, 1966). Tacit and explicit knowledge are complementary and essential for knowledge creation. There are many definitions of tacit knowledge but Polanyi's (1966) definition is widely accepted. He encapsulates the essence of tacit knowledge in the phrase "we know more than we can tell". Nonaka and Takeuchi (2007) argue that tacit knowledge is highly personal and hard to formalise. Therefore, it is difficult to communicate to others. Rosenberg and Nathan (1982) describe tacit knowledge as the knowledge of techniques, methods and designs that work in certain ways and with certain consequences, even when one cannot explain exactly why. Tacit knowledge consists of the "know-how" and the "know-that" (Polanyi, 1966). Polanyi pointed out that "know-how" is the ability of a person to perform tasks while "know-that" is holding pieces of knowledge in one's mind. Semertzaki (2011) defines explicit knowledge as the output of tasks and activities of an organisation in the form of reports, records, databases, and procedures, among others. Explicit knowledge is recorded in order to be retained for future generations and mostly captured in libraries, archives, databases and cultural heritage institutions.

Tacit knowledge can be defined as personal knowledge embedded in individual experience and involves intangible factors such as personal beliefs, perspectives and a value system. This personal knowledge is sometimes known as individual tacit knowledge. It is the knowledge that an individual possesses; natural talent or expertise that can neither be articulated nor transferred easily. Another category of tacit knowledge is collective knowledge. This kind of tacit knowledge belongs to a group of people and has its own values, beliefs and unwritten norms that the group fully agrees to and follows. Tacit knowledge functions naturally as background knowledge which assists in accomplishing a task in focus or at hand.

## **Communication channels that enhance the transfer of tacit knowledge**

Communication is the social glue that keeps an organisation tied together. It is a key process underlying all aspects of the organisation's operations. Organisational structure directs the flow of information and describes the formally prescribed pattern of interrelationships existing between various units or departments. Sekeran and Bougie (2009) define communication as the process of conveying information from a sender to a receiver using a medium in which the communicated information is understood the same way by both the sender and the receiver. Knowledge is created through the flow of information and is anchored on the beliefs and commitments of the holder. Tacit knowledge consists of the hands-on skills, special know-how, heuristics, intuitions, and the like that people cultivate as they engage in the flow of their work activities. Tacit knowledge is deeply rooted in action and comes from the simultaneous engagement of mind and body. Nonaka and Konno (1998) stated that tacit knowledge can be communicated through a process of dialogue, discussion, experience sharing and observation. Transfer of tacit knowledge happens through storytelling, brainstorming, on-job training and debriefing sessions.

In the African culture, sharing of narratives and stories of routine experiences in the form of oral internal antiquity is a powerful device to communicate values and experiences. Stories exist in the realm of knowledge and are particularly suited to knowledge management instead of information management (Reamy, 2002). Brainstorming leverages the collective thinking of the group by engaging each other, listening to and building ideas. Brainstorming can be summed up as a methodology used to bring out creativity and innovation. On-job-training is planned, organised and conducted at the employee's worksite. On-job-training is used generally to broaden the employee's skills and increase productivity as well as to develop proficiency skills unique to the employee's job. This kind of method of training lifts the employee's morale, productivity and professionalism. Alipour, Salehi and Shahnava (2009) in a study on the effectiveness of on-job training in Iran revealed that on-job training leads to more creativity, achieving organisational objectives and improves work quality.

The tacit knowledge transfer process is ultimately human to human and is inherently interactive and dynamic. Tacit knowledge transfer is enhanced if the environment is



right, that is, the people involved, the right conditions exist, right means are used and right actions are taken (Collison & Parcell, 2001). In debriefing, the what, why, how and when of things is explored orally (Kransdroff, 2003). Debriefing was originally used in military campaigns and war games to question and examine persons who have returned from mission or exercise, to establish what has occurred and design new strategies as a result of previous experience (Pearson & Smith, 1985).

### **Barriers to transfer of tacit knowledge**

Fear and ambition mixed with a dollop of distrust create a condition for knowledge hoarding. Fear is a strong emotion affecting behaviour. People will hoard their knowledge if they think sharing it will result in punishment or competitors stealing their ideas. Bartol and Srivastava (2002) stated that individual employees are reluctant to share knowledge and expertise because the disclosure might lead to erosion of individual power. Knowledge hoarding also comes in when people or employees feel that an injustice has been done to them. They become distrustful of management and become afraid of negative job evaluations and figure out that they are better off not sharing anything.

When people acquire new knowledge, they believe that it is the key to their success and are likely to guard instead of sharing it. Many employees do not want to share the expertise they get through many years of hard work due to competition. These employees feel that if they can solve problems they will be valued and get self-respect. Greenhalgh and Rosenblatt (1984) defined job insecurity as a perceived powerlessness to maintain desired continuity in a threatened job situation. They further maintained that job insecurity is based on individuals' perceptions and interpretations of the immediate work environment. Job insecurity in organisations leads to attitudinal reactions, intentions to quit, reduced commitment and reduced job satisfaction which makes the transfer of tacit knowledge impossible.

Neo (2002) in a study of knowledge sharing practices in a Singapore news company found that cultural factors have significant impact on an individual's decision to share or hoard knowledge. This study revealed that lack of motivation, management support, trust and teamwork spirit were considered as major barriers to knowledge sharing. This concurs with Albers (2009) in a study which revealed that culture was critical in implementing knowledge management. He emphasised that an ideal

knowledge management culture should be characterised by trust, openness, teamwork, collaboration, risk taking, tolerance for mistakes, common language courage and time for learning. The noise in tacit knowledge transfer can be ringing telephones inside or outside the room, people moving in and out of the room, mumbling, speaking too fast and distracting gestures from the sender of the message or recipients. Blacker (1995) stated that poor lighting and uncontrolled temperatures could affect people's morale and concentration, which in turn interfere with knowledge transfer. Geographical distance is also a physical barrier in the transfer of tacit knowledge. Distance between the sender and the receiver of a message determines the effectiveness of the transfer of a message. Semantic barriers such as language, use of complicated words or uncommon expressions hinder the transfer of tacit knowledge. Semantic barriers occur when a sender and the receiver assign different meanings to the same word. Physiological barriers such as visual challenges, hearing problems and ill health also hinder tacit knowledge transfer.

Attitude is a set of beliefs and feelings people have about specific ideas, situations and people, which influence behaviour. Cools and Van den Broeck (2006) in Martins and Martins (2011) defined attitude as a learned predisposition to respond in a consistently favourable or unfavourable manner with respect to a given object. Attitudinal barriers can be brought about by factors such as poor staff management, lack of consultation and personality conflicts which can make people refuse to communicate or share knowledge. Personal attitudes of individual employees which may be due to lack of motivation or dissatisfaction at work can result in resistance to change. Disterer (2001) notes that if leading members of an organisation are not comfortable with change and are not willing to take risks, then new ideas may be covered very easily and knowledge not culturally legitimated may be suppressed.

## **Research methodology**

Methodologies used in the previous studies to study knowledge transfer were primarily quantitative and mixed methods approaches. Szulanski (1996) applied quantitative methods to examine the transfer of best practices among eight firms. Szulanski (2003) further used a quantitative approach to examine stickiness associated with knowledge transfer in multinational enterprises in which the transfer was in multiple contexts. Binotto, Siqueira and Simioni (2011) used a mixed methods

approach to examine the difficulties associated with transferring marketing knowledge. The current study adopted a qualitative approach to get rich information about the transfer of tacit knowledge among library staff at KNLS. This approach was humanistic, interactive and enabled the researchers to build rapport and credibility with the respondents. The methodology facilitated the exploration and understanding of people's beliefs, experiences, attitudes, behaviour and interactions. In terms of paradigms, this study employed an interpretivist worldview which relies on naturalistic methods, based on people's subjective experiences of their internal worlds, and treating them as the sources of their thoughts and feelings. Kroeze (2012) explains that the aim of interpretivism is to understand the subjective experiences of those being studied as well as how they think, feel and act or react in their habitual contexts.

The study was based at the KNLS establishments in Nairobi City County. The population of the study consisted of all staff in these establishments. Stratified sampling was used to select the actual respondents in the study. The KNLS establishments in Nairobi were stratified into departments. Payne (1990) opines that stratification involves organising population into distinct groups or strata as per their characteristics. The study further employed purposive sampling to select respondents based on their professionalism and the area of specialisation. Therefore, the respondents in this study were librarians and library staff from the following departments: National Library, Nairobi Area Library, Collection Development and Book Distribution, Buruburu Library, Outreach Mobile Library Services and the administrative office in Buruburu. Key informants in the study were senior members of management from Technical Services, Human Resource, Audit, Corporate Communications, as well as Research and Planning. The key informants were purposively sampled based on their positions and duties performed at KNLS. Of particular interest were policy formulation and implementation, training and development of staff, information and knowledge flow inside and outside the institution, technical services, audit, information processing and dissemination strategies amongst other duties in the institution. Patton (1990) observes that qualitative inquiry typically focuses in-depth on a small sample. Sekeran and Bougie (2009) point out that in qualitative research, a researcher does not determine the number of subjects that will be sampled at the beginning of the study. They further explain that the general rule in qualitative research is to continue to sample until no

new information or no new insights are gained. Overall, data was collected from thirty six (36) librarians and eight (8) key informants who were senior management staff in Nairobi. Data was collected through in-depth face to face interviews and analysed using content data analysis software (Nvivo) and presented using qualitative techniques, where necessary, the study employed tables, graphs and charts.

## **Research findings**

The findings of the study are presented hereunder according to the research objectives:

### **Knowledge management practices**

#### **Knowledge creation, capturing, sharing and transfer**

The study found that knowledge creation at KNLS was the outcome of an interactive process between the staff and management. Knowledge was created on a daily basis through group discussions, staff meetings, brainstorming, on-job training, in-house trainings and practical demonstrations. The respondents stated that they created new knowledge through group discussions, brainstorming, staff meetings, staff evaluation reports and appraisals. One of the respondents had this to say:

*I participate effectively in face to face group discussions in our section and forward questions on what I want to know, and when I get the answer, I apply it to the problem at hand and hence get new ways of solving the problems at hand.*

The key informants in the study stated that they habitually pick staff to work on research papers and present them in staff forums where the management and the staff participate effectively in asking and answering questions thereby creating new knowledge. The study established that new knowledge acted as a key resource in influencing library operations. The new knowledge also helped the libraries in catching up with changing user needs and information technologies.

Eighteen (50%) of the respondents stated that knowledge was captured through the presentation of research papers and appraisal of staff expertise; fourteen (39%) were not aware of how knowledge was captured; while four (11%) of the respondents stated that there were no activities on knowledge capturing. The study findings indicate that knowledge capturing was semi-formal. This study concurs with Martins

and Martins (2011) in their study which revealed that the wave of knowledge loss and attrition that organisations were facing in a world of layoffs, retirements, death and mergers poses a threat and challenge to organisations.

The study further established that the KNLS staff acquired knowledge through attending conferences, seminars, workshops, in-house/outside trainings, research and collaboration with other institutions. The study established that KNLS had staff with a wealth of experience and expertise in the field of librarianship. The respondents were well trained. Over half of the respondents had worked for over fourteen years. The respondents acted as repositories of knowledge. The study findings indicated that knowledge sharing at KNLS was semi-formal. The staff shared their knowledge during staff meetings, tea and lunch breaks, research presentation, practical demonstrations, brainstorming sessions, KNLS intranet, e-mails, and social media. The study further indicated that the staff transferred their tacit knowledge during the sharing process consciously and unconsciously.

### **Knowledge management policy**

The study established that KNLS did not have a written policy to govern knowledge management activities. Thirty-four (94%) of the respondents pointed out that there was no written knowledge management policy governing knowledge management practices at KNLS. Two (6%) of the respondents stated that they were not sure of the existence of any policy that governs knowledge management practices. The key informants pointed out that KNLS had not formally embraced knowledge management into the institution hence there were no written policies to guide in knowledge management. The study's findings indicated that knowledge management practices were informal. The findings also revealed that knowledge management was new at KNLS and only about 60% of the staff participated intuitively in knowledge management activities. KNLS management had taken initiatives to facilitate knowledge sharing and transfer activities through job rotations, in-house trainings, staff meetings, use of intranet, e-mails, and workshops. The key informants pointed out that KNLS management had taken a further initiative to sponsor some of the library staff to attend knowledge management courses.

## **Kinds of tacit knowledge at KNLS**

The study revealed that KNLS staff have both individual and collective tacit knowledge. The individual tacit knowledge consisted of a life-time's accumulation of skills, wisdom, experiences, expertise, and best practices. The collective tacit knowledge was embedded in daily practices, routines, organisational culture and in their informal groupings. This study concurs with Jacobs & Roodt (2011) in their study which concluded that individual tacit knowledge is deeply rooted in individual experiences, ideas, values and emotions. The study further revealed that individual tacit knowledge was based on individual competences, experience and skills.

## **Transferability of tacit knowledge**

As shown in Figure 1, 72% of the respondents stated that tacit knowledge was transferable. The respondents narrated that the expertise in areas such as binding, indexing, cataloguing and classification were transferrable after some time while working practically with the expert in the area. The respondents pointed out that the tacit knowledge transfer occurred during face-to-face interactive knowledge sharing. They gave examples such as hands-on training, on-job training, internship training and informal discussions. More than one-quarter (28%) of the respondents said that tacit knowledge was not transferrable. These respondents argued that the know-how and expertise was hard to transfer since the process was complex, time consuming and required a lot of patience '*to fit into another person's shoes*'.

The key informants in the study pointed out that tacit knowledge was transferred through job rotation, practical demonstrations, training and mentoring. They stated that the institution had not laid down strategies and policies to facilitate tacit knowledge transfer although the process was informal. This finding strongly agrees with the assertion of Nonaka and Takeuchi's (1995) definition that tacit knowledge is "knowledge that has been transformed into habit, and is highly context-specific and has a personal quality hence difficult to transfer". Hislop (2009) as well as Mládková (2012) posit that tacit knowledge is always stored in peoples' brains. Therefore, sharing of tacit knowledge is difficult, complex, time-consuming and one of the biggest challenges of knowledge management. The study further concurs with Hariharan (2015) in a study which concluded that "wisdom represents a deeper understanding of knowledge and the fundamental principles behind this knowledge".

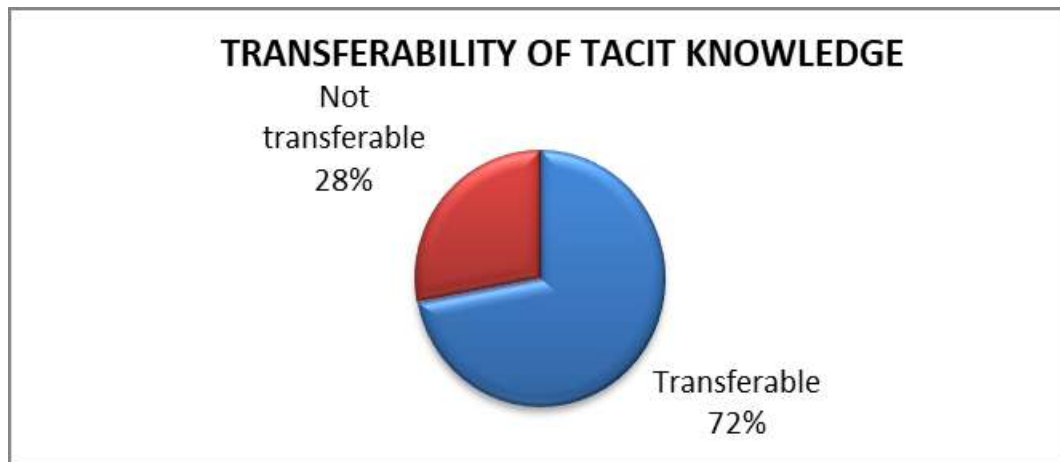


Figure 1: Presents responses from the respondents on transferability of tacit knowledge

### Communication channels for tacit knowledge transfer

As indicated in Figure 2, most respondents used practical demonstrations, brainstorming, and face to face staff meetings to transfer tacit knowledge. The key informants of the study pointed out that 80% of the communication channels used by the library staff to transfer tacit knowledge were informal.

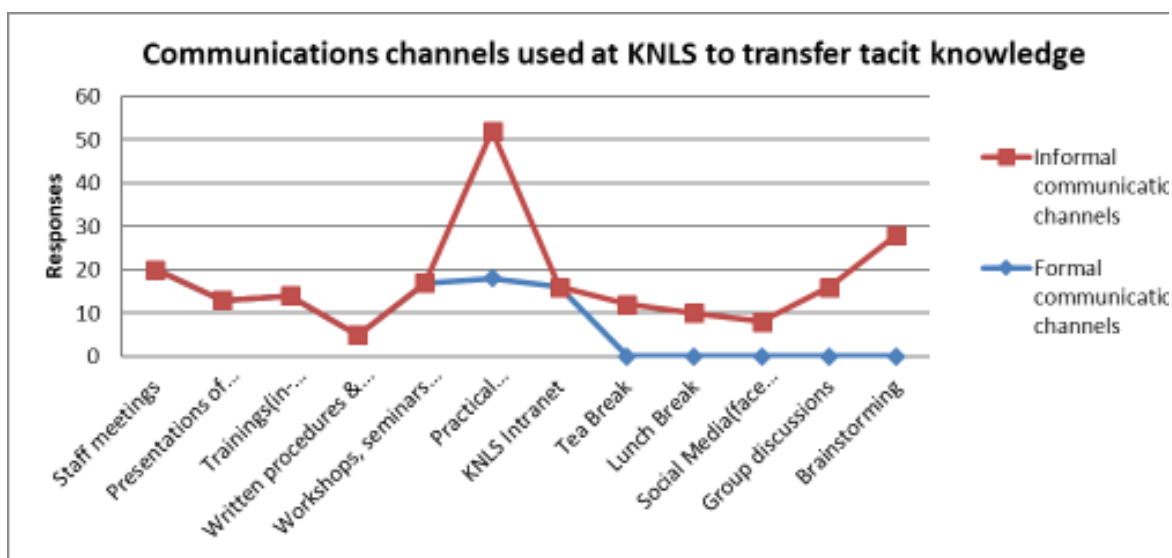


Figure 2: Communication channels used at KNLS to transfer tacit knowledge

## **Effectiveness of communication channels used in transfer of tacit knowledge**

Twenty-two (61%) of the respondents stated that the communication channels were effective, whereas fourteen (39%) of the respondents said that the communication channels were not effective in aiding the effective transfer of tacit know-how and expertise.

## **Preferred communication channels**

Twenty-six (72%) of the respondents stated that they preferred brainstorming and practical demonstration, which were face-to-face interactive communication channels, to transfer know-how and expertise to another person, new employee or intern. These respondents reiterated that face-to-face interactions were effective and provided a smooth transfer of tacit knowledge. One respondent said:

*I prefer practical demonstrations and brainstorming because it is easy in terms of recall than written procedures*

These findings concur with Collison and Parcell (2001) that tacit knowledge transfer process is a human-to-human process and that this process is inherently interactive and dynamic.

## **Best communication channel to transfer tacit knowledge in a multi-generational workplace**

The study sought to find the best communication channel to employ in a multi-generational workplace to transfer tacit knowledge. Sixteen (44%) respondents preferred brainstorming; twelve (33%) practical demonstrations; seven (19%) social media; while three (8%) favoured written procedures and manuals. The key informants stated that coaching and mentoring were the best communication channels to transfer tacit knowledge in a multi-generational workplace. They pointed out that these communication channels would mitigate challenges associated with differences in age, interests and culture.

## **Challenges in transfer of tacit knowledge**

The study sought to determine the challenges encountered by the library staff in the transfer of tacit knowledge. The study established that lack of motivation, lack of



knowledge management strategies and policies, and knowledge hoarding were the major challenges that hindered the transfer of tacit knowledge at KNLS.

**Table 1: Challenges that hindered effective transfer of tacit knowledge at KNLS**

| No. | Challenges/barriers to transfer of tacit knowledge            | Frequencies (multiple responses) |                |                      |                |                  |                |
|-----|---------------------------------------------------------------|----------------------------------|----------------|----------------------|----------------|------------------|----------------|
|     |                                                               | Staff /staff                     |                | Staff / New employee |                | Staff to Interns |                |
|     |                                                               | No. of responses                 | Percentage (%) | No. of responses     | Percentage (%) | No. of responses | Percentage (%) |
| 1   | Knowledge hoarding                                            | 23                               | 63.8           | 8                    | 22             | 5                | 13.8           |
| 2   | Lack of trust                                                 | 18                               | 50             | 7                    | 19             | -                |                |
| 3   | Arduous Relationship                                          | 14                               | 38.8           | 12                   | 33             |                  |                |
| 4   | Lack of motivation                                            | 30                               | 83             | --                   | -              | -                | -              |
| 5   | Inadequate training                                           | 21                               | 58             | 19                   | 52.7           | 19               | 53             |
| 6   | Inappropriate communication channel                           | 8                                | 22             | 10                   | 27.7           | 6                | 16.6           |
| 7   | Physiological factors                                         | 16                               | 44             | 8                    | 22             | 3                | 8              |
| 8   | Fear                                                          | 12                               | 33             | -                    | -              | -                | -              |
| 9   | Language barrier                                              | 14                               | 38.8           | 10                   | 27.7           | 12               | 33             |
| 10  | Lack of knowledge on the subject                              | 3                                | 8              | -                    | -              | -                | -              |
| 11  | Attitudinal barriers                                          | 18                               | 50             | -                    | -              | -                | -              |
| 12  | Age gap                                                       | 18                               | 50             | 22                   | 61             | 16               | 44             |
| 13  | Technophobia                                                  | 6                                | 16.6           | 8                    | 22             | -                | -              |
| 14  | Distance                                                      | 4                                | 11             | -                    |                | -                |                |
| 15  | Culture                                                       | 18                               | 50             | 19                   | 52.7           | -                | -              |
| 16  | Lack of knowledge management awareness, programmes & policies | 27                               | 75             | -                    |                | -                |                |

As shown in Table 1, the study further established that a lack of motivation, lack of knowledge management awareness, strategies and policies and knowledge hoarding were the major challenges that hindered the transfer of tacit knowledge at KNLS. The findings also concur with Riege (2005) that the lack of time to identify colleagues and share knowledge; low awareness of the benefits of possessed knowledge to others; poor interpersonal skills; lack of social networking; and differences in culture, race and value systems are some of the individual barriers to tacit knowledge sharing.

### **Challenges that hindered transmission of tacit knowledge when acting as the source**

As shown in Table 2, the major challenges in the transfer of tacit knowledge from the source to the recipient(s) at KNLS were noise, lack of motivation, lack of trust, resistance from recipients and attitudinal barriers.

| Table 2: Challenges in transfer of tacit knowledge |                            |                          |                |                                                                                                                                                                                                           |
|----------------------------------------------------|----------------------------|--------------------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NO                                                 | Challenges                 | Responses                |                | Details of responses                                                                                                                                                                                      |
|                                                    |                            | Multiple responses (No.) | Percentage (%) |                                                                                                                                                                                                           |
| 1                                                  | Resistance from recipients | 18                       | 50             | Unwillingness from the recipients to contribute or ask questions. Poor listening skills of recipients, lack of cooperation and collaboration on the task at hand.                                         |
| 2                                                  | Context                    | 16                       | 44             | The environment not conducive for learning e.g. sometimes the temperature is too hot where a recipient sleeps or takes nap. Sometimes the temperature is too cold for the recipients to concentrate.      |
| 4                                                  | Noise                      | 32                       | 88.8           | Distractive noise from the background e.g. use of mobile phones, people moving in and out.                                                                                                                |
| 5                                                  | Equipment                  | 10                       | 27.7           | Outdated equipment, shortage of equipment and lack of modern equipment for practical use by the recipients.                                                                                               |
| 6                                                  | Attitude                   | 17                       | 47             | This happens due to personal perceptions or past experiences. People are rated as incapable of performing or accomplishing tasks thus recipients do not want to pay attention to what is being presented. |
| 7                                                  | Lack of motivation         | 21                       | 58             | Lack of recognition and rewards                                                                                                                                                                           |

|   |               |    |      |                                                                                                         |
|---|---------------|----|------|---------------------------------------------------------------------------------------------------------|
| 8 | Lack of trust | 18 | 50   | Lack of amiable relationship with the recipient                                                         |
| 9 | Fear          | 12 | 33.3 | Fear of unknown, past experiences, fear of victimisation and fear of losing ownership of the knowledge. |

### **Challenges that hindered reception/absorption of tacit knowledge: recipient**

As shown in Table 3, the major challenges hindering the absorption or reception of tacit knowledge were noise, context, attitudinal barriers and the source.

| Table 3: Challenges that hindered reception of tacit knowledge: recipient |                                     |                    |                |                                                                                                                                                                 |
|---------------------------------------------------------------------------|-------------------------------------|--------------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No.                                                                       | Challenges                          | Multiple responses |                | Details of responses (“...”)                                                                                                                                    |
|                                                                           |                                     | No                 | Percentage (%) |                                                                                                                                                                 |
| 1                                                                         | Language barrier                    | 12                 | 33             | The source used difficult words, semantics, accents and mother tongue interruptions                                                                             |
| 2                                                                         | Inappropriate communication Channel | 6                  | 16.6           | The channel used was inappropriate for the audience e.g. use of power point, issuing written manuals instead of practical demonstrations                        |
| 3                                                                         | Context                             | 16                 | 44             | Lack of controlled room temperatures and the sitting arrangement and layout.                                                                                    |
| 4                                                                         | Source                              | 15                 | 41.6           | The source was not knowledgeable in the subject area. Lack of clarity of the source in delivering the message, mother tongue interruptions and use of semantics |
| 5                                                                         | Physiological factors               | 10                 | 28             | Factors such as ill health, poor eyesight and hearing difficulties                                                                                              |
| 6                                                                         | Attitudinal barriers                | 16                 | 44             | Poor perception, insufficient training and lack of motivation                                                                                                   |
| 7                                                                         | Noise                               | 20                 | 55.5           | Background noise disruptions, ringing phones and mother tongue interruptions (MTI)                                                                              |
| 8                                                                         | ICT illiteracy                      | 4                  | 11             | Technophobia due to lack of ICT literacy skills                                                                                                                 |
| 9                                                                         | Inadequate equipment                | 10                 | 27.7           | No enough equipment to provide hands-on training.                                                                                                               |

## Challenges that hindered transfer of tacit knowledge in a multi-generational workplace

Figure 3 shows that lack of trust, age gap, lack of motivation, attitudinal barriers, and different learning styles were the major challenges that hindered the transfer of tacit knowledge in a multi-generational workplace.

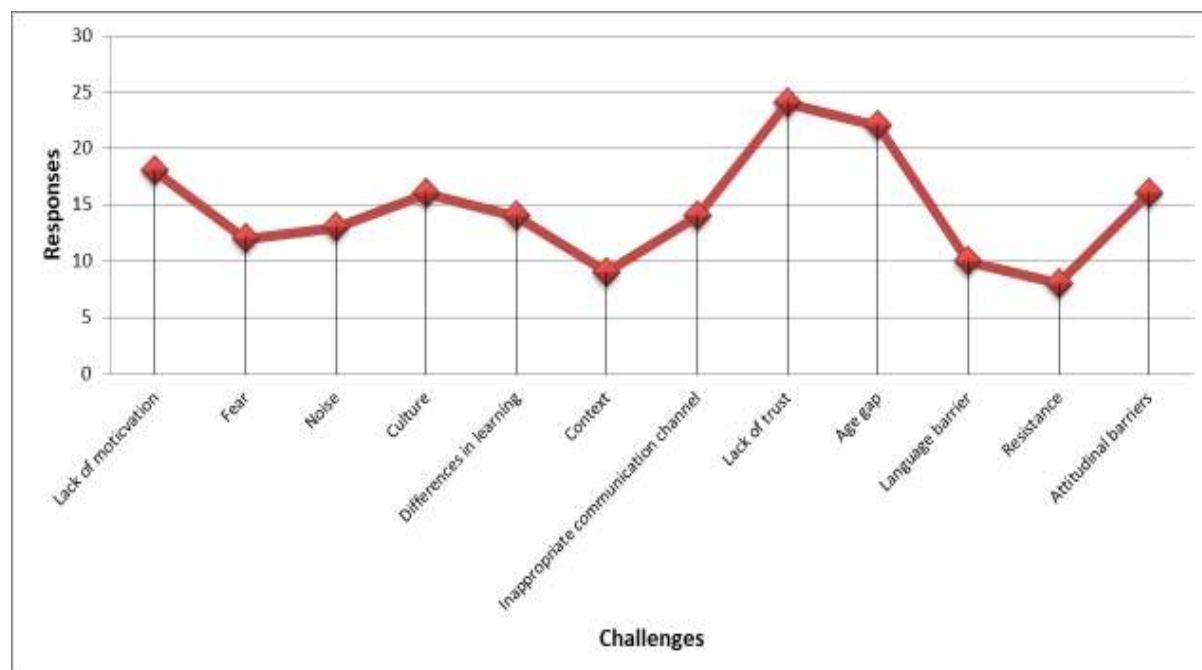


Figure 3: Challenges that hinder transfer of tacit knowledge in a multigenerational workplace

## Conclusions and recommendations

The study concluded that KNLS library staff had accumulated a wealth of knowledge, expertise and experiences, which should be tapped, used to improve library operations, re-engineer existing services, and attain a competitive edge. Generally, tacit knowledge was shared through informal communication and interactions. A lack of motivation and knowledge management strategies and policies compounded with knowledge hoarding hindered the effective transfer of tacit knowledge at KNLS and could lead to knowledge loss. The study concurs with Leonard and Swap (2014) who concluded that recovering losses associated with tacit knowledge gap can be costly and time-consuming or impossible to replace.

The study recommends that KNLS should formulate a knowledge management policy, motivate staff, carry out a knowledge audit, inculcate a knowledge sharing

culture and continue to train and develop its staff. The study also recommends that the KNLS management capture and harness the wisdom, expertise and experiences embedded in the minds of older employees before they leave the organisation through brainstorming and mentoring of younger employees.

The study proposes a model to enhance the transfer of tacit knowledge at KNLS. The model presents five stages that would ensure a smooth transfer of tacit knowledge. This is summarised in Figure 4.

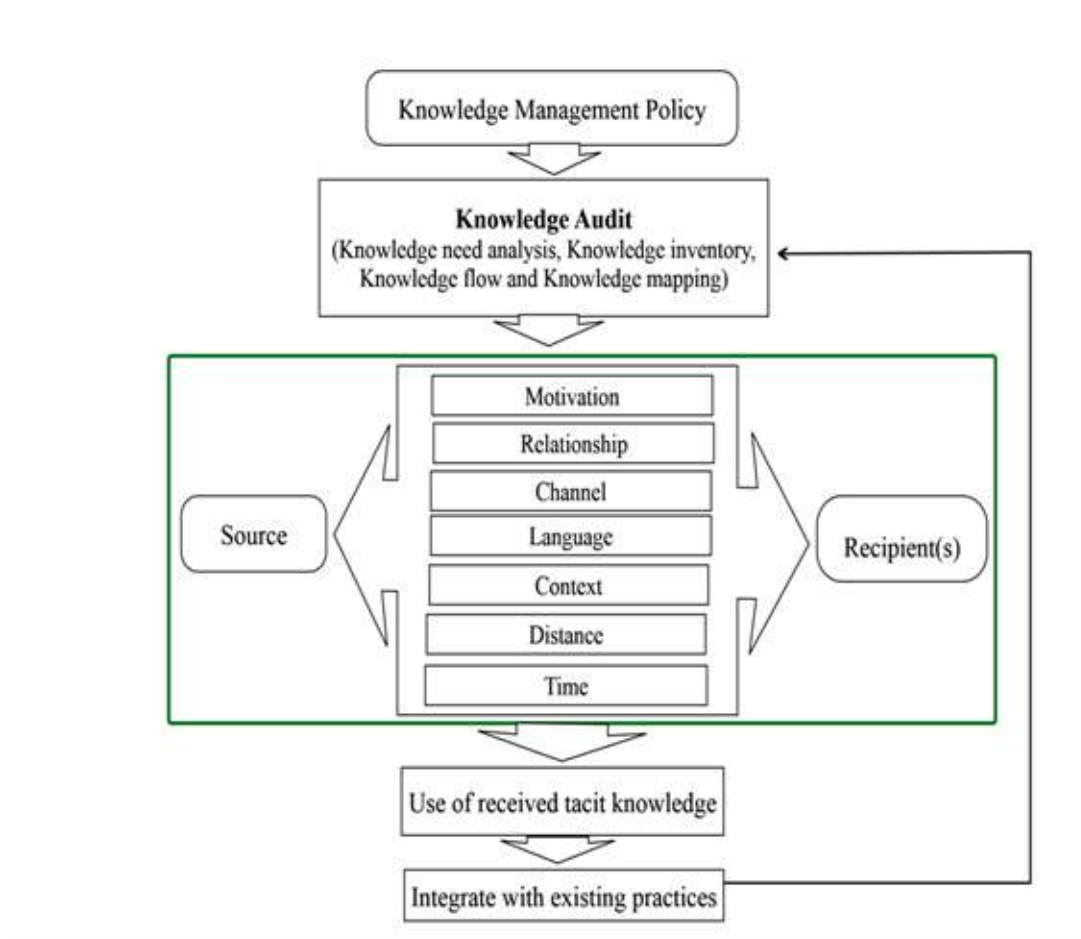


Figure 4: Proposed model for transfer of tacit knowledge at KNLS

### Stage 1: Knowledge management policy (KMP)

Intellectual capital is the foundation for the creation and protection of an organisation's value. A knowledge management policy would foster knowledge management initiatives, procedures and tools that will enable KNLS to truly and effectively exploit its intellectual capital.

## **Stage 2: Knowledge audit (KA)**

A knowledge audit is a view of the organisation's knowledge assets and associated knowledge management systems. Knowledge auditing will facilitate a detailed examination, review, assessment and evaluation of KNLS' knowledge abilities, its existing knowledge assets and resources, and its knowledge management activities. Knowledge audit would help to determine the knowledge being managed and how well it is being managed. Knowledge audit has four components, namely:

### **Knowledge needs analysis**

This component identifies knowledge KNLS library staff possess, and what they would require in future in order to meet the institution's objectives. The knowledge needs analysis will assist KNLS to develop future strategies and measure the library staff skills, competency enhancement needs, and opportunities for training and development.

### **Knowledge inventory**

This component is a knowledge stock taking exercise to identify and locate knowledge assets and resources throughout the KNLS as an organisation.

### **Knowledge flow**

This component looks at the flow of knowledge in the institution. It examines attitudes, habits, behaviours, and skills in knowledge sharing, use and dissemination. This component would examine how the library staff in the institution go about their daily work activities and how they seek, share, transfer and use their knowledge. This component further allows the institution to identify knowledge gaps and areas of duplication. It would generally highlight the areas of good practice that can be built on as well as barriers to knowledge flow and effective use.

### **Knowledge mapping**

A knowledge map is defined as an on-going joint quest to help discover the constraints, assumptions, allocation, ownership, value and use of knowledge assets, artefacts, people and their expertise. It is a component that uncovers blocks to knowledge creation, and finds opportunities to leverage existing knowledge. It would show the knowledge which exists at KNLS and where it can be found. It would direct how knowledge moves around the organisation from where it resides, to where it is

required. It identifies constraints to the flow of knowledge and highlights opportunities to leverage existing knowledge. It discovers effective and emergent communities of practice where learning is happening.

### **Stage 3: Tacit knowledge transfer process**

This is the stage where tacit knowledge is shared and transferred between the source and the recipient(s). It is influenced by the following factors:

#### **Source**

This is the provider or presenter of the know-how, skills, experiences and expertise. The source in the proposed tacit knowledge transfer model can also act as the recipient in the communication process.

#### **Recipient(s)**

The recipient in the proposed tacit knowledge transfer model receives the knowledge from the source. Given that this is a multidirectional process, the recipient can also act as the source in the transfer of tacit knowledge.

#### **Motivation**

This ingredient enables sharing and transfer of tacit knowledge. Motivated employees go to higher levels to ensure that they meet the targeted goals at all times. They always put the organisation first before their own interests. The source needs motivation to share and transfer his or her expertise, know-how, experiences and skills. The source also needs recognition, rewards and incentive for work well done. The recipient, on the other hand, requires motivation to enable him or her to absorb and retain the knowledge. An unmotivated recipient tends to be busy, making unnecessary noise in the background as well as causing disruptions. Recipients who are not motivated resist change and may use all means to resist the absorption of expertise and know-how.

#### **Relationship**

The source and the recipient should have a good relationship in order to facilitate the transfer of tacit knowledge. The relationship between the two needs to be intact and built on trust to ensure that none of them has ill feelings of the other.

## **Language**

The language used by the source when transferring his/her expertise, know-how, skills, ideas and experiences should be understood by the recipient(s). The transfer process significantly depends on the communication abilities of both the sender and the receiver. They both should have a common language to make transmission and absorption of tacit knowledge easier and faster.

## **Context**

Context is a framework that embeds the behavioural and structural aspects of an organisation. This includes organisational knowledge sharing culture, organisational structures and climate.

## **Distance**

Distance between the source and the receiver is a significant factor in the transfer of tacit knowledge. There should be physical and social interactions such as face to face contact of the participants to facilitate tacit knowledge transfer.

## **Time**

Time is a scarce resource. Transference of tacit knowledge is time-consuming. Therefore, quality time for interaction should be allocated to facilitate the transfer of tacit knowledge.

## **Stage 4: Use of the received knowledge**

Tacit knowledge is identified as transferred when the recipient uses or applies it.

## **Stage 5: Integration of the new knowledge with existing practices**

The expertise, skills and know-how can be embedded in the daily routines, procedures and can be used to improve performance, reengineer existing services and enhance the competitive edge.

## **Stage 6: Loop**

After integration of new knowledge with existing practices, the loop goes up to the audit level. The new knowledge integrated with existing practices should be audited.

Today, knowledge is vital for the survival of any organisation. In the current knowledge-based economy, gaining a small advantage over competitors carries an organisation a long way. Private libraries, cyber cafés, resource centres and information bureaus are on the lookout for possibilities of exploring the optimal



exploitation of intangible assets to attain a competitive advantage. The findings of this study may assist the Kenya National Library Service to leverage available resources and utilise its intellectual capital to enhance creativity as well as innovate existing services to attain a competitive advantage. Knowledge management practices provide effective management of intellectual capital, which leads to effective dissemination of library services and user satisfaction.

This study is significant to KNLS and information centres because it suggests ways to identify, share, and transfer tacit knowledge that exists within libraries and utilise it to enhance learning and performance. This study may also benefit KNLS and other institutions by identifying ways of retaining and motivating staff in order to get an excellent output from them. The findings of the study may also enable libraries and other related organisations to identify and address the challenges that hinder the transfer of tacit knowledge. This study acts as a guide to KNLS and various information centres in the formulation and implementation of strategies and policies to enhance a smooth transfer of know-how, expertise and experience. This would pave the way to tapping invisible reservoirs of experience for creativity and innovation of library services.

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# Knowledge sharing and self-efficacy as determinants of job satisfaction of library personnel in public universities in South-West, Nigeria

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## Abstract

*Job satisfaction is crucial in all organizations, including public university libraries. The job satisfaction of library personnel in public universities in South-West, Nigeria was observed to have been declining for some time. Lack of job satisfaction could cause slowing down of work, low productivity and complaints. There is abundant evidence to support knowledge sharing and self-efficacy as predicting factors of job satisfaction elsewhere. However, not much research has been done on their influence on the job satisfaction of library personnel in South-West, Nigeria. This study, therefore, examined the influence of knowledge sharing and self-efficacy on job satisfaction of library personnel in public universities in South-West, Nigeria. The study adopted survey research design. The population of the study consisted of 411 library personnel working in public universities across South-West, Nigeria. Total enumeration was used to include all library personnel. A validated questionnaire was used to collect data. The Cronbach's alpha reliability coefficients for the constructs ranged from 0.85 to 0.94. A response rate of 80.8% was achieved. Data collected were analyzed using descriptive and inferential (multiple linear regression) statistics. The findings revealed that there was a joint positive and significant influence of knowledge sharing and self-efficacy on job satisfaction of library personnel in public universities in South-West Nigeria ( $Adj.R^2 = 0.239$ ;  $F(2, 329) = 52.929$ ;  $p < 0.05$ ). The study concluded that knowledge-sharing and self-efficacy are factors that promote job*

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*satisfaction. It was recommended that for enhancement of job satisfaction, library management and the university administration should collaborate to provide comprehensive education and training for library personnel on knowledge sharing and the acquisition of self-efficacy competencies.*

**Keywords:** job satisfaction, knowledge sharing, library personnel, self-efficacy, South-West Nigeria

## **Introduction**

It is not appropriate to think of human elements in an establishment in terms of productivity and efficiency alone: of equal importance is the satisfaction derived by the individual from the job. Job satisfaction has been conceptualised by this study as the outcome that is experienced when one's expectations have been met. Job satisfaction can similarly be seen as the capacity of a vocation to address representatives' issues and enhance their efficiency. It could be unprofitable for an organisation to cause its employees not to be satisfied with their work situations if such organisation plans to keep its best employees from other competitors. According to Boateng, Dzandu and Tang (2014), knowledge is a crucial asset to individuals as well as organisations that desire to succeed in an increasingly changing environment. It is therefore presumed that for an employee to achieve job satisfaction in an organisation he/she requires a degree of organisational knowledge and capability to share it. The process of knowledge sharing is an insightful method to pass the learning process from one employee to the whole establishment. Similarly, self-efficacy has been viewed as an individual's ability to deal with the occasions that impact their lives. It is also described as an individual's perceived ability to attain a designated type of performance and achieve a specific result (Bandura, 1993; Pajares & Johnson, 1996). Hence, a strong sense of knowledge-sharing and self-efficacy may be essential for library personnel's job satisfaction

## **2. Problem and purpose of the study**

Job satisfaction is a crucial issue in every organisation, simply because for any organisation to accomplish its stipulated targets, it should have satisfied employees. A low rate of job satisfaction is perceived as evidence of the deterioration of the work conditions in many organisations. It has however, been observed that job satisfaction

of library personnel is on the decline because there appears to be a neglect of library personnel in the aspect of job security, recognition for a job well done, career development opportunities, conducive work environment, promotion and improved salary packages (David & Damilola, 2017). Although there is ample evidence of research done on job satisfaction and other variables, but not many studies have examined the nexus between job satisfaction, knowledge sharing and self-efficacy (Almahamid,McAdams, & Kalaldehy, 2010). It is on this note that this study examined how knowledge sharing and self-efficacy could predict the job satisfaction of library personnel in public universities in South-West Nigeria.

The main objective of this study is to investigate how knowledge sharing and self-efficacy influence the job satisfaction of library personnel in public universities in South-West, Nigeria. The following research questions guided the study:

- What is the level of job satisfaction of library personnel in public universities in South-West, Nigeria?
- What is the level of knowledge-sharing of library personnel in public universities in South-West, Nigeria?
- What is the level of self-efficacy of library personnel in public universities in South-West, Nigeria?

## **Hypotheses**

The following null hypothesis was tested at 0.05 level of significance:

Ho<sub>1</sub> There is no combined significant influence of knowledge-sharing and self-efficacy on job satisfaction of library personnel in public universities in South-West, Nigeria.

## **3. Theory and literature review**

This section focuses on theory and literature review

Three theories were employed to underpin the discussion of variables in this study, namely: Herzberg Motivator-Hygiene Theory, Organisational, Epistemology Knowledge Management (KM) Theory, and Social Cognitive Theory.

3.1 Herzberg Motivator-Hygiene Theory was employed to discuss job satisfaction. The theory was propounded by Frederick Herzberg in 1959. Herzberg, while emphasising the motivator-hygiene factors sought to explain satisfaction and motivation in the organisation. He interviewed a group of employees to find out what made them feel satisfied and dissatisfied on the job. From these interviews, Herzberg proceeded to build up his theory that there are two dimensions to job satisfaction: “motivation” and “hygiene”. Hygiene issues, according to Herzberg, cannot motivate employees but can minimise their not being satisfied. Hygiene issues include company policies, supervision, salary, interpersonal relations and working conditions. Motivators, on the other hand, create satisfaction by fulfilling individuals' needs for meaningful and personal growth. They are aspects such as achievement, recognition, the work itself, responsibility and advancement (Herzberg, 2003). Once the hygiene areas are addressed, the motivators will promote job satisfaction and encourage productivity. This theory is relevant to this study because when library personnel's needs are adequately and equitably addressed, their morale will be boosted and their level of job satisfaction in the university library will be greatly increased.

3.2 The Organisational Epistemology Knowledge Management (KM) Theory was propounded by Von and Roos in 1995. The theory adopts an epistemological approach in managing organisational knowledge. It distinguishes between individual knowledge and social knowledge. According to Von and Roos, knowledge resides both in the individuals and at a social level within an organisation. The authors submitted that “everything known is known by somebody”. The Von and Roos model of organisation epistemology is actually used for the knowledge management process but can equally be applied to knowledge sharing. The model actually identified five factors that can promote knowledge sharing. First is the mindset of the individual receiving the knowledge as a crucial component of the organisation. Second is the organisational structure; the third and fourth indicators are ‘communication in the organisation’ and ‘relationship between members’, while lastly they identified the management of human resources. Von and Roos discovered that these indicators could affect the successful management of organisational knowledge for innovation, competitive advantage and other organisational goals. The theory is relevant to this study because it sees knowledge as a crucial component of the organisation (library).



Hence, library personnel who are custodians of this crucial knowledge could be encouraged to share it with other library stakeholders.

3.3 The Social Cognitive Theory was propounded by Bandura in 1986. It refers to an individual's belief in his/her abilities to perform duties and bear responsibilities. Bandura's theory explains how behaviour and other cognitive factors influence and interrelate with one another in different ways. The theory emphasised the belief of an individual or group of peoples' abilities to mobilise and motivate cognitive resources and courses of action necessary to meet an occasional need. Self-efficacy, according to Bandura, mediates between an individual's knowledge and his/her actions (Bandura & Bandura, 2006). Bandura believes that in creating and changing the self-efficacy belief system in individuals, the following experiences are crucial, namely; mastery experience, vicarious experience, verbal persuasion and physiological responses. Mastery experience implies that every achievement brings confidence. Vicarious experience is more efficient when people perceive a typical connection between their capacities and the capacities of others. Also, verbal persuasion is frequently used by instructors basically for simplicity and convenience (Bandura, 1977). Sensible self-certification and affirmation from others can support efficacy recognitions. Lastly, a physiological response is particularly persuasive in a task that requires physical strength and stamina. The social cognitive theory is relevant to this study because it emphasises the belief of library personnel's abilities to mobilise and motivate cognitive resources and courses of action necessary to meet occasional needs in the library.

### **Job satisfaction**

Job satisfaction is a phenomenon that is exceptionally complex and that can be interpreted in a variety of ways. It is a state of having no pain, oppression and burden, but a pleasant experience of work (Muthu, Seenii, & Senthilnayagam, 2016). The general productivity of workers, specifically librarians, in any organisation is determined by the level of job satisfaction of such workers (Lamprey, Boateng & Antwi, 2013). It has also been noted that librarians working in organisations that embrace open communication, participatory management, achievement opportunities and trust-based relationships seem more satisfied and committed, and less likely to resign (Burd, 2003; Fanimahin & Popoola, 2013). It has been observed that the level

of job satisfaction among library personnel in most public university libraries in Nigeria is probably low when compared with what is obtainable among their counterparts in the faculties of the same institution (Yaya, 2017). Yaya, Opeke, and Onuoha (2016) also noted that job satisfaction enhances the efficiency of workers in any organisation, especially in the academic libraries as a job satisfied worker is a happy and productive worker.

Knowledge has been conventionally described as beliefs that are true and justified. Knowledge can also be seen as information that comes with insights, framed experience, intuition, judgment, and values (Nonaka, 1994). The greater part of the investigations conducted in the past by Ul-Abedeen, Tazlo, and Steigenberger (2017) analysed knowledge from the polarity of tacit and explicit knowledge. The tacit knowledge is knowledge that reflects in people's aptitudes, recollections, qualities, and points of view. Explicit knowledge, on the other hand, is gained from published documents or that which is codified or documented somewhere. Awodoyin, Osisanwo, Adetoro and Adeyemo (2016) reported that the librarians were also of the view that the benefits accruing to them because of knowledge sharing are numerous. Shared knowledge has enhanced their effectiveness, has been mutually beneficial to those sharing the knowledge; it has boosted their confidence and strengthened bonds and connections.

## **Self-efficacy**

Self-efficacy is the "inside thought" of Bandura's social-cognitive theory and it suggests one's limits in dealing with an issue and playing out an appropriate action (Tojjari, Esmaeili & Bavandpour, 2013). For example, Ash-Argyle and Shoham (2014) carried out a study with regard to the self-perception of librarians with respect to their professional efficacy. One of the significant findings of the study is the positive correlation between self-efficacy in the professional development domain and the degree of involvement in providing research work services and in assisting with students' research processes. The self-efficacy theory bears witness to one's confidence in his/her specific limits which drives him/her to the practices required for achieving results and empowers him/her to do additional efforts (Tojjari *et al.*, 2013). High self-efficacy empowers employees to harness important information, make strong decisions, and take correct action; importantly, when encountering pressure

(Adio & Popoola, 2010). People with a strong sense of self- efficacy assume that they can effectively control the consequence of events in their lives. This perception gives them a different perspective from those with a weak sense of self-efficacy, since this tendency directly influences their behaviour (Tojjari *et al.*, 2013).

## **Methodology**

The survey research design was adopted for this study. The population for this study comprised all the 411 library personnel in the 17 public universities (Federal & State) in South-West, Nigeria. A total of 411 copies of a questionnaire were distributed to the respondents in the university libraries in South-West Nigeria, of which 332 copies were retrieved, giving a response rate of 80.8%. A total enumeration technique was used for this study. University libraries having annexes were also considered in the survey. We postulated four research questions for the study and designed the questionnaire along the identified research questions. The validity of the instrument was tested to ensure that it accurately measured the construct developed for the study. To ascertain the reliability of the study a pilot study was conducted using Cronbach's alpha; the results obtained were 0.85 for job satisfaction, 0.94 for knowledge sharing and 0.91 for self-efficacy. The data collected were analysed using descriptive statistics such as frequency distribution, percentages, mean and standard deviation, especially for research questions. The hypothesis was analysed using descriptive and inferential statistics. The result attested to the mutual relationship that existed among knowledge- sharing, self-efficacy and job satisfaction variables in the study.

| Table 1. Sampling size and sampling frame |        |      |                                                           |                                                                                                     |              |                         |
|-------------------------------------------|--------|------|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------|--------------|-------------------------|
| Geopolitical Region                       | States | S/ N | Public universities for the study                         | Websites address of the universities                                                                | Year founded | No of library personnel |
| S.West, Nigeria                           | Ekiti  | 1    | Federal University, Oye-Ekiti                             | <a href="http://www.fuoye.edu.ng/">http://www.fuoye.edu.ng/</a>                                     | 2011         | 10                      |
|                                           |        | 2    | Ekiti State University, Ado Ekiti                         | <a href="http://www.unad.edu.ng">http://www.unad.edu.ng</a>                                         | 1988         | 27                      |
|                                           | Lagos  | 3    | University of Lagos, Lagos                                | <a href="http://www.unilag.edu.ng">http://www.unilag.edu.ng</a>                                     | 1962         | 52                      |
|                                           |        | 4    | National Open University of Nigeria, Lagos.               | <a href="http://www.nou.edu.ng">http://www.nou.edu.ng</a>                                           | 2002         | 22                      |
|                                           |        | 5    | Lagos State University. Ojo, Lagos.                       | <a href="http://www.lasunigeria.org">http://www.lasunigeria.org</a>                                 | 1983         | 27                      |
|                                           | Ogun   | 6    | Federal Univ of Agriculture, Abeokuta.                    | <a href="http://www.unaab.edu.ng">http://www.unaab.edu.ng</a>                                       | 1988         | 39                      |
|                                           |        | 7    | Olabisi Onabanjo University Ago-Iwoye                     | <a href="http://www.oouagoiwoye.edu.ng">http://www.oouagoiwoye.edu.ng</a>                           | 1982         | 23                      |
|                                           |        | 8    | Tai Solarin University of Education, Ijebu-Ode            | <a href="http://www.tasued.edu.ng">http://www.tasued.edu.ng</a>                                     | 2005         | 15                      |
|                                           | Ondo   | 9    | Federal University of Technology, Akure                   | <a href="http://www.futa.edu.ng">http://www.futa.edu.ng</a>                                         | 1981         | 21                      |
|                                           |        | 10   | Adekunle AjasinUniversity, Akungba.                       | <a href="http://www.adekunleajasinuniversity.edu.ng">http://www.adekunleajasinuniversity.edu.ng</a> | 1999         | 16                      |
|                                           |        | 11   | Ondo State University of Science & Technology,. Okitipupa | <a href="http://www.osustech.edu.ng">http://www.osustech.edu.ng</a>                                 | 2008         | 9                       |
|                                           |        | 12   | University of Medical Sciences, Ondo                      | <a href="http://www.unimed.edu.ng">http://www.unimed.edu.ng</a>                                     | 2015         | 6                       |
|                                           | Osun   | 13   | Obafemi Awolowo University, Ile-Ife                       | <a href="http://www.oauife.edu.ng">http://www.oauife.edu.ng</a>                                     | 1962         | 36                      |
|                                           |        | 14   | Osun State University., Osogbo                            | <a href="http://www.uniosun.edu.ng">http://www.uniosun.edu.ng</a>                                   | 2006         | 17                      |
|                                           | Oyo    | 15   | University of Ibadan, Ibadan                              | <a href="http://www.ui.edu.ng">http://www.ui.edu.ng</a>                                             | 1948         | 61                      |
|                                           |        | 16   | Ladoke Akintola Univ. of Tech., Ogbomosho                 | <a href="http://www.lautech.edu.ng">http://www.lautech.edu.ng</a>                                   | 1990         | 28                      |
|                                           |        | 17   | First Technical University, Ibadan                        | <a href="http://www.techu.edu.ng">http://www.techu.edu.ng</a>                                       | 2012         | 2                       |
| TOTAL                                     |        |      |                                                           |                                                                                                     |              | 411                     |

**Table 2: Demographic characteristics of respondents**

| S/N | Demographic Statement             | Frequency | Percentage % |
|-----|-----------------------------------|-----------|--------------|
| 1.  | Gender                            |           |              |
|     | Male                              | 192       | 57.8         |
|     | Female                            | 140       | 42.2         |
|     | Total                             | 332       | 100.0        |
| 2.  | Marital status                    |           |              |
|     | Single                            | 43        | 13.0         |
|     | Married                           | 284       | 85.5         |
|     | Divorced                          | 4         | 1.2          |
|     | Widowed                           | 1         | .3           |
|     | Total                             | 332       | 100.0        |
| 3.  | Age of respondents                |           |              |
|     | ≤20                               | 5         | 1.5          |
|     | 21-30                             | 27        | 8.1          |
|     | 31-40                             | 99        | 29.8         |
|     | 41-50                             | 126       | 38.0         |
|     | 51-60                             | 69        | 20.8         |
|     | 61 and above                      | 6         | 1.8          |
|     | Total                             | 332       | 100.0        |
| 4.  | Highest Educational qualification |           |              |
|     | Diploma                           | 91        | 27.4         |
|     | BSc/BA                            | 99        | 29.8         |
|     | BLIS                              | 6         | 1.8          |
|     | MSc/MA                            | 2         | .6           |
|     | MLIS                              | 124       | 37.4         |
|     | PhD                               | 10        | 3.0          |
|     | Total                             | 332       | 100.0        |
| 5.  | Designation                       |           |              |
|     | Library officer                   | 143       | 43.1         |
|     | Assistant Librarian               | 60        | 18.1         |
|     | Librarian II                      | 41        | 12.3         |
|     | Librarian I                       | 39        | 11.7         |
|     | Senior Librarian                  | 27        | 8.1          |
|     | Principal Librarian               | 16        | 4.8          |
|     | Deputy University Librarian       | 5         | 1.5          |
|     | University Librarian              | 1         | .3           |
|     | Total                             | 332       | 100.0        |
| 6.  | Length of service                 |           |              |
|     | Below 6 years                     | 63        | 19.0         |
|     | 6-10 years                        | 89        | 26.8         |
|     | 11-15 years                       | 69        | 20.8         |
|     | 16-20years                        | 54        | 16.3         |
|     | 21-25 years                       | 21        | 6.3          |
|     | 26-30 years                       | 22        | 6.6          |
|     | Above 30 years                    | 14        | 4.2          |
|     | Total                             | 332       | 100.0        |

## **Results**

This section represents demographics and reports findings based on the three research questions.

### **Demographic information of respondents**

The respondents for this research were library personnel (librarians and library officers). The socio-demographic characteristics examined in this study included gender, marital status, age, highest educational qualification, designation and length of service of the respondents.

From Table 2, 192 (57.8%) of the respondents were male. This indicates that there was a somewhat larger number of males in the librarianship profession than women in South-West Nigeria. It additionally uncovered that a larger number of the respondent, 284 (85.5%), were married. This implies that they are likely to show maturity while carrying out their obligations to the library users in their different universities. It also revealed that there were more library personnel in the age bracket of 41-50 years, 126 (38%). With regard to the educational qualifications of the respondents, 124 (37.4%) were holders of master's degrees in Library and Information Science (MLIS) while 99 (29.8%) were holders of bachelor's degrees in Library and Information Science. This implies that about 67% of the respondents were professionally qualified librarians. It was also revealed (read from the table) that 143 (43.1%) of library personnel in Nigerian university libraries belong to the library officer cadre. The table further revealed that only 5 (1.5%) deputy librarians and 1 (0.3%) University Librarian responded to the questionnaire. This trend is appropriate, with personnel in these groups, which may be attributed to their busy office schedules.

Research Question one: What is the level of job satisfaction of library personnel in public university libraries in South-West Nigeria?

| Table 3: Level of job satisfaction of the library personnel |                                                                           |                |                |                |              |      |                       |      |
|-------------------------------------------------------------|---------------------------------------------------------------------------|----------------|----------------|----------------|--------------|------|-----------------------|------|
| S/N                                                         | STATEMENT                                                                 | VHL<br>(%)     | HL<br>(%)      | LL<br>(%)      | ZL<br>(%)    | Mean | Standard<br>Deviation | AM   |
|                                                             | Hygiene                                                                   |                |                |                |              |      |                       |      |
| a.                                                          | leadership styles                                                         |                |                |                |              |      |                       |      |
| i.                                                          | I am satisfied with the management style in my library                    | 98<br>(29.5%)  | 141<br>(42.5%) | 86<br>(25.9%)  | 7<br>(2.1%)  | 2.99 | 0.80                  | 3.02 |
| ii.                                                         | My relationship with my supervisor is very satisfactory                   | 96<br>(28.9%)  | 170<br>(51.2%) | 59<br>(17.8%)  | 7<br>(2.1%)  | 3.07 | 0.74                  |      |
| iii.                                                        | In my library, the leadership gives recognition when job is properly done | 103<br>(31.0%) | 137<br>(41.3%) | 137<br>(26.2%) | 5<br>(1.5%)  | 3.02 | 0.80                  |      |
| iv                                                          | The leaders have the interest of the subordinates at heart in my library  | 103<br>(31.0%) | 137<br>(41.3%) | 70<br>(21.1%)  | 22<br>(6.6%) | 2.97 | 0.89                  |      |
| v                                                           | In my library, the leadership gives room for team work                    | 112<br>(33.7%) | 148<br>(44.6%) | 62<br>(18.7%)  | 3<br>(3.0%)  | 3.09 | 0.80                  |      |
| B                                                           | Conducive work environment                                                |                |                |                |              |      |                       |      |

Key: VHL = Very High level, HL = High Level, LL = Low Level, ZL = Zero level, M = Mean, SD = Standard Deviation; AM = Average Mean

\*\*\*Decision Rule: if mean falls between 1 - 1.49 = Zero level; 1.5 - 2.49 = Low Level; 2.5-3.49 = High level; 3.5 - 4 = Very High level

From Table 2, it can be deduced that library personnel in public university libraries in South-West Nigeria considered their level of job satisfaction to be high, making a decision by the overall mean score of 2.82 on the scale of 4. They considered the good leadership styles in practice as the reasons for their high level of job satisfaction (mean = 3.02). For instance, about 78% of library personnel claimed their library leadership made provision for teamwork on a high level or very high level scale. Again about 52% library personnel claimed their relationship with their supervisor was satisfactory on a high-level scale. Another important implication of this is that all the indicators under Hygiene, namely leadership styles, 'conducive work environment' and remuneration were considered as high to the library personnel's' job satisfaction, as each of them had average mean scores of 3.02, 2.91 and 2.83 respectively.

|      |                                                                             |                |                |                |               |     |
|------|-----------------------------------------------------------------------------|----------------|----------------|----------------|---------------|-----|
|      |                                                                             | (11.4%)        | (41.9%)        | (39.5%)        | (7.2%)        |     |
| iv.  | My salary is sufficient to meet all my essential needs                      | 24<br>(7.2%)   | 84<br>(25.3%)  | 157<br>(47.3%) | 67<br>(20.2%) | 2.9 |
| v.   | My present designation in the library corresponds with my current salary.   | 57<br>(17.2%)  | 126<br>(38.0%) | 110<br>(33.1%) | 39<br>(11.7%) | 2.5 |
|      | Motivator                                                                   |                |                |                |               |     |
| d.   | Employees' promotion opportunities                                          |                |                |                |               |     |
| i.   | My promotion is regular                                                     | 98<br>(29.5%)  | 106<br>(31.9%) | 106<br>(31.9%) | 22<br>(6.6%)  | 2.8 |
| ii.  | My boss recommends me for advancement frequently                            | 84<br>(25.3%)  | 145<br>(43.7%) | 70<br>(21.1%)  | 33<br>(9.9%)  | 2.8 |
| iii. | I receive promotion as at when due                                          | 82<br>(24.7%)  | 145<br>(43.7%) | 87<br>(26.2%)  | 18<br>(5.4%)  | 2.8 |
| iv.  | I am satisfied with the opportunities for regular promotion                 | 71<br>(21.4%)  | 156<br>(47.0%) | 85<br>(25.6%)  | 20<br>(6.0%)  | 2.8 |
| v.   | My advancement correlates with the level of my contribution to the library  | 60<br>(18.1%)  | 150<br>(45.2%) | 94<br>(28.3%)  | 28<br>(8.4%)  | 2.7 |
| e.   | Career advancement opportunities                                            |                |                |                |               |     |
| i.   | I am permitted to attend conferences/workshops                              | 100<br>(30.1%) | 125<br>(37.7%) | 92<br>(27.7%)  | 15<br>(4.5%)  | 2.9 |
| ii.  | I am supported by the library to attend local conferences/workshops         | 75<br>(22.6%)  | 117<br>(35.2%) | 90<br>(27.1%)  | 50<br>(15.1%) | 2.6 |
| iii. | I am supported by the library to attend international conferences/workshops | 72<br>(21.7%)  | 82<br>(24.7%)  | 96<br>(28.9%)  | 82<br>(24.7)  | 2.4 |
| iv.  | My supervisor designs with me my career                                     | 58             | 105            | 107            | 62            | 2.4 |

## Research Question 2: What is the level of knowledge sharing of library personnel in public university libraries in South-West Nigeria?



| Table 4: Level of knowledge sharing of the respondents |                                                                                                                                                  |                |                |               |               |      |                       |      |
|--------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|---------------|---------------|------|-----------------------|------|
| S/N                                                    | STATEMENT                                                                                                                                        | VHL<br>(%)     | HL<br>(%)      | LL<br>(%)     | Z L<br>(%)    | Mean | Standard<br>Deviation | AM   |
| a.                                                     | Willingness to share                                                                                                                             |                |                |               |               |      |                       |      |
| i.                                                     | I think it is important to share                                                                                                                 | 201<br>(60.5%) | 120<br>(36.1%) | 11<br>(3.3%)  | -             | 3.57 | 0.56                  | 3.59 |
| ii.                                                    | I like to share knowledge                                                                                                                        | 232<br>(69.9%) | 89<br>(26.8%)  | 8<br>(2.4%)   | 3<br>(0.9%)   | 3.66 | 0.57                  |      |
| iii.                                                   | I find it personally satisfying                                                                                                                  | 208<br>(62.7%) | 118<br>(35.5%) | 6<br>(1.8%)   | -             | 3.61 | 0.53                  |      |
| iv                                                     | I want others to know what I am doing                                                                                                            | 209<br>(63.0%) | 103<br>(31.0%) | 18<br>(5.4%)  | 2<br>(0.6%)   | 3.56 | 0.63                  |      |
| v                                                      | I think I have things to learn from others                                                                                                       | 200<br>(60.2%) | 114<br>(34.3%) | 17<br>(5.1%)  | 1<br>(0.3%)   | 3.55 | 0.61                  |      |
|                                                        | Recognition                                                                                                                                      |                |                |               |               |      |                       |      |
| i.                                                     | I feel proud of my self                                                                                                                          | 174<br>(52.4%) | 118<br>(35.5%) | 18<br>(5.4%)  | 22<br>(6.6%)  | 3.34 | 0.86                  | 3.18 |
| ii.                                                    | I want my co-worker to know I am competent                                                                                                       | 134<br>(40.4%) | 111<br>(33.4%) | 64<br>(19.3%) | 23<br>(6.9%)  | 3.07 | 0.93                  |      |
| iii.                                                   | I want to be respected by my co-worker                                                                                                           | 120<br>(36.1%) | 131<br>(39.5%) | 47<br>(14.2%) | 34<br>(10.2%) | 3.02 | 0.96                  |      |
| iv                                                     | I want to improve the performance and reputation of my library                                                                                   | 150<br>(45.2%) | 146<br>(44.0%) | 30<br>(9.0%)  | 6<br>(1.8%)   | 3.33 | 0.71                  |      |
| v                                                      | I may get rewarded by my library                                                                                                                 | 115<br>(34.6%) | 133<br>(40.1%) | 72<br>(21.7%) | 12<br>(3.6%)  | 3.06 | 0.84                  |      |
| c.                                                     | Interaction                                                                                                                                      |                |                |               |               |      |                       |      |
| i.                                                     | I have access to necessary communication tools for sharing knowledge                                                                             | 87<br>(26.2%)  | 171<br>(51.5%) | 63<br>(19.0%) | 11<br>(3.3%)  | 3.01 | 0.77                  | 3.09 |
| ii.                                                    | Knowledge sharing amongst the internal staff takes place through regular communication at review meetings, coffee rooms, corridors in my library | 109<br>(32.8%) | 129<br>(38.9%) | 73<br>(22.0%) | 21<br>(6.3%)  | 2.98 | 0.90                  |      |

|      |                                                                                    |                    |                |                |               |      |      |      |
|------|------------------------------------------------------------------------------------|--------------------|----------------|----------------|---------------|------|------|------|
| iii. | There is enough time to share knowledge                                            | 114<br>(34.3%)     | 139<br>(41.9%) | 67<br>(20.2%)  | 12<br>(3.6%)  | 3.07 | 0.83 |      |
| iv.  | We can interact as colleagues in my library                                        | 144<br>(43.4%)     | 138<br>(41.6%) | 48<br>(14.5%)  | 2<br>(0.6%)   | 3.28 | 0.73 |      |
| v.   | My library does not have rigorous procedure to sharing knowledge                   | 119<br>(35.8%)     | 150<br>(45.2%) | 43<br>(13.0%)  | 20<br>(6.0%)  | 3.11 | 0.85 |      |
| d.   | Work Culture                                                                       |                    |                |                |               |      |      | 2.61 |
| i.   | Reward system in my library is tied to employees' effort towards knowledge sharing | 22<br>(6.6%)       | 120<br>(36.1%) | 135<br>(40.7%) | 55<br>(16.6%) | 2.33 | 0.83 |      |
| ii.  | My library increases my benefits if I engage in high quality knowledge sharing     | 32<br>(9.6%)       | 68<br>(20.5%)  | 149<br>(44.9%) | 83<br>(25.0%) | 2.15 | 0.91 |      |
| iii. | Everyone in my library feels responsible for sharing knowledge                     | 71<br>(21.4%)      | 99<br>(29.8%)  | 117<br>(35.2%) | 45<br>(13.6%) | 2.59 | 0.97 |      |
| iv.  | My organisation provides a learning environment                                    | 114<br>(34.3%)     | 132<br>(39.8%) | 68<br>(20.5%)  | 18<br>(5.4%)  | 3.03 | 0.88 |      |
| v.   | My library discourages negative behavior towards knowledge sharing                 | 89<br>(26.8%)      | 156<br>(47.0%) | 73<br>(22.0%)  | 14<br>(4.2%)  | 2.96 | 0.81 |      |
|      |                                                                                    | Overall mean= 3.11 |                |                |               |      |      |      |

**Key: VHL = Very High Level, HL = High Level, LL = Low Level, ZL = Zero Level, Mean, Standard Deviation; AM = Average Mean**

**\*\*\*Decision Rule: if mean falls between 1 - 1.49 = Zero level; 1.5 - 2.49 = Low Level; 2.5-3.49 = High level; 3.5 - 4 = Very High level**

Table 4 revealed that library personnel in Nigerian Universities considered their level of knowledge sharing to be high, judging by the overall mean score of 3.11 on the scale of 4. A willingness to share was considered very high, with an average mean score of 3.56 and recognition is high (average mean = 3.18), followed by interaction (average mean = 3.09) and lastly, work culture was considered high with an average mean score of 2.61. It shows that library personnel were willing to share both their tacit and explicit knowledge with colleagues and other stakeholders in the library and the university at large. Other implications that can be deduced from Table 4 is that the majority of the respondents indicated that 'I found it personally satisfying to share

knowledge' judging by its low standard deviation value as well as about 98% of respondents that indicated either very high or high level scale for it.

| Table 5: Level of self-efficacy of the respondents |                                                                                                                                                               |                |                |               |               |      |      |      |
|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|---------------|---------------|------|------|------|
| S/N                                                | STATEMENT                                                                                                                                                     | VHL<br>(%)     | HL<br>(%)      | LL<br>(%)     | ZL<br>(%)     | M    | SD   | AM   |
| a.                                                 | Verbal/ social persuasion                                                                                                                                     |                |                |               |               |      |      |      |
| i.                                                 | If someone opposes me, I can find the means and ways to achieve what I want done.                                                                             | 112<br>(33.7%) | 155<br>(46.7%) | 53<br>(16.0%) | 12<br>(3.6%)  | 3.11 | 0.80 | 3.32 |
| ii.                                                | I can perform a task effectively, even when I have been told that I am not capable of achieving it and have never attempted it before or watched anyone do it | 143<br>(43.1%) | 139<br>(41.9%) | 26<br>(7.8%)  | 24<br>(7.2%)  | 3.21 | 0.87 |      |
| iii.                                               | I can achieve a better result, when I am told I am capable and would have no difficulty in achieving such task.                                               | 193<br>(58.1%) | 123<br>(37.0%) | 11<br>(3.3%)  | 5<br>(1.5%)   | 3.52 | 0.64 |      |
| Iv                                                 | I can perform my duty better whenever I am acknowledged for my effort                                                                                         | 197<br>(59.3%) | 95<br>(28.6%)  | 32<br>(9.6%)  | 8<br>(2.4%)   | 3.45 | 0.77 |      |
| b                                                  | Physiological response                                                                                                                                        |                |                |               |               |      |      |      |
| i.                                                 | I can remain calm when facing difficulties because I can rely on my coping strengths and abilities                                                            | 168<br>(50.6%) | 147<br>(44.3%) | 9<br>(2.7%)   | 8<br>(2.4%)   | 3.43 | 0.67 | 3.16 |
| ii.                                                | I am good at solving problems when I feel physically and emotionally normal                                                                                   | 166<br>(50.0%) | 147<br>(44.3%) | 13<br>(3.9%)  | 6<br>(1.8%)   | 3.42 | 0.66 |      |
| iii.                                               | Whenever I feel fatigued and stressed, I rarely complete a task                                                                                               | 99<br>(29.8%)  | 148<br>(44.6%) | 74<br>(22.3%) | 11<br>(3.3%)  | 3.01 | 0.81 |      |
| iv                                                 | If I am trouble, I can rarely think of a solution                                                                                                             | 90<br>(27.1%)  | 110<br>(33.1%) | 94<br>(28.3%) | 38<br>(11.4%) | 2.76 | 0.98 |      |
| c.                                                 | Vicarious experience                                                                                                                                          |                |                |               |               |      |      |      |
| i.                                                 | I am better at doing my job when I work as a team member                                                                                                      | 118<br>(35.5%) | 144<br>(43.4%) | 52<br>(15.7%) | 18<br>(5.4%)  | 3.09 | 0.85 |      |
| ii.                                                | I can solve a problem when I watch my                                                                                                                         | 116            | 185            | 20            | 11            | 3.22 | 0.70 |      |

|      |                                                                                                                                                        |                    |                |                |                |      |      |      |
|------|--------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|----------------|----------------|----------------|------|------|------|
|      | colleagues/someone performing such task                                                                                                                | (34.9%)            | (55.7%)        | (6.0%)         | (3.3%)         |      |      |      |
| iii. | I find it difficult to attempt or carry out a particular task when I have watched someone having some difficulties in achieving a similar task         | 57<br>(17.2%)      | 45<br>(13.6%)  | 140<br>(42.2%) | 90<br>(27.1%)  | 2.21 | 1.03 | 2.65 |
| iv.  | I find it difficult to attempt a task when I have watched someone attempted such task unsuccessfully which I have never attempted doing before myself. | 38<br>(11.4%)      | 64<br>(19.3%)  | 118<br>(35.5%) | 112<br>(33.7%) | 2.08 | 0.99 |      |
| d.   | Mastery experience                                                                                                                                     |                    |                |                |                |      |      |      |
| i.   | If I cannot do a job the first time, I keep attempting until the point when I can                                                                      | 187<br>(56.3%)     | 107<br>(32.2%) | 23<br>(6.9%)   | 15<br>(4.5%)   | 3.40 | 0.81 |      |
| ii.  | When trying to learn something new, I soon give up if I am not initially successful                                                                    | 40<br>(12.0%)      | 50<br>(15.1%)  | 108<br>(32.5%) | 134<br>(40.4%) | 1.99 | 1.02 |      |
| iii. | When things look excessively troublesome for me, I abstain from attempting to do them                                                                  | 40<br>(12.0%)      | 59<br>(17.8%)  | 128<br>(38.6%) | 105<br>(31.6%) | 2.10 | 0.98 |      |
| iv.  | I lose courage whenever I fail in an assigned job/duty                                                                                                 | 16<br>(4.8%)       | 60<br>(18.1%)  | 138<br>(41.6%) | 118<br>(35.5%) | 1.92 | 0.85 | 2.35 |
|      |                                                                                                                                                        | Overall mean= 2.87 |                |                |                |      |      |      |

**Key:** VHL = Very High Level, HL = High Level, ML = Medium Level, LL = Low Level, SD = Standard Deviation; AM = Average Mean

\*\*\*Decision Rule: if mean falls between 1 - 1.49 = Zero level; 1.5 - 2.49 = Low Level; 2.5-3.49 = High level; 3.5 - 4 = Very High level

### Research Question 3: What is the level of self-efficacy of library personnel in public university libraries in South-West Nigeria?

Table 5 shows that library personnel in public university libraries in South-West Nigeria considered their level of self-efficacy to be high. The overall mean score is 2.87 on the scale of 4. They considered their level of verbal/ social persuasion to be high with 3.32 average mean. They also considered their physiological response to be high (average mean = 3.16). Furthermore, their level of vicarious experience is also seen as high (average mean = 2.65); however, mastery experience is

considered low (average mean = 2.35). Another implication that can be deduced from table 4.4 is that the majority of the respondents indicated that when things look excessively troublesome for them, they abstain from attempting to do them, judging by about 71% of respondents that indicated either low or zero level scale under it.

## **Discussion of findings**

This section discusses the salient findings of this study as they relate to previous studies. The discussion follows the research questions and it is on this basis that sources of relationships between knowledge sharing, self-efficacy and job satisfaction of library personnel were established through past empirical studies. Each of the three research questions and the hypothesis were discussed based on their influences on the job satisfaction of library personnel in public universities in South-West Nigeria. The findings of the study are discussed as follows:

Research question one sought to determine the level of job satisfaction of library personnel in public university libraries in South-West Nigeria. The result showed that library personnel considered the leadership styles that were practiced as good and that the conducive work environment in their library was their greatest measure of job satisfaction in the university system. The results were supported by the submissions of Burd (2003); Fanimihin & Popoola (2013) who reported that librarians working in organisations that embraced open communication, participatory management, achievement opportunities and trust-based relationships seem more satisfied and committed and less likely to resign.

Research question two sought to determine the level of knowledge sharing of library personnel in public universities in South-West Nigeria. Findings from research question two showed that 'willingness to share' appeared to have a higher average mean score of 3.59 followed by recognition given by the management to the practice of knowledge sharing, with an average mean of 3.18. It showed that library personnel were always willing to share their knowledge irrespective of whether the administration gave recognition. It was equally revealed that interaction among library personnel was a key factor in their knowledge sharing, with an average mean of 3.09. Similar to the findings of this study, Awodoyin *et al.* (2016) found that knowledge

sharing is of immense benefit to library workers because it propels them to innovate, with new knowledge and collective ideas.

Research question three sought to determine the level of self-efficacy of library personnel in public university libraries in South-West Nigeria . Findings from research question three showed that verbal/social persuasion and the physiological response of library personnel contributed immensely to their self-efficacy level. The findings implied that library personnel were more inclined towards the areas of self efficacy. However, this is not consistent with the findings of Ash-Argyle and Shoham (2014), who found a low degree of self-efficacy in professional and technological skills from their research on the self-efficacy and role perception of school librarians opening the door for variations

Consequently, the findings from the hypothesis showed a significant combined predictive relationship among knowledge sharing, self-efficacy and job satisfaction of library personnel in public university libraries in South-West, Nigeria, thus nullifying the earlier stated hypothesis. The findings of this study confirmed the existing dearth of research investigating the connections between issues such as knowledge sharing and self-efficacy on the one hand and job satisfaction on the other. Thus, this study has created a platform through which the existing gap has been filled and a bedrock on which future research could be built. It can be noted that when a library personnel have the ability to produce a desired effect, possess adequate training on knowledge and are always willing to exchange knowledge with others, they would be happy and enjoy satisfaction when carrying out their duties in the university library.

The only hypothesis for this study was tested using multiple linear regression analysis. The result generated was used to attest to the mutual relationship that existed among the variables (knowledge sharing, self-efficacy and job satisfaction) in this study.

**Hypothesis 1: There is no combined significant influence of knowledge sharing and self-efficacy on job satisfaction of library personnel in public university libraries in South-West, Nigeria.**

| Table 6: Multiple linear regression showing combined significant influence of knowledge sharing and self-efficacy on job satisfaction of library personnel in public universities in South-West, Nigeria |                             |            |                           |        |                   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|------------|---------------------------|--------|-------------------|
| Coefficients                                                                                                                                                                                             |                             |            |                           |        |                   |
| Model                                                                                                                                                                                                    | Unstandardised Coefficients |            | Standardised Coefficients | t      | Sig.              |
|                                                                                                                                                                                                          | B                           | Std. Error |                           |        |                   |
| (Constant)                                                                                                                                                                                               | . 1.248                     | 0.165      |                           | 4.511  | 0.000             |
| Knowledge sharing                                                                                                                                                                                        | 0.252                       | 0.081      | 0.197                     | 3.111  | 0.002             |
| Self- efficacy                                                                                                                                                                                           | 0. 552                      | 0.057      | 0.342                     | 5.393  | 0.000             |
| a Dependent Variable: Job satisfaction                                                                                                                                                                   |                             |            |                           |        |                   |
| Testing for combined significant influence of Knowledge sharing and Self-efficacy on Job satisfaction                                                                                                    |                             |            |                           |        |                   |
| ANOVA <sup>a</sup>                                                                                                                                                                                       |                             |            |                           |        |                   |
| Model                                                                                                                                                                                                    | Sum of Squares              | Df         | Mean Square               | F      | Sig.              |
| Regression                                                                                                                                                                                               | 21.332                      | 2          | 10.666                    | 52.929 | .000 <sup>a</sup> |
| Residual                                                                                                                                                                                                 | 66.300                      | 329        | .202                      |        |                   |
| Total                                                                                                                                                                                                    | 87.632                      | 331        |                           |        |                   |
| a. Predictors: (Constant), Knowledge Sharing, Self-efficacy                                                                                                                                              |                             |            |                           |        |                   |
| b. Dependent Variable: Job Satisfaction                                                                                                                                                                  |                             |            |                           |        |                   |
| <b>R = 0.493</b>                                                                                                                                                                                         |                             |            |                           |        |                   |
| <b>R<sup>2</sup> = 0.243</b>                                                                                                                                                                             |                             |            |                           |        |                   |
| <b>Adjusted R Square = 0.239</b>                                                                                                                                                                         |                             |            |                           |        |                   |

Table 6 shows that the combined contribution of the independent variables (Knowledge sharing and Self-efficacy) on the job satisfaction of library personnel in public university libraries in South-West Nigeria was significant. The table also shows that the analysis of variance (ANOVA) for the regression yielded an F-value of 52.929 ( $P < 0.05$  level). This implies that the combined influence of the independent variables on the dependent variable was significant. This indicates that knowledge-sharing and self-efficacy have a significant combined influence on the job satisfaction of library personnel in public university libraries in South-West Nigeria.

Besides, the table also reveals a coefficient of multiple correlation  $R = 0.493$ , coefficient of  $R^2 = 0.243$  and adjusted  $R^2 = 0.239$ . The model implies that knowledge sharing and self-efficacy jointly account for almost 24% change or variation in the job satisfaction of library personnel in public university libraries in South-West Nigeria. The remaining 76% as observed here may be due to other factors influencing job satisfaction of library personnel in the South-West Nigerian public universities. Consequently, the null hypothesis that there is no combined significant influence of knowledge sharing and self-efficacy on the job satisfaction of library personnel in public university libraries in South-West, Nigeria is therefore rejected.

## Conclusion

This study has found the following:

- Library personnel in public university libraries in South-West Nigeria saw their level of job satisfaction as high. They ascribed this mainly to good leadership styles in operation in their library.
- Library personnel's level of knowledge sharing was also high. They ascribed this to their willingness to share, recognition of and interaction with other colleagues. The library personnel's level of self-efficacy was similarly high. They ascribed this to a high degree of verbal/social persuasion coupled with their physiological response ability. Knowledge- sharing and self-efficacy combined have a positive and significant influence on library personnel's job satisfaction.
- The hypothesis that there is no combined significant influence of knowledge sharing and self-efficacy on job satisfaction of library personnel in public university libraries in South-West, Nigeria is therefore rejected.

In view of the findings that were uncovered in this study, the accompanying recommendations are therefore proffered as the way forward:

- It was discovered that library personnel may lack mastery experience. This was ascribed to their lack of courage to try again whenever they fail in a particular assigned duty. The library and university administration should organise self-efficacy training for library personnel in order to improve their capabilities.



- Library personnel should be given proper recognition as custodians and providers of information resources required in supporting the educational curricula of every academic programme in the university system.

The findings of this study demonstrate that knowledge-sharing and self-efficacy together corresponded with the job satisfaction of library personnel in the public university libraries in South-West, Nigeria. This implies that genuinely inspired library personnel, who have a great understanding of his feeling will progressively be productive in the university library. Additionally, the investigation confirmed that a satisfied employee is a fulfilled one. Likewise, the study similarly found that library personnel in South-West Nigerian universities saw their degree of job satisfaction as high. They ascribed this to the great leadership styles that were prevalent in their library plus the fact that they were being recognised by the authorities as the best measures of their job satisfaction in the university system. With the aforementioned, there would be great development and improvement in the university system as library personnel will always put in their best to ensure the further growth of the system.

In all, the study demonstrated some challenging issues confronting job satisfaction of library personnel in the university setting. They ascribed these to non-payment of allowances paid to other academic staff as well as a lack of adequate recognition and marginalisation of librarians by the university authorities. On the off- chance that these problems are not checked, they will cause low morale and the loss of experienced library personnel in the university system. Likewise, the findings of this study in the area of deficient funding of library resources; will result in insufficient provision of significant educational resources to support the curricula and programmes in the university system.

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# Change management in the implementation of electronic health records systems (EHR) at Inkosi Albert Luthuli Hospital, South Africa

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## Abstract

*For decades, most public hospitals have relied on managing records manually, using different formats of classification. However, hospitals in South Africa are now changing to electronic health records for the day-to-day functioning driven by an eHealth strategy. Earlier studies conducted on the health record management in Kwa-Zulu Natal, Limpopo, Eastern Cape, Gauteng and Western Cape in South Africa, all point to scant evidence on change management in electronic health records system implementation in public hospitals in South Africa. This paper presents empirical results of an investigation regarding the management of change in the implementation of the EHR system at the Inkosi Albert Luthuli Central Public Hospital Ethekeeni area, Kwa-Zulu Natal. The findings show that an ill-defined change management approach in the EHR system implementation could hinder the progress and health service delivery. The study recommended that the implementation of a robust and functional EHR system must be equally accompanied by viable and executable parallel change management blueprints.*

**Keywords:** Change management, electronic health records system, health information technology, EHR, Inkosi Albert Luthuli Central hospital, public hospital

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## Introduction

Most hospitals in South Africa have relied on managing records manually using different formats of classification (Msomi, 2019). However, recently hospitals are changing to electronic health records systems for the day-to-day functioning and quality service delivery. Schutznak and Fernandopulle, (2014) have declared that the, “digital age of medicine is upon us”. Therefore the efficacious adoption and implementation of electronic health records systems depends on understanding the factors contributing to and influencing change management. Electronic records management systems are designed to preserve the structure, validate content, framework and interactions of records to facilitate accessibility and sustain value for referral evidence (Hoffman & Podgurski, 2008). Challenges facing the South African public health sector in records management have been extensively examined by different authors, e.g. Erasmus and Van Der Walt 2015; Katuu 2015; Luthuli 2017); Marutha 2011; O’Mahony 2009; Thomas 2016; Weeks 2013. The research has revealed common issues not limited to misfiling or missing files, duplication of files, illegal access and obliteration of records, long waiting times to receive medical attention, limited human resources, poor handwriting and more. The authors further endorsed the execution and use of an electronic health records system. Although Marutha and Ngoepe (2018) entrenched a medical records management framework that can assist public hospitals to implement successful record-keeping, concerns of management change in the implementation process have not been fully considered in-depth.

This paper sought to examine change management in EHR system implementation at Inkosi Albert Luthuli Central Public Hospital, located at Cator Manor in Durban. It is a tertiary and quaternary hospital and patients are referred from other hospitals via electronic/telephone book system. The hospital offers primary care services such as radiology and pathology, and consist of domains for medical, surgery, mother and child (disease?) prevention, peri-operative (care?) and professional (?) allied to medical support. The hospital is the first in Africa to deploy and upgrade to MEDITECH 6.1.5 platform, the electronic health records system that assists with hospital administration, HIV and TB related treatment, care and support services for terminally and chronically ill patients, mental-related illness. It also offers services for pregnant woman and handles medical assessments and referrals (MEDITECH,

2018). The 846 bed hospital implemented and went live with the MEDITECH system in August 2016 from the old work flow system used in previous years.

## **Problem and purpose of the study**

The overall problem is that for many years South Africa has been attempting to implement electronic health records systems in both public and private hospitals, yet concerns and issues of managing change in their implementation have not been fully addressed. Even though several previous studies (Luthuli, 2017; Marutha, 2016; Thomas, 2016; Katuu, 2015; Marutha, 2012; Weeks, 2012) have pointed out the necessity of implementing electronic health records systems to improve health service delivery in South Africa,; the question regarding the management of change has not been fully examined in depth, there is no notable evidence in KwaZulu-Natal specifically at Inkosi Albert Luthuli Central hospital. For example, Luthuli (2017) has in a comparative analysis of public and private hospitals in Kwa-Zulu Natal acknowledged the need for the ICT integration to improve the management of health records for public health service delivery. Nonetheless, the study does not examine change management in this integration process. Likewise, Marutha (2012) focused on the assessment of medical records management in healthcare service delivery in Limpopo province, and mentioned the need for adopting electronic health systems to ensure successful delivery of health services but fall short of recommending change management strategies in their implementation. Thomas (2016), however, examined the EHR implementation in primary healthcare and underscores the high degree of change that should be managed during pre- and post- adoption of EHR. This study was restricted to the primary health care, and did not do any in-depth comparative analysis regarding change management in the implementation of EHR. Weeks (2012) indicates that human socio-technology factors in EHR change need to be actively managed, nevertheless the researcher did not recommend in-depth on how those factors would be addressed.

The existing literature reveals little evidence of empirical studies conducted on change management in the implementation of EHR systems in South Africa, particularly in Kwa-Zulu-Natal. The study sought to evaluate change management orientation in operation of EHR in eThekwin area with specific reference to Inkosi Albert Luthuli. The study is intended to contribute to the development of an EHR

framework that supports successful implementation of health information technology to improve health service delivery. Furthermore, the study provides insight into the management of change for health-care professionals, hospital management, IT experts and records management personnel in the integration of ICT for the improvement of health care and service delivery.

The following were research objectives for the study:

- To determine factors facilitating the adoption of EHR in public and private hospitals.
- To assess changes experienced by hospitals due to EHR implementation.
- To examine how hospitals monitor and evaluate the impact of EHR implementation.
- To determine tools used by hospital leadership to reinforce change and sustain results.

## **Theory and literature review**

The study adopted a leading change model in integration with technology acceptance model. The study triangulated the leading change model with TAM in order to understand various factors that influence the implementation, acceptance, use and benefits of electronic health records systems at Inkosi Albert Luthuli Hospital. Theory triangulation involves at least two set theories interpreting a single set of data (Saldana & Omasta, 2017). The models were chosen upon the foundation of earlier studies by Martin and Voynov (2014) that utilised the leading change model with TAM to assess the implementation and operation of EHR in physician's practices. Both models allowed the researcher to get an insight of the pre- or post-implementation and acceptance of the EHR system; even if the EHR implementation was done years back in the hospital. The leading change model and TAM model also evaluates the changing behaviour of hospital employees towards tactical processes on their daily duties using the EHR systems. Martin and Voynov (2014: 629) indicate that the Kotter change management model serves as a foundation for understanding a complex setting. The Inkosi Albert Luthuli Central Hospital is one of the complex, biggest hospitals in KwaZulu-Natal with different segments and health professionals working directly or indirectly in the hospital, comprising top management, doctors, nurses, and

administrators working directly or indirectly with EHR systems (Antwi & Kale, 2014: 2).

Like most developing countries, South Africa is progressing towards improving health information management by means the application of technology to deliver health service. By the National Health Act (Act 61 of 2003), the National Department of Health (NDOH) of South Africa has the statutory mandate to facilitate and coordinate the establishment, implementation and sustainability of comprehensive health information systems at national, provincial and local levels, including the private health sector. Health information technology is designed to improve access and healthcare services. In South Africa the public sector has recognised the need and importance of developing electronic health records systems. Marutha and Ngulube (2018) indicated the significance of implementing EHR in public hospitals as it may bring certain improvements in records management. Electronic health records (EHR) are digital versions of a patient's collected information, available instantly and securely to authorised users (Katuu, 2015). Putting electronic records management system into practice appear to be a serious challenge in the public health sector (Marutha and Ngulube, 2012). Although EHR system have been executed in some hospitals in South Africa, half of the public health sector still make use of manual record administration and management (Katurura and Cilliers, 2018:2). The implementation of an EHR system allows hospitals to share updated patient information and also access medical history for any decision making (Katurura and Cilliers, 2018:1).

The adoption of electronic health records systems in South Africa is driven by an eHealth strategy that regulates the use of information and communication technology for health purposes (eHealth strategy, 2012-2017). The national eHealth strategy South Africa is set to lead in improving patient's information systems nationwide (South African Health News Service, 2012). One of the aims of the e-Health strategy of South Africa is to lay a basis for future incorporation and coordination of eHealth initiatives in public and private health sector (eHealth strategy of South Africa, 2012-2017: 8). The e-Health strategy is reinforced to ensure effective adoption and successful implementation (Erasmus & Van der Walt, 2015: 187). Fast technological changes and improvements have inclined the way the corporate world functions in the



public or the private sector (Shonhe, 2017:19). Thomas (2016) indicates that the solitary use of technology remains inadequate in guaranteeing successful EHR system implementation in hospitals. The National Archives of Australia (2011:8) supports that implementation of electronic records management system in any organisation will not come as the only solution to any related information management problems; however this also includes public hospitals. The term change is based on an initial motive, need and urgency of the situation and attempts to implement plans for change that lead to the intended results (Heyes, 2014). A change management approach is regarded as part of the essential premeditated processes in the development of an EHR system (Nguyen, 2009). It is in that regard that change management remains central to the successful implementation of electronic health records systems in South Africa (Katuu, 2015 & Marutha, 2016).

Many public organisations, including the health sector internationally, have progressed to electronic records management systems in hospitals, acknowledging change management as the driving force to electronic records management; however, in South Africa this is not the case, as the National Archives of South Africa have inadequate directives on change management in electronic records management systems. For example, the National Archives of Australia (2011) have a strong basis of change management as the key consideration for implementing an electronic records system. The National Archives of Australia (2011:13) attest that electronic records management systems need to be undertaken as a massive essential change management movement. They further point out that developing innovative systems that individuals are not used to unavoidably engenders concerns on how effectual and reliable the new system will be, based on the following:

- Retrieval tool
- Protection and confidentiality of sensitive information
- The flexibility of the system on it is user friendliness and time consuming or not
- What happens when the system goes offline

The above-mentioned factors need to be projected as part of a change management approach to prevent the EHR system's failure, and all perceptions of concerns and issues from a former system need to be addressed before innovations to successfully

reinforce and manage change. Marutha and Ngulube (2012) focused on the implementation of an electronic health records system in the public health sector and underscored the view that hospitals were not efficiently taking advantage of the information technology to support health service delivery. Implementing electronic health records in the hospital setting requires more effort to reshape the mind-set of health care professionals towards change and healthcare tactical processes (Weeks, 2013); this includes reviewing and upgrading organisational tools that support skill development to guide all parties involved in the use of digital evolution (National Archives of Australia, 2011). Electronic health records are complex to implement, owing to the human capital mind-set, electronic records management system identification, and organisational culture (Marutha, 2016). Capitalising on the possible benefits of electronic records systems, it compels advancement in the organisational practices as a whole and transition in people's behaviour (National Archives of Australia, 2011:8).

Although EHR systems have been executed in some areas of South Africa, more than half of the public health sector still make use of paper based **records** (Katurura and Celliers, 2018:2). Hence there is a greater necessity to comprehend its adoption from a South African public health perspective (Thomas, 2016:37). The ill-fated part is that ICT's are introduced in hospitals without crucial processes and procedures to precaution control and access to (ERDM) electronic records management system (Marutha, 2011:32). It is in this regard that change management has become a necessity for public health organisations integrating the use of information communication technology (ICT) to deliver health services. Management of change minimises possible occurrences that can lead ICT implementation failure or ineffectiveness.

## **Methodology**

The study focused on Inkosi Albert Luthuli Central Hospital in the management of change in the implementation of EHR systems in public hospital. Bryman, (2012:67) states that the word "case" is often allied with an intensive analysis of particular locations such as community or organisation; in the case of this study the hospital is the area of attention. The study used a case study design as it comprises a detailed information analysis of a single case (Bryman, 2012). The case study is more

concerned with detailed change management techniques in the execution of an EHR system in the Inkosi Albert Luthuli Central Hospital. Luthuli (2017) also did a case study examining medical records at Ngwelezane public hospital, as it provides an in-depth understanding of aspects that prompt changes and developments in the organisation. Similarly, Marutha (2011) has also focused on electronic records management systems in the Limpopo Province, and used the case study in order to understand in-depth public health sector perspective in the application of ICT in the province.

The study utilised a quantitative approach to assess change management's effect on the implementation and use of electronic health records in the Inkosi Albert Luthuli Hospital. On the data collection, the study used questionnaires to measure behavioural pattern of users towards the system, interviews and direct observation as an instrument to validate and support information collected from EHR system users. The population of the study was drawn from the Inkosi Albert Luthuli Central Hospital. The total sample size was 108 participants. The study used stratified random sampling, which consists of three groups due to dissimilar interaction and duties of users (hospital employees) with the EHR system. Out of forty four departments twenty four were randomly selected. On the first group two nurses, and two doctors who directly render health services were conveniently selected, resulting in a totalling of forty eight (48) nurses and thirty one (31) doctors. In the second group ten patient's administrators, ten ward clerks, one records management personnel member who deals with hospital administration were selected based on their availability. The third group of eight managers were all purposefully selected as their number was too small. On the data analysis qualitative and quantitative data was triangulated to strengthen information presented by cross-verifying in order to increase credibility. Descriptive analysis was used; generated from Google Form Software for interpretation. Data from interviews were thematically categorised and presented narratively.

## **Findings and discussions**

The finding of the study are presented and discussed below.

## **5.1 Factors facilitating the adoption of EHR system at the hospital**

The first objective of the study was to identify factors facilitating hospitals to implement EHR systems. For any technology system implementation in an organisation, there is a sense of urgency or motive behind it (Msomi, 2019). The study asked the hospital management about factors that facilitated the Inkosi Albert Luthuli Central Hospital to utilise the EHR system to render and deliver health services. One member of the hospital management said that one of the motives was that the hospital was initiated and opened post 1994 where South Africa was in the process of recuperating from the apartheid era that resulted in inequality in the public health sector. The rest of the respondents commonly stated that the EHR system is used to promote privacy and security of patient information, as most hospitals lose or misplace files of patients. Another respondent stated that it is operating as one of the biggest referral hospital in Kwa-Zulu Natal, it is state of the art and a strong support system for other hospitals in the province and beyond. Hence from the initial stage it fully operated electronically as it serves various hospitals.

Other respondents indicated that due to different reports of challenges facing public hospitals in the country, Inkosi Albert Luthuli Central Hospital came as a response, altering and improving health service delivery by implementing an EHR system to tackle challenges by minimising patient waiting times, easily consolidating patients' history for medical attention, decision or litigation purposes, avoiding duplication of tests and costs. These factors of EHR systems that drove the hospital to implement the EHR system derived from common challenges discovered by different authors who studied records management in the public health sector. Katuu (2015) revealed that poor data gathering in hospitals results in duplication of files and hospitals often fail to track and locate the original file. Luthuli (2017) disclosed similar challenges in the Ngwelezane Public Hospital: their manual record management system was time-consuming and resulted in long waiting times for patients to receive medical care, which affected the delivery of health services. Van der Walt and Katuu (2016) underlined that the apartheid era affected the public health service delivery; therefore most challenges facing health records management originate from the past health system.

### 5.1.2 Awareness of EHR system

The effect of EHR changes becomes more visible in an organisation when users are reactive towards the system. Therefore, the overall users (hospital employees) at Inkosi Albert Luthuli Central Hospital were asked about the extent of their awareness of the current EHR system. The majority of employees indicated that they were aware of the EHR system operating in the hospital; 77.8% of respondents confirmed this. Of the other respondents, 9.1% pointed out that they are usually aware, due to the surroundings of the hospital, 7.1% indicated that they are somewhat aware and 6.1% percent that they not aware. The overall highest percentage of EHR results validated findings from the hospital management, that all employees at Inkosi Albert Luthuli Central Hospital undergo basic computer training, and EHR system training, before commencing their respective duties, hence they are all aware of the HER.. The hospital also offers refreshment training to every employee that has been out of the system for more than three months for different reasons (study leave or maternity leave). The table below illustrates the results.

| Table 1: EHR system users' awareness (N=99) |           |            |
|---------------------------------------------|-----------|------------|
| EHR system users awareness                  | Responses |            |
|                                             | Number    | Percentage |
| • Not aware                                 | 6         | 6.1%       |
| • Somewhat Aware                            | 7         | 7.1%       |
| • Usually aware                             | 9         | 9.1%       |
| • Aware                                     | 77        | 77.8%      |

### 5.2 Change management in EHR system used at the hospital

The second objective focused on changes experienced by the hospital in the implementation of its EHR system. The hospital management indicated that from time to time changes are made in the EHR system due to improving health service delivery, problems encountered, system upgrades and new developments in treatment. The hospital management further indicated that they have moved from one system to another since the hospital was opened. In August 2016, the hospital went live with the new system. All employees have to re-do training to be able to utilise the system efficiently. Boonstra (2014:11) underscores that ensuring continuity of

healthcare services while implementing the change is challenging. One interviewee mentioned that training is an issue when upgrading or changing the system: at times users resist change as the old system is still instilled in them. Training people who are already on duty is challenging as the hospital needs to continue operating as usually. One of the respondents added that:

*One of the main challenges of using EHR system in the hospital is that, at times companies developing the system software's leaves the country and it becomes problem for the hospital to manage the system over a period of time, therefore that results the hospital initiating and implementing the new system that can be easily managed local.*

The hospital management indicated that for ICT related matters, the hospital together with the Department of Health in KwaZulu-Natal is in agreement with the Information Technology Company. The company is based on the premises of the hospital. They further indicated that the company covers the entire scope of the electronic health records system and provides most change management provision in all projects initiated for successful project implementation and sustainability. However, the hospital management make sure that all changes that take place meet the requirements of the Department of Health.

### **5.2.1 Problems encountered in managing EHR change**

The following are the problems encountered by the hospital in managing change at Inkosi Albert Luthuli Central Hospital:

- Some answered that the interface around the system may not meet users' requirements; for example each doctor may have a different way of doing things, but the system may not be accommodating in terms of what the doctor is trying to achieve.
- They emphasised that starting training over again, when moving from one system to another, is one of the contributing aspects of user resistance.
- They underscored that when the number of patients captured and treated using the system increases and reaches a certain number, data storage becomes insufficient on the system.

- However, from time to time the EHR system needs to be merged to increase storage and to accommodate changes in the way new or existing patients are treated.

### 5.2.2 Involvement of users in discussions of the implementation of EHR system

The leading change management model attests to the fact that sharing a clear vision of changes and involving users in the change processes is important for every organisation going through changes (Kotter, 1995). The hospital management commonly agreed that there are different level of steering committees involving various protocols together with private partners communicating with users and ensuring that there is a clear vision of utilising the EHR system. However, the respondents were asked how often they were involved in the implementation of the EHR system, and 56.6% indicated that they were never involved. Table 2 illustrates the results.

| Table 2: Rating of involvement of users in EHR system (N=99) |           |            |
|--------------------------------------------------------------|-----------|------------|
| Involvement of users in EHR system                           | Responses |            |
|                                                              | Number    | Percentage |
| • Often                                                      | 1<br>4    | 14.1%      |
| • Sometimes                                                  | 1<br>6    | 16.2%      |
| • Rarely                                                     | 1<br>3    | 13.1%      |
| • Never                                                      | 5<br>6    | 56.6%      |

### 5.2.3 Reasons for sharing EHR system changes

The literature indicated that a vital part of managing change in health information systems is by frequently communicating within the organisation, allowing each individual to easily understand the direction an organisation is moving towards (Antwi & Kale, 2014). The hospital management commonly identified that meetings and emails are tools utilised to conduct communication with users about all EHR system changes taking place. On the other hand, users were asked about how often the

hospital shares reasons for making any changes in the system. The majority 47% indicated that the hospital never shares reasons for making changes. Additionally, 28% confirmed that they sometimes receive communication, while 15% hardly receive any information about changes, 10% of respondents said they often receive communiques about changes in the EHR system. The illustration below reflects the information graphically.

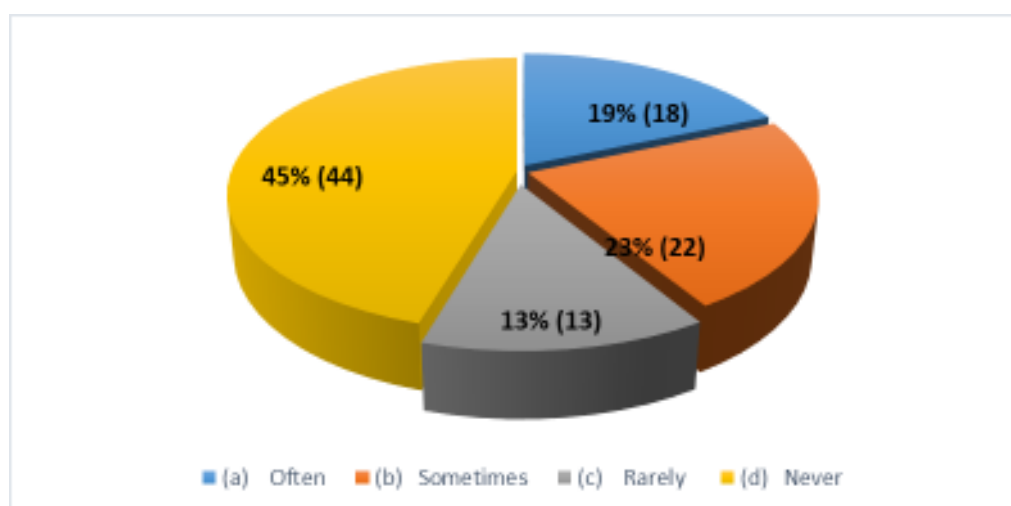


Figure 1: Rating of sharing reasons for EHR system changes  
(N=97)

#### 5.2.4 Job restructuring or changes in duties due to EHR implementation

Different users were asked about changes in their job description through the implementation of EHR system. The word implementation in the study covers system modification, upgrade or changing from one system to another (Msomi, 2019). The majority of doctors, 20 (20.20%), indicated no changes in their job description due to any form of implementation in the system, while 32 (32.32%) of nurses confirmed the same response: no changes altered their tasks using the EHR system. Half of the filing clerks, 3 (5.5%), also recorded no notable changes, while 3 (3.03%) indicated that they were not sure. On the other hand 5 (5.05%) patient administrators also indicated that they were not sure. In the responses of the overall majority of hospital employees, they confirmed that there were no changes in their job description in the implementation (modification or upgrades) of the EHR system; however, Boonstra *et al.* (2014) attest that changes might take place without employees realising it. Alpay



*et al.* (2004) confirmed that executing and sustaining EHR systems in the hospital setting necessitates staff training and development as ICT leads to organisational shifts and responsibilities as job descriptions evolve with changes in operational work flow over time, due to continuous system upgrades.

| Table 3: Job re-structuring or changes due to EHR system (N=96) |          |            |          |
|-----------------------------------------------------------------|----------|------------|----------|
| EHR users                                                       | Response |            |          |
|                                                                 | Yes      | No         | Not Sure |
| Doctor                                                          | 4(4.04%) | 20(20.20%) | 6(6.06%) |
| Nurse                                                           | 7(7.07%) | 32(32.32%) | 7(7.07%) |
| Filing or Ward Clerk                                            | 1(1.01%) | 5(5.05%)   | 3(3.03%) |
| Records management personnel                                    | -        | -          | -        |
| Patient administrators                                          | -        | 5(5.05%)   | 5(5.05%) |

### 5.3 Monitoring and evaluation the use of EHR system implementation

The third objective of the study was to examine how hospitals monitor and evaluate the impact of EHR system implementation. The execution of EHR system is regarded as a long, constant process that requires an ongoing evaluation and commitment, in order to have positive results (Msomi, 2019). The majority of users indicated that the impact of an EHR system is measured through the number of common cases reported about the system; thus, how their division and the information technology department know if there are challenges facing users on the system (83; 83%). They also indicated that their performance and competence on the system is evaluated through an assessment test they write after EHR system training. The test is set at a 75% pass rate in order for users to be regarded as competent to utilise the system. They additionally stated that they repeat training and rewrite tests if they did not obtain the set percentage set.

One of the respondents from hospital management indicated that data quality captured was used to monitor staff productivity, data coding to verify whether EHR users are following the correct procedures when recording patient information, therefore errors and missing patient information also aid to determine users' training

needs on the system or on a particular module as users do training based on their respective duties. Another interviewee from the hospital management specified that the admission department is able to monitor the registration process from the number of patients in the waiting area to patients attended to, discharged and also admitted using the EHR system. Another respondent from hospital management pointed out that case studies (occurrences based on system usage) and user studies in the form of surveys, where questionnaires are distributed to users based on the EHR utility are used to measure and monitor staff productivity and system relevance to health services delivered by Inkosi Albert Luthuli Hospital. The hospital also monitors and measures the effectiveness of the EHR system through statistics data generated from the above mentioned areas and also the perceived patient waiting time as an indicator of system efficacy. Erasmus and Van der Walt (2015) discovered that patient waiting time can be used as a success indicator when evaluating the EHR system. Stravers (2015) confirmed that time spent by personnel searching for patient files or patient information allow hospitals to review and monitor the effectiveness of the system. The literature revealed that time spent finding and retrieving patient paper files resulted in long queues and increased patient waiting time (Weeks, 2015). It is for this reason that the hospital monitors and evaluates the use of the EHR system based on time as an indicator of effectiveness. Thomas (2016) attests to the fact that continuous monitoring of the EHR system allows the executors and the hospital to evaluate if any alteration is needed on the system.

#### **5.4. Tools used by hospital leadership to reinforce change and sustain results**

The fourth objective of the study determined tools used by the Inkosi Albert Luthuli hospital to reinforce change and sustain results. Effective leaders acquire interpersonal skills in order to efficiently manage any organisational changes and needs (Kotter and Schlesinger, 2008). The hospital management indicated they provide in-depth training for users comprising basic computer training for all hospital employees prior to commencing duties, to ensure that everyone in the hospital is computer literate. They further train employees on the EHR system based on their respective modules in relation to their duties. The hospital management indicated that they make sure users fully utilise the system changed or upgraded to, as the old

system only allows users to refer to and view records, not edit or add on the information

The hospital management further indicated that calls logged by users are utilised to analyse common problems or challenges faced when performing duties using the system; this gives an indication if the vendor needs to be involved to improve the system or whether the problem is with the users. All this is done liaising with the hospital management and departments involved, to sustain the effectiveness of the system. They further specified that setting targets for users forces them to perform, and that results in a positive outcome of the system usage, as patients will be promptly served. The hospital management added that demo recalling is also provided to users to refresh their skills modules related to their daily tasks should they encounter challenges. The hospital management further indicated that manuals simplifying all steps involved in the actual workflow are available to support users in understanding the EHR system in relation to their respective duties.

## **Conclusions**

This paper presents empirical results on change management in the implementation of an electronic health records system at Inkosi Albert Luthuli Central Hospital. The aim was to assess management of change in the implementation of the EHR system in the hospital. It emphasises the prominence of the change management process in the EHR system operation and its progress in the hospital. It presents the position of a change management strategy in an EHR system execution in the manner in which it supports the positive outcome of using the new system by users. The overall evidence shows that the default of embedded change management approaches in the EHR system implementation could deter the progress of operating to the unique benefit of the hospital as system upgrades and advancement merge to improve the system for its users.

The study makes the following recommendations with regard to effective change management in the implementation of electronic health records systems.

## **Involvement of users in EHR system changes or upgrades**

The study revealed a communication breakdown between actual users (employees) and Inkosi Albert Luthuli Hospital top management in the discussion of EHR system changes. Therefore, the study recommends the following:

- The hospital must organise regular departmental presentations, allowing users to present advantages and disadvantages of utilising the EHR system in their daily tasks. In that manner the hospital will know the shortfalls and challenges facing each department utilizing the system.
- The EHR users must also help the hospital management during presentation sessions on finding a conducive method to get them more involved in the discussion of any changes or system upgrades made in the system.
- The hospital should open a suggestion tool to be used by EHR system users whenever they want to add value by improvement or changes of the system, more especially in the areas that cannot be tracked by the system.

## **Sharing reasons for EHR system changes**

The study established that the majority of users hardly receive reasons for changes made on the system when they occur. The following are recommended:

- The hospital must always make it a priority that users understand the reasons for changes, and what value it is going to add in their daily tasks, prior to changes taking place.
- The hospital must develop a constant communication plan to fully support the change process that mainly communicates reasons for change with staff representatives from all levels involved in planning and decision making.

## **Implementation of change management at Inkosi Albert Luthuli Central Hospital**

The study revealed that the information technology company covers the entire scope of change management at Inkosi Albert Luthuli Hospital

- Although the IT company works hand in hand with the hospital in guiding changes, the hospital should be leading the change management initiatives as

they work closer with employees to bridge of the gap of communication between users and the IT company.

- The Inkosi Albert Luthuli Hospital should have established its own change management agents or champions working together with the IT company covering the management of change in the operation EHR system or any information technology project initiated in order to develop their knowledge and strategies specifically.

## **Monitoring and evaluating the use of EHR system implementation**

The study revealed that there are no formal directive standards from the Department of Health guiding the monitoring and evaluation of EHR systems in the hospital

- The Department of Health working together with the hospital should develop its own change management framework in the implementation of EHR systems that will include a formal monitoring and evaluation process in the hospital.
- The hospital must do regular evaluations on the use of the EHR system for each department, to understand broader concerns from a user's perspective.

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# **E-records security classification and access controls in Moi University, Kenya**

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## **Abstract**

*Moi University has installed a range of computerised systems that generate a variety of e-records which when securely managed can promote accountability and good governance for enhanced service delivery. However, e-records security management at Moi University seems not to be fully compliant with international best practices through the entire lifecycle from generation to disposal. This paper (which is part of a thesis on e-records security management) therefore investigated e-records security management at Moi University with a view to offering practical and policy interventions to address this challenge, to identify how business activities are aligned to access classification, to assess how security classification of the e-records process is handled to improve access control and to establish the existence of security classification and access policies at Moi University. Data was collected from Moi University staff using interviews and questionnaires and was analysed thematically, and using the Statistical Package for Social Sciences (SPSS) version 24. Findings revealed that even though the analysis of business functions and processes was being carried out at Moi University, the University had failed to appreciate e-records classification security best practices among them; developing a classification scheme and a policy guide on security classification. The study further established that*

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*although the university had access controls that depended on user role privileges and the principle of least privilege, unauthorised access to classified e-records and systems by personnel with requisite privileges and stolen access credentials belonging to fellow personnel members was prevalent. The study recommends that the university should develop and enforce e-records management policies that integrate matters of security*

**Keywords:** E-records; e-records management; security classification; access controls

## **Introduction and background**

Adoption and implementation of information systems in organisations worldwide have become indispensable as a result of the on-going rapid technological advancements. As early as the 1990s, there existed information and records management systems. (Marutha 2019; Katuu 2012). The primary purpose of this information system is to facilitate business transactions and process so as to generate, receive, manage, disseminate and administer and provide access to the e-records and other information needs, including artificial intelligence between an organisational unit and its clients.

Embracing technology is an indication of acceptance by organisations that e-records can be admissible in a court of law, be compliant with regulatory and statutory requirements, meet audit requirements, be used for decision making and other purposes depending on the ability to establish their authenticity, reliability, integrity, availability, control, and utility by indicating the dependability of the systems used to generate them. Thus, e-records management has become an integral tool of governance that enables institutions to create and maintain dependable evidence of business processes in the form of electronic records. This is possible when e-records provenance can be traced and the information is complete and accurate in content, context and structure and can be located, retrieved, presented and interpreted (Kenya Electronic records and data management standard, 2016).

E-records security management also entails the developing, implementing, monitoring, reviewing and providing of a necessary improvement on e-records

security policies, procedures, processes, organisational structure, and information system functions. These coordinated activities enable protection of e-records and the information systems through defining, achieving, maintaining and improving their security effectively and efficiently, which is essential to the organisation's achievement of its core business processes and maintaining its legal compliance, business continuity, competitive edge, growth and image and quality service delivery among others (ISO, 2014; ISO, 2012; Parker, 2002).

Personnel play an essential role in the implementation of e-records security management. Therefore, organisations have the responsibility of ensuring that they have a support system in terms of human resources (personnel) who are competent and reliable to enhance e-records security. Many authors, however, have indicated that personnel are the major threat to e-records security management practices in organisations. They habitually do not see themselves as part of the organisations e-records security 'effort' and often take actions that ignore organisational e-records security best interests. These actions may include but are not limited to knowingly or unknowingly damaging information systems and stealing information for personnel, destroying or deleting critical e-records of the organisation or personnel and unauthorised sharing of access privileges, thus providing access to vital information of the organisations' operations by unauthorised individuals among others (National Association County & City Health Officials (NACCHO), 2015; Andersson, Reimers and Barreto, 2014; Bey, 2012; Parker, 2002). Altogether, personnel of an organisation can easily espouse an organisational culture which can impact positively or negatively on the organisation's e-records security management culture. A study by Tucker and Pitt (2009) on customer performance measurement in facilities management established that organisations' culture is the combination of shared values, behaviour patterns, moves, symbols, attitudes and normative ways of conducting business. This implies that with the right culture, awareness and continuous education, personnel can highly support organisations' efforts towards achieving e-records security management practices. Consequently, Roer and Petric (2017) ascertain seven critical dimensions of e-records security culture in organisations that should be natured in personnel: right attitudes, behaviour, cognition, communication, compliance, norms and responsibilities.

E-records security management is a broad area and this paper will dwell on e-records security classification and access control as part of the process and practices of e-records security management. E-records classification is a well-established practice that originated from the military (Bergstrom, 2017); however, it has not been given the utmost attention in many organisations despite enabling determination of the value and level of sensitivity of various information held by an organisation. In addition, classification and access control provide a better understanding of e-records and how and why they need to be protected. That is; they reduce threats of information leakage, help in the identification of e-records suitable for routine dissemination or for disclosure in the event of a request, protection of the rights and interests of the organisation, its staff and its stakeholders; it enhances compliance with legal and statutory requirements, and demonstrates organisations' commitment to good governance. Despite e-records security classification being vital, most organisations face difficulties in its development and implementation. In addition, there is little literature on e-records security classification to enhance its implementation. For instance, the existing methods described in standard works do not provide a coherent and systematic approach to e-records classification. Niemimaa and Niemimaa (2017) assert that the implementation of information classification standards describes the practice of information classification in a general and universal manner without explaining how the practice could be applied in any particular organisation. Further, there is a lack of detailed descriptions regarding the synopsis of the processes, procedures and concepts, roles involved in the classification and how they interact, how to modify the method for different situations and a framework that structures and guides the classification.

## **Problem and purpose of the study**

Moi University has a range of computerised systems such as Integrated Personnel and Payroll Data System (IPPDS), Financial Management System (FMS), Hostel Booking System (HBS), Examination Management System (EMS) among others that generate a variety of e-records. The e-records generated must be securely managed to promote accountability and good governance for enhanced service delivery. However, e-records classification management and access control at Moi University is not fully compliant with international best practice through the entire lifecycle from

generation to disposal. This paper, therefore, sought to investigate e-records security classification and access controls at Moi University with a view to offering practical and policy interventions to address this challenge. To investigate e-records security classification and access controls at Moi University with a view to offering practical and policy interventions to address this challenge, the study addresses the following three research tasks:

- To identify how business activities are aligned to access classification.
- To assess how the security classification of the e-records process is handled to improve access control.
- To establish the existence of security classification and access policies at Moi University.

## **Theoretical framework and literature review**

The main aim of this paper was to investigate e-records security classification and access control at Moi University. As indicated in the abstract, this paper is part of a thesis on e-records security management at Moi University, Kenya. The study was underpinned by Records Continuum and Parkerian Hexad models. The Records Continuum model is vital to this paper since its emphasis is continuous management of records, from the moment records are created (and even before creation) and maintained until they are disposed of. It also focuses on providing sustainable record-keeping to connect the past to the present and the present to the future. Moreover, the Records Continuum Model recognises e-records from creation to disposal as part and parcel of the business process of an organisation.

This paper examines, among others, how the security classification of the e-records process is handled to improve access control. Thus the model ensures the creation of the right e-records containing the right information, in the right formats; the organisation of the records to facilitate their use; systematic disposal of records that are no longer required; as well as protecting and preserving the records to enhance access (Kemoni, 2008). The Records Continuum Model is a best practice mechanism that describes the management of electronic and paper records, which uses an integrated approach to managing e-records with the goal of ensuring the reliability, authenticity, and integrity of records. This is vital to an institution of higher education

like Moi University which has experienced phenomenal expansion in terms of physical infrastructure and enrolment that has resulted in an increased generation of both electronic and paper records.

The Records Continuum Model is most suitable to help manage such records in order to improve responsiveness, increase efficiency and satisfy user requirements. For these reasons, Moi University should provide an environment that supports e-record-keeping and security measures to enable proper creation and maintenance.

Even though the Records Continuum Model promotes the management of records in all formats, it fails to address a range of aspects that are anticipated in the study; for example, it does not place much emphasis on skills development among record-keeping staff. Furthermore, it partially discusses the security of records. Therefore, it cannot be used as a stand-alone theoretical framework for this study. For these reasons, the Parkerian Hexad (PH) model was applied to enhance the study.

The PH model is relevant to the study since it strongly advocates the security of information and appreciates the fundamental role of creators/custodians. New technological trends embraced by Moi University such as Integrated Personnel and Payroll Data System (IPPDs), Financial Management System (FMS) and Hostel booking system (HBS) among others have made e-records security and information contained in it a more daunting task. The PH model encourages organisations to invest in better policy writing and enforcement procedures and methods, employee education and awareness, and improving the available technology infrastructure, as one of the objectives of the paper is to identify the existence of security classification and access policies at Moi University

Moreover, the elements of the PH Model (which include confidentiality, integrity, availability, authenticity, possession/control and utility) are vital in the continuum management of e-records and necessary to e-records' essential characteristics, that are content, context, and structure, which give e-records meaning over time and ensure efficient access. One of the objectives of the study is to identify how business activities are aligned to access the classification of e-records at Moi University. Therefore, the model is vital to understanding the University's position on the e-records security classification and access to e-records. As the PH Model focuses

sufficiently on the role that people (e-records personnel) play in ensuring e-records security and that they are captured into an effective records management system that establishes a relationship between the record, the creator and the business context that originated it. The following is a brief literature review.

## **Security classification of e-records**

Organisations generate, receive and manage a massive variety of e-records that must be protected from unauthorised access, disclosure, misrepresentation, modification, and other security threats. This is made possible by applying the right process and procedures and having in place proper systems and systemic requirements. Classification enables an organisation to understand its e-records' sensitivity, value, criticality, nature and impact of an unauthorised disclosure in relation to legal and regulatory requirements among others (Plymouth University, 2017; The University of Newcastle, 2017; City University of Hong Kong, 2015). It instigates with systematic identification and organisation of e-records into categories conferring to logically structured conversations, methods and procedural rules in a system as represented in a classification scheme (Bantin n.d., ISO, 2001). Benett (2011) adds that the classification of e-records is a shorthand way of determining how this information is to be handled and protected.

ISO (2001) explains that classification is a powerful tool that helps organisations work effectively by ensuring records are named in a consistent manner over time, assisting in the retrieval of all records relating to a particular function or activity, determining security protection and access appropriate for sets of e-records, allocating user permissions of access to or action on particular groups of records, distributing responsibility for the management of particular sets of records, distributing records for action and determining appropriate retention periods and disposal actions for records. It should take account of business needs, for example, unauthorised access or damage to the information therein.

To understand e-record classification, an analysis of the business process should be carried out. This involves gaining an understanding of what an organisation does and how it does it, and also gaining an understanding of the existing systems available. The analysis provides an understanding of the relationship between the organisation's business and its records (Glavan and Vesna, 2017; ISO, 2001). AIIM

(2009) asserts that far too many good records management programmes are suffering from a lack of user acceptance and one way of solving the puzzle is by developing a programme that is tightly coupled with the underlying business process. For the reason that business process is the organisation's strategic assets, analysing the processes yields documentation describing the organisation's business process, a business classification scheme that shows the organisation's activities and transactions in hierarchical relationship and a map of the organisation's business process that shows the points at which e-records are created or received as products of the business function (Tasmania Archive Heritage Office (TAHO) ,2015; ICA, 2008; DIRKS manual, 2003; ISO, 2001).

Moreover, e-records security classification designates the sensitivity of e-records that governments, organisations, and institutions have created, and stored in the conduct of their business functions, including those received from external sources. It comprises a set of instructions, procedures or sources that identify and protects all ICT systems and the e-records therein regardless of technology used, a plan, program, and e-records including the reasons for classification (for example, whose disclosure could have adverse consequences to the organisation) (Centre for Development of Security Excellence, 2017; University of Tasmania, 2014; Bey, 2012; Parker, 2002). It is essential for the organisation or university to guarantee that the classification process is understood to be a 'living process', that is, e-records security classification is not a one-time process and procedure but carried out regularly and periodically reassessed to enhance requisite security (TAHO, 2015). Further, every organisation has diverse e-records including, but not limited to, sensitive records that can only be accessed by certain personnel and those that can be accessed by everyone. For instance, in government, e-records are classified not just by assigning value to the e-records, but also as a means to secure them. This gives the measure by which an organisation assigns a level of sensitivity and ownership to each piece of e-records that it creates, receives and maintains (Public Service of Kenya, 2010; Mishra, 2011).

Various factors influence the e-record security classification. Mishra (2011) in a study of information security and cyber laws in New Delhi, India, outlined considerations in the classification of a record. These considerations include: how much value that

information has to the organisation, how old the information is, and whether or not the information has become obsolete. Laws and other regulatory requirements and the nature of the organisation are also important considerations when classifying e-records.

Around the world, classification is identified as an essential factor in protecting e-records. For example, in the USA the Department of Defence (DoD) developed a manual, DoD 5200.2, to guide the development of security classification that includes access controls, declassification, and downgrading (DoD, 2002). In 2003, the National Archives of Australia prepared an overview guide on classification tools that could assist Commonwealth countries to support records management processes. Furthermore, the State Records Authority of New South Wales and the National Archives of Australia ISO have developed guidelines that can be applied globally in e-records security classification, among others. Therefore, organisations should adopt an e-records security classification process to be able to apply the right level of classification. This may include but is not limited to analysis of a business process (understanding the process activities, functions of the organisation), identify the e-records and the information systems available (multiple media types and formats of e-records), identify the creators (the organisation should ensure that there is a custodian that is authorised for the classification and is responsible for establishing, implementing and maintain the e-record), undertake impact assessments (once an e-record is classified, the date and the event can be easily determined, after which the consequences of compromise might change).

However, an event may trigger an increase in the sensitivity of the e-record; for instance, a personnel dependants form may be public when not filled in, after which it is confidential. Other issues may include e-records control, encryption, blending of the e-records with other organisation e-records; if a security breach does occur, is damaged or destroyed, e-records backup frequencies. Conventions or standards and availability of an audit trail to demonstrate the university data are reliable), apply classification-based controls (appropriate controls must be applied to ensure the protection is given to the e-record commensurate with the security classification. For instance, a need-to-know principle, clear desk policy to stop unauthorised personnel from using any classified system or e-record; classified e-records from external



sources should retain security classification as forwarded), document and maintain e-records security classification register (the organisation should be able to be reviewed, updated and maintained periodically, and an e-records security classification register indicating all e-records classified and the level of classification), audit logs (to enhance and maintain integrity, authenticity, utility, availability and confidentiality of the e-records a strict logging process is to form part of the e-records classification register. The audit log must be well designed to enhance its capability of capturing a 'trail of evidence' which can be used to investigate inappropriate, unauthorised or illegal access) education and awareness (this should be a continuous process from the induction of the personnel to enable them to understand the prominence of security classification to e-records and information systems and other computer technologies (Griffith University, 2019; University of Southern Queensland, 2018; TAHO, 2015)

ISO (2013), however, asserts that an organisation should avoid using too many classification categories, as complex schemes may become harder and uneconomic to use. Thus, e-records security classification may be ascribed as restricted (this classification label is applied to e-records, information systems and computer technologies that are very sensitive in nature and are strictly confidential to the university, the government or any other legal agreements between the university and third-parties, for instance, consultants or service providers, contractors, researchers as required by the scope of the activity at hand). The e-records are considered critical to the university's capacity to conduct its business process. Their disclosure could cause severe harm to the university's reputation, its personnel, students and third parties. They are accessible to relevant personnel with specific roles or positions and business partners with appropriate authorisation. Examples of the e-records may include examination papers before being released, personnel data, privileged accounts' passwords of the university's key information systems, pending criminal investigations, social security numbers, financial account numbers, medical records among others) (Griffith University, 2019; University of Plymouth, 2017; City University of Hong Kong, 2015; Kahanwal and Singh, 2013 Mishra, 2011; Collette and Gentile, 2006; DoD, 2002).

Secondly, *confidential* (this classification is applied to sensitive information that is intended for use by a specific group of authorised personnel within the university and business partners assigned on a need-to-use basis and for an authorised envisioned purpose. It is accessible to only specified and authorised personnel with prerequisite credentials. A breach could cause unacceptable damage to adverse and lasting consequences threatening the university and its activities. Examples here include student information, personnel financial information, patent(s) pending, students' and staff disciplinary details, unpublished research information and identifiable research subject information) (University of Exeter, 2018; University of Plymouth, 2017; City University of Hong Kong, 2015; Mishra, 2011; DoD, 2007 Collette and Gentile, 2006).

Thirdly, *internal use*; the classification is assigned to non-sensitive operation e-records. The information contained therein is intended for use within the university or organisation (authenticated personnel) and authorised service providers. A breach of such e-records may have moderate to adverse implication and access may be provided free to a specific group of personnel depending on their roles and responsibility. They include policies, unpublished research, a notice of meetings, seminars, training materials, advertisement, manuals, and procedures) (University of Exeter, 2018; University of Plymouth, 2017; City University of Hong Kong, 2015; Kahanwal and Singh, 2013).

Fourthly, *public* (the information in this category, can be used by both personnel and members of the public without restriction, although it should not be placed in the public domain without a proper reason. That is, approval by authorised parties should be considered before being released for public consumption, having in mind the information's utility, accuracy and completeness prior to release. The information may include academic programmes and admission information, press releases, published academic literature (Griffith University, 2019; University of Exeter, 2018; University of Plymouth, 2017; City University of Hong Kong, 2015; TAHO, 2015; Mishra, 2011; DoD, 2007; Collette and Gentile, 2006;)

Fifthly, *private* (this classification is a default classification in most organisations and universities referring to their information assets. Access may be open to all personnel and external authenticated third-parties) (Griffith University, 2019). Sixth is protected, (somewhat, very little information belongs in this category thus it is used with

restraint. Thus, this classification requires a substantial degree of protection, as disclosure may cause serious harm to the organisation or university, personnel or students. The e-records that fall in this category may include highly sensitive communication between the university and the government, executive management or council matters of a highly sensitive nature, litigious or law enforcement information, the loss and/or compromise of which would seriously jeopardise the university, significant inquiries or investigations that are likely to cause serious harm to individuals, groups or the general community, for instance crime and corruption enquiries, highly sensitive financial and economic information) (Griffith University, 2019; TAHO, 2015).

Although e-records classification is important, maintaining a security classification beyond its utility is costly and administratively burdensome, thus organisations should ensure they establish at the time of classification the period the e-record remains classified (Executive office of the president of the United States classification guide, 2018). This is consistent with TOHA (2015) sentiments that e-records, information systems, and computer technologies must be declassified or downgraded when protection is no longer required or is no longer required at the original level. If a user believes that an e-record, for example, has been incorrectly security classified, they must advise the custodian or owner who may consider the need to reclassify the e-record. Ideally, the e-records declassification triggers will be set when the initial classification is applied and should be captured in the e-records classification register. Perhaps the declassification triggers may include a set time period after the creation of an e-record or system, passing of a set date for review, after circumstances that have a direct impact on the e-record or information system change significantly, such as a change of strategic priorities or a change of government, among others.

Nonetheless, the classification category varies from one organisation to the other. The Public Service of Kenya (2010) asserts that the government of Kenya gives security classification and levels of access to classified information as follows: top secret (information and material whose unauthorised disclosure would cause exceptionally, grave damage to the Republic), secret (information and material whose unauthorised disclosure would cause serious injury to the interests of the Republic),

confidential (information and material whose unauthorised disclosure would be prejudicial to the interests of the Republic), restricted (information and material whose unauthorised disclosure would be undesirable in the interests of the Republic).

### **E-records access control**

During security classification, the person should consider access control since the classification alone will not stop unauthorised personnel from accessing the e-records in any way unless proper access controls are adopted. The computer technologies embraced by organisations should enable access to e-records from autonomous end-points to enhance efficiency. The e-records should also be available in real-time to enhance real-time decisions and actions to authorised personnel and third parties.

Protecting information systems, applications and e-records against unauthorised access are vital in e-records security. This denotes that e-records management systems should guarantee complete, organised, accessible and secure records which are compliant with legislative, regulative and appropriate business requirements, reflecting a comprehensive range of appropriate business activities and systematic creation. For these reasons, the acceptance of e-records for legal compliance, audit decision making, and other purposes is contingent on establishing the authenticity, integrity, utility, reliability of the systems used to generate them (Kenya electronic records management standard, 2016)

To enhance access control organisations should grant limited access on a need-to-have basis, use of strong access credentials (including passwords, PIN, passcode, biometrics), use a multi-factor authentication, hardening computer systems, deployment of security technologies such as firewalls, antiviruses, intrusion detection systems among others, use of encryption where applicable, regular software updates, maintain and monitor logs, conduct systems vulnerability assessments, penetration testing and remediate and conduct user awareness (Communication Authority of Kenya, 2018; TAHO, 2015). Further, a formal access control matrix (user registration process to enable assignment of access rights) must be developed to record role-based authorised access on an individual basis (Uasin-Gishu county ICT policy, 2016). This may include the provision of unique user identification (ID) or credentials to enable users to be linked to and held accountable for their actions; the use of shared ID's should only be permitted where necessary for business or operational

reasons and should be approved and documented. Immediate disabling or removal of IDs of users who have left the organisation should also be observed as part of access control. (Kenya information security standard,2016).

Role-based access control is a method applied successfully by many organisations to link access rights with the business process to enhance e-records security. Bandar and Colin (2007) in their study on access control requirements for processing electronic health records in Australia emphasised that an access control mechanism should be applied to limit the actions or operations that a legitimate user of a computer system can perform. In this regard, institutions such as Moi University must be able to control access to e-records and in which circumstances they can be accessed because the records may contain personal, commercial or operationally sensitive information (ISO, 2001). Bigirimana, Jagero and Chizema (2015) in their study of an assessment of the effectiveness of e-records management at the African University, Mutare, Zimbabwe found that an effective e-records management system is critical in ensuring that the movement and location of records are controlled in a way that any record can be accessed when needed and that there is an auditable trail of recordable transactions. They further stated that the record-keeping system whether paper or electronic should include a set of rules for referencing, titling, indexing and if appropriate, security marking of records. These should be easily understood and enable the efficient retrieval of information. They further stated that confidentiality and accessibility should concurrently be adhered to through proper classification, labelling, indexing, and file naming.

ISO (2001) reiterates that an organisation should identify the transaction or business activity that the record documents, identify the business unit to which the records belong, check the access and security classification to establish whether the activity and the business area are identified as areas of risk or have security considerations and/or are legally required restrictions and to establish the appropriate control mechanisms for handling and recording the access or security status of the record in the system to signal any need for additional control measures. Hence, assigning rights and permissions to user accounts associated with a role among others must be done appropriately and be consultative for authorised users.

Furthermore, appropriate security and access should be determined by analysis and appraisal of the records series and business rules developed for the acceptable management of records. (TAHO 2015. ISO (2001) advise that access to records is restricted only where it is expressly required by business need or by law. The access and security classifications may be assigned in consultation with the business unit to which the records belong and restrictions may be imposed for a stated period to ensure that the additional monitoring and control mechanisms required for these records are not enforced for an extended period.

### **Security classification and access policies**

Accordingly, organisations have to consider establishing and implementing an access control policy based on the business process and e-records security requirements. The policy should take into account the security requirements of business process, policies on information dissemination and authorisation, for instance, a need-to-know principle, e-records security levels, and e-records classification, consistency between the access rights and e-records classification policies of systems and networks, roles with privileged access, removal of access rights, archiving of records of all significant events concerning the use and management of user identities and secret authentication information and management of access rights in a distributed and networked environment (Kenya information security standard, 2016; ISO/IEC, 2014; ISO, 2001).

Kenya's Access to Information Act no. 31 of 2016 provides a framework for public entities (such as Moi University) and private bodies to proactively disclose information that they hold and provide information on request in line with the constitutional principles, as well as a framework to facilitate access to information held by private bodies in compliance with any right protected by the constitution and any other law so as to promote accountability, transparency and public participation and access to information. Under the Act, entities must provide for a person who may disclose information of public interest in good faith and a framework to facilitate public education on the right of access to information.

## **Research method**

The paper employed the pragmatic paradigm which is consistent with the mixed research approach where qualitative and quantitative aspects are applied (Ngulube, 2015). A case study research design was employed, whereby Moi University was the focus in investigating e-records security classification and access control at the institution. The case study design gave the researcher ample room to conduct an in-depth investigation of the unit of analysis (Yin, 2009).

The target population for quantitative data for the study was one hundred and forty-five (145) respondents consisting of top management, deans of schools and directors of Information Communication and Technology as well as Quality Assurance directorates, action officers, records managers, and records staff. A complete enumeration of the population was taken, therefore a choice of sample size was not necessary. The data was collected using interviews and questionnaires. The questionnaires were administered to action officers, records managers and records staff, while interviews were administered to top management, deans of schools and directors of Information Communication Technology as well as Quality Assurance directorates respectively. Qualitative data were analysed thematically and presented in a narrative description, while quantitative data was organised using Statistical Package for Social Sciences (SPSS version 24) and summarised by use of descriptive statistics for ease of analysis and presentation by the researcher. Only qualitative data by interviews are reported in the next section.

## **Findings**

The findings are reported in Sections 1.1 - 1.3. Only qualitative data by interview are reported in the findings for this paper

### **1.1 Aligning business activities to access classification**

To understand security classification, the respondents were asked about the roles they played in business activity analysis of the University. All the 16 respondents (deans and directors) noted that they are involved in the business activity analysis. For instance, 14(87.5%) reported that they are involved in business activity analysis at school level, university senate level and dean's committee level in the areas of academics, financial, planning and administration, student affairs, staff matters,

outreach, research, community services among others. Another 2 (12.5%) (directors) were also involved in business activity analysis like their counterparts to fulfil the requirements of their directorates, that of quality control on the teaching process and other university services, project planning, implementing ICT activity processes. The responses are summarised in the words of respondents R13 and R7 respectively.

R13 stated that:

*Besides academics, research, teaching, we represent the school at all university meetings for instance Senate, deans' meetings where we discuss and deliberate on matters affecting the university and come up with suggestions and solutions to enable decision making. We also have different departments in the school, and each department has a business unit. Every month we have a school management board meeting where we get updates from colleagues, and within the departments themselves they also hold meetings and deliberate on the areas of improvement, which are later tabled at the level of deans, a committee of Senate and committees' of the university.*

R7 noted that:

*We are involved in the business activity analysis to some extent because of the information we host and the insights and direction we provide on ICT infrastructure and processes, we provide an ICT plan, give ideas, on the same at both deans committee or at school level and Senate level. Also, we receive suggestions from different stakeholders of the university on issues of computers, bandwidth, and internet coverage among others.*

The respondents were further asked how business activities are aligned to enhance access classification. The results showed that 3 (60%) of the respondents believed it is difficult to align access classification because of the lack of proper guidelines. Another 2 (40%) indicated that business activities are aligned to access classification. The responses were summed up by the respondent (R3) and (R4) respectively:

Respondent R3 said that:

*Access classification is controlled by individual departments for example purchasing, finance, and examination you cannot change anything only the department who has custody can make changes. Specific section heads and units manage the different software used for example examination, library, and finance.*

The contrary opinion of respondent R4 indicated that:



*With the inadequate implementation of the available legislation and lack of guidelines, it is difficult to have a procedural and systematic alignment of records classification to the business process.*

Further, the researcher probed whether the university classified its e-records. 21 (100%) respondents noted that there is some security classification that is applied. Though a majority, 19 (90.4%), of the respondents indicated that there was no clear guideline and direction, but depending on the business function, security classification was applied, while 2 (8.6%) indicated, there were guidelines on the same referring to the quality manual procedures. 'Confidential', which was being applied to personnel records, student records, medical records, and legal records'; 'Top secret' was applied to records created or passed through or could be accessed by a minimal number of users including e-records from deliberation of the University Council, fiscal records, student examinations among others; 'public' those accessed by both members of staff and the community, including notice of upcoming events that is sports, requests for tenders, medical campaigns, rallies, walks, job advertisements among others; 'internal use' which are meant for day to day university personnel and students including notice of meeting for either staff or students, university policy documents, service charters, performance contract records, internal job advert notices, notices for internal upcoming events, among others. The responses were summed up in the words of (R6):

*That the university lacks a written e-records classification scheme, which could have helped in providing an organised way of classification and provision of restrictions applicable to e-records. While that being the dilemma, classification of activities by departments, schools and other units is done in relation to the nature of the activity in most cases.*

## **1.2 How the security classification of the e-records process is handled to improve access control**

The respondents were also asked on how the security classification of the e-records process is handled to enhance access control. The results showed that 21 (100%) said that description, control, link and determination of disposal and access status is done by respondents in diverse ways. Five (23.8%) indicated that e-records created and or received at top management level are described and linked to the function that leads to their creation; thus, determining access status which is that of nature of the business activity, role-played and individual's rank. For example, those records from

the university council are not accessed by anyone, but those with the privilege to access is determined with their role and rank. The respondents unanimously indicated that determination of the disposal of records is not generalised, but records are given longer access periods. Sixteen (76.2%) shared the same sentiment that a role and level of or position of a person determine access to certain types of e-records for example, a school administrator maintains access to student marks at the school level and at the departmental level, the department head. The respondents indicated that disposal is rather complicated because e-records are not disposed of.

The responses are summarised in the words of respondents R7 and R13 respectively.

R7 said:

*We have a number of controls regarding access to ICT and different levels of security. We have different principles we use, for example, the Principle of least access whereby one is required to access information that they need not everything in the database. An administrator is allowed to access information that is relevant to her/his work, but she/he cannot go for example to check on health records, salaries, or financial information on the systems. Somebody like the Vice-Chancellor can have more access rights than someone at the middle level and lower level. Each user has a privilege that only allows access to what one requires. Not all users are allowed to delete anything, an ordinary user cannot delete a record, a record cannot be deleted by one person, but cascaded and deleted by the head of the department that is if deletion is an option; the deletion goes through stages, there are stages before a record is deleted, but the person who can delete is the person who has a superuser or administrative privileges or higher privileges. If an ordinary person who has fewer privileges marks a record for deletion, the deletion process is cascaded upward.*

R13 observed:

*After creation, records are named in relation to the business activity that led to their creation. E-records are stored in internal computer drives, email, external hard drives, compact disks, in order to ensure the protection of vital information stored, these storage devices are fitted with powerful, unique passwords, and encryption to deter unauthorised access, and secure storage media are kept in rooms fitted with grills and CCTV camera to monitor any movements. Access is only granted to authorised staff; Offices are fitted with firefighting equipment such as fire extinguishers and hose pipes.*

Responses from questionnaires on whether the respondents were aware of e-records security classification and level of access indicated that 63 (53.4%) noted they are not aware, while 55 (46.6%) specified that they are aware of security classification and level of access at Moi University. Those who said security classification was available were further asked what security classification was available. Out of the 46% of the respondents who indicated they were aware of security classification and level of access, 27(22.9%) specified internal classification level, 13 (11.0%) stated public, 10 (8.5%) itemised confidential and 5 (4.2%) identified secret classification level, while 63 (53.4%) were not able to give a response.

### **1.3 Existence of security classification and access policies**

On whether they were aware of the security classification and access policies and what it entails; responses from interviews revealed that all 21 (100%) respondents concurred that there was no access policy. However, the respondents mentioned Quality Management Procedures (QMP) and the ICT policy as the available tools. When asked whether they knew what they entail, they responded that the QMP defines the roles of every individual and assigns them duties depending on their category. Respondents were further asked if available policies imposed security classification or any other restrictions. The results showed that 21(100%) of the respondents indicated that classification of each item of the information was done in relation to business processes of the university because it was not well documented; thus, security classification is neither here nor there. For instance, information which should have some limited access, and those that have the least privileges, are determined by each department in relation to the business process.

Moreover, responses from questionnaires indicated that 109 (92.3%) of the respondents generally indicated that there was no e-records security classification policies or guidelines and 9 (7.6%) indicating ICT policy as a guideline.

The study wanted to determine whether the university has a user permission register and how it distinguishes the privileges of the user. However, all five top management respondents stated that there is no written user permission register, but user permissions are based on one's level in the university structure, the roles played and privileges accorded to individuals.

## Discussion

E-records are a product and a strategic asset that reflects the business process of a university. To guarantee and enhance security, the process should begin before creation and run through all the stages up to disposal. The findings indicated that the university security practices in e-record management were minimal and decentralised. Each department or school has its way of managing security, since there are no guidelines and programmes to guide e-records security management. Likewise, findings from action officers record managers and records staff showed a significant number (87, 73.7%) of respondents were not satisfied with the security practices, while 31 (26.3%) indicated having more or less satisfaction. The study findings further indicated that the e-records security management component of the organisation functions was represented by the ICT directorate. It was revealed that in the next five years the university was planning to increase funding to the ICT department. The location of e-records within ICT directorate perhaps suggests that the functionalities of records management are thought of as an ICT function, which should not be the case. Despite the ICT directorate playing a major role in the ICT infrastructure, they may not fully understand the requirements of e-records security management. The literature reviewed revealed that for successful e-records management, inclusivity of appropriate stakeholders is vital. This is because e-records are by-products of the business process of the university, which should receive adequate attention.

The findings from the interviews indicated that analysis of business functions is carried out in Moi University where all 21 (100%) respondents are involved. This response perhaps suggests that functions, processes or procedures and activities that lead to the creation of e-records of the University are understood and practised. The literature reviewed indicated that to improve business processes, the same should be analysed in order to understand the activities, their relationship, and values of their relevant metrics. The literature further indicated that an analysis of a business function of an organisation is vital for it links the business process to e-records. It further indicated that business analysis is a clear way of developing a business classification scheme which shows the organisation's activities and transactions in the hierarchical relationship; thus, the need for the development of a classification scheme, which in turn guides e-records security classification (Glavan and Vesna,

2017; ISO, 2001; AIIM ,2009). Similarly, the continuum model observes that business activities are created as part of the business communication process within and without the organisation and advocates intellectual control of e-records management actions. The e-records management actions include classification of records within a logical system (Upward, 2004; Xiaomi, 2003). From the study findings, it is evident that the university has not fully prioritised e-records security areas and practices including that of developing a classification scheme and written directive on security classification to establish whether the activity and the business area are identified as areas that need more security consideration and/or legal restrictions. The findings indicated that the university classified its e-records without proper guidelines. The university has also failed to appreciate and initiate or put emphasis on e-records security areas and practices, including that of developing a security classification guideline. There neither existed e-records classification scheme nor a documented e-records security classification guide as mentioned earlier. The two documents have different purposes, but they work hand in hand. The functions of e-records classification scheme include providing a clear directive on ways and means by which records can be classified including the aim to logically organise e-records created, received and how they are maintained can help in developing a security classification guide (Caravaka, 2017). Ngulube and Stilwell (2011) assert that records should be classified wisely according to their subjects to make it easier for users to search for a specific individual subject record/information. The findings indicated that security classification is based on the nature of the information and the level at which the e-record was generated. This includes 'top secret' (including deliberations of the University Council, student examinations, fiscal matters), 'confidential' (including staff records that is social security numbers, loans and pension records, health records, personnel and pension records, students records), 'Public' (Notices for rallies, workshops, graduations,) and 'internal use' (records used by university staffers and students, internal job advertisements and internal memorandums)'. The literature reviewed provides similar but more secure classification techniques depending on the nature of the organisation (Griffith University, 2019; University of Plymouth, 2017; City University of Hong Kong, 2015; Kahanwal and Singh, 2013 Mishra, 2011; Public Service of Kenya, 2010; DoD, 2007). The guiding principle in e-records security is that the assigned security classification must be appropriate to the content therein;

thus, dictating access security control requirements and privileges from e-records inception to disposal (Charles Darwin University ,2017).

Security classification thus dictates the access controls that should or must be applied to e-records to guarantee their security. From the literature reviewed access control is vital, since it helps to protect the assets of the organisation, prevent illegal entry, enhancement of staff safety, reduction of security cost and facilities management, among others. ISO (2001) asserts that the development of appropriate categories of access rights and restrictions is based on the organisation's regulatory framework analysis, business activity analysis and threat assessment where reasonable security and access will depend on both the nature and size of the organisation as well as the content and value of the information requiring security. Access requirements must be considered to ensure access restrictions and/or access privileges. For instance, there are a variety of devices that can be installed to provide an input for authorised users to open a door or access a specific device, for example, users' access cards, keypad input, and biometric information. E-records access controls/restrictions may include among others secure log-in credentials and processes, access rights to the approved system, additional levels of security that may be applied to specific records within the system, and level of access (Charles Darwin University, 2017; National Archives of Malaysia, 2015; ISO/IEC, 2014; ISO, 2001). The findings indicated that the nature of the business activity determines access status, the role played by and individuals' ranking in the university or department. The findings thus provide a positive attribute that the university practices access control. Unfortunately, the university did not have an access policy to provide directions and guidance on sensitive matters like a user permission register and how the distinction is made on user rights and privileges. The literature reviewed indicated that access policies and/or user permission registered are vital and are ways of giving proper directions and/or prosecuting those who go against the restrictions.

## **Conclusions and recommendation**

The university has not fully appreciated e-records security classification and access controls including developing a classification scheme and a written instruction on security classification to provide sensitive e-records that legally require restrictions and the duration of the restriction. Although the university had in place access

controls that depended on user role privileges and the principle of least privilege, the findings pointed out that unauthorised access to classified e-records and systems had been witnessed, caused by personnel with requisite privileges and stolen access credentials belonging to fellow personnel. These findings identified personnel as a significant threat to information security. The study recommends that the university should develop e-records management policies that integrate matters of security. The existing regulatory frameworks should guide the university-wide policy formulation. They include an e-records classification scheme, documented e-records security classification guideline, appraisal, retention and disposal schedules, preservation policy, security policy, access policy, and an e-records management policy that encompasses all the procedures and schedules.

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# Nurturing the physical, digital, and biological learning spaces within a higher education ecology: an African LIS perspective

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## Abstract

*This conceptual paper highlights the importance of nurturing the physical, digital, and biological learning spaces within a higher education (HE) ecology. It emphasises the role of language, media and technology as conduits of information that enable the acquisition of knowledge and skills within the "fourth industrial revolution". The paper draws on the theoretical framework of TPACK to propose the trilogy of technological, pedagogic and content knowledge required by faculty to design, teach and assess exit level outcomes of HE programmes. By citing various teaching and learning theories, the paper theoretically unpacks what is recommended to produce a sound learning strategy that will help students become better critical and creative thinkers. It proposes various e-pedagogic opportunities to flip and extend learning time and reconfigure learning spaces, which have the potential to improve teaching and enhance learning. The paper advises that by changing learning outcomes from the mere reproduction of information to seeking its meaning and contextual application will help facilitate deeper learning and a mind-set shift from dualism and multiplicity to relativism. The paper acknowledges the transformational benefits of e-learning, learning management systems and the opportunity to collaborate with a diversity of students and research partners both nationally and internationally online. It also recognises significant challenges to integrating blended learning into a higher education curriculum as technology remains a disruptive and expensive innovation. The paper concludes that faculty members require incentives to become life-long learners to constantly update their knowledge and skills through policy and budgets*

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*that will support and reward innovative teaching. The paper proposes and influences the continuous review and development of each LIS curriculum for these academic programmes to stay relevant within the 21<sup>st</sup> century's 4IR rhetoric and beyond.*

**Keywords:** Higher education, fourth industrial revolution, 4IR, TPACK, blended learning, engagement theory, dualism, multiplicity, relativism, pedagogy, andragogy, heutagogy, library and information science, LIS, curriculum, life-long students

## **Introduction and background**

South Africa has one of the highest unemployment rates in the world, which rose to 29,1% in the third quarter of 2019 (Stats SA, 2019). There are a number of contributing factors to the current crisis, but when it comes to the solutions, the higher education (HE) sector has the ability to help address this socio-economic crisis. Unfortunately, underprepared students, large classes, high academic vacancies and classrooms with insufficient teaching and learning infrastructure jeopardise the standard of HE. The result, according to the Council of Higher Education (CHE), is that up to half of all students that enter HE do not finish their qualifications at all and only around half of the remaining students finish on time (CHE, 2014: 5). In order to address these challenges, it is important to understand the requirements for success and move towards an equity-based system for the betterment of the overall environment in comparison to a simplistic approach based solely on equality.

Current African socio-economic problems need to be solved by HE graduates who are able to apply their knowledge and skills critically and creatively within local contextual settings, i.e. “think global, act local” in order to transform themselves and the communities they live in. Language, media and technology act as important conduits of information, which enable the acquisition of knowledge and skills. Therefore 21<sup>st</sup> century literacies, for example computer, media and network literacies, are required by graduates to participate effectively in the knowledge economy of the fourth industrial revolution (4IR). Active participation in the 4IR requires engagement in the highly disruptive technologies which are blurring the lines between the physical, digital, and biological spheres, and are collectively referred to as cyber-physical

systems (Schwab, 2016). Nurturing the physical, digital, and biological learning spaces within a higher education (HE) ecology is thus vital to creating a healthy learning experience for students to acquire, question and create new knowledge, which can be applied in their local context.

The adoption of digital information and communication models allowed universities to do business on an international scale. While internationalisation of African universities, who now have to compete in the global HE market, has both institutional benefits and disadvantages, including the opportunity to collaborate with a diversity of students and research partners both nationally and internationally in research, curriculum and teaching methods can improve human resource capacity, while a brain drain and the commercialisation of HE are seen as risks associated with globalisation (Jowi, 2012: 158–159). Neoliberal commercialisation of HE has resulted in universities receiving less funding and being expected to fulfil more complex roles (Altbach, 2008: 5). Kerr refers to the term ‘multiversity’ to capture the English collegiate tradition, the German research idea and the American importance of service to society found within most modern universities today (Kerr in Altbach, 2008: 8). In South Africa servicing both the public and private sectors of our society requires universities to offer a wide range of specialised and generic programmes to cater for both the capitalist private sector and more socialist public sector (Altbach, 2008: 9). Ek, Ideland, Jönsson, and Malmberg (2013: 1305) capture the tensions between different institutional cultures that differ in their epistemologies of catering for the private market with more emphasis on creating skills and practical experience and with research on market-related problems (marketisation of HE), or trying to create more scientifically sound academic programmes (academicisation of HE). The authors conclude that the dominance of marketisation or academicisation within HE will depend on the aims of the education (vocational or generic), the prevailing traditions, academic associations and composition of the staff (Ek *et al.*, 2013: 1316). However, the authors believe that the incorporation of both, for example in the peer review system, where the competition for recognition and resources ensures academic excellence, can also work very well together. Ek *et al.* (2013: 1316) thus question whether the tensions in their native country Sweden might actually be a result of the politicalisation and tighter governance of HE to conform to both at the same time? In the African context this often requires development, and in South

Africa current developments in teaching and research is funded by the University Capacity Development Grant (UCDG) programme. The University of Zululand's (UNIZULU) University Capacity Development Plans (UCDP) propose to build capacity in both research and the scholarship of teaching and learning through interventions such as the Post-Graduate Diploma in Higher Education, which seeks to professionalise teaching in the university. In addition, the strategic plan foregrounds the need to address the opportunities and challenges presented by technology. One of the key issues in UNIZULU's UCDP proposal is to enhance staff capacity in integrating technology into teaching and learning. The main research question the paper asks is how a good learning strategy can help transform students into critical and creative thinkers, who are capable of finding a niche in the 4IR. The objective of the paper is to highlight the importance of seamless learning by nurturing the physical, digital and biological learning spaces within a higher education ecology.

## **Literature review**

The following literature and theory review introduces teaching methods to expand the classroom in time and space, including offering well planned and appropriately designed blended learning. Blended learning integrates the face-to-face and online components of a course so that they complement and extend one another. It starts with teaching the teacher to embrace life-long learning because although experts in their disciplines, unless they adopt appropriate teaching methods and technology to communicate their content knowledge to students, their expertise is normally insufficient.

The paper concurs with Garrison and Kanuka (2004: 97) that blended learning is particularly effective in its ability to facilitate a community of inquiry as seen in Figure 3. The community provides the stabilising, cohesive influence that balances the open communication and limitless access to information on the Internet (Garrison & Kanuka, 2004: 97).

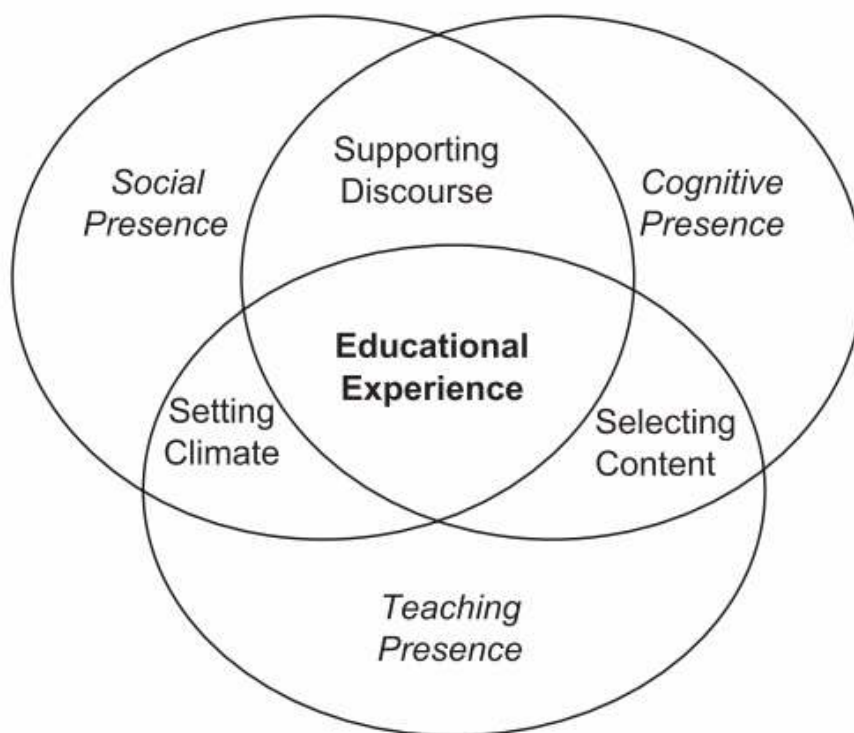


Figure 1: Community of inquiry (source Garrison & Kanuka, 2004:98)

Communities also provide the space for free and open dialogue, critical debate, negotiation and agreement — the hallmarks of higher education (Garrison & Kanuka, 2004: 97). Blended learning has the capabilities, through a learning management system (LMS), to facilitate these conditions and it adds an important reflective element with multiple forms of communication to meet specific learning requirements and styles (Garrison & Kanuka, 2004: 98). O'Brien and Toms (2008: 1) recommend that teachers adopt successful technologies which are not only usable but also engage users. The transfer of information through theory and practical lectures still forms the foundation for the acquisition of “three kinds of knowledge” that in turn provides the foundation of constructivism, i.e. physical, logico-mathematical and arbitrary conventional (De Vries in Georgescu, 2008: 48). The physical knowledge is more easily facilitated in practical lectures when students build networks, computers and multimedia productions by experimenting with physical hardware components like video cameras, computer components and network hardware. The logico-mathematical knowledge does not come as naturally to most students, as De Vries, in Georgescu (2008: 48), explains that this source of knowledge comes from the individual who introduces into objects characteristics that are not characteristics of

the objects themselves, for example, the Dewey decimal classification system, and deals with relationships between concepts and abstractions.

### **Theoretical underpinnings**

The HE curriculum should promote an epistemological development in a student's conceptions of knowledge, i.e. from an understanding that all knowledge is either right or wrong, also known as dualism, to realising that there are multiple ways of investigating a problem or research question, called multiplicity, to the awareness that knowledge is actually provisional or temporary, and then to an insight that knowledge depends on the interpretation of information and scientific evidence with a variety of possible conclusions that can be drawn from it, which is referred to as relativism (Entwistle, 2008: 26).

Säljö in Entwistle (2008: 7) explored conceptions of learning, where the first two describe the learning implied by the majority of assessment methods, which depend on remembering factual information, and then reproducing it in summative tests and exams; the third category marks the start of a qualitative change, as information is seen as having a purpose beyond acquisition, i.e. it also has to be applied, while the transformation reaches an important threshold when learning becomes equated with understanding, seeking meaning and seeing things in different ways, which leads to personal transformational change and a sense of identity (Entwistle, 2008: 27).

### **Technology, pedagogy, and content knowledge (TPACK)**

The integration of technology into the LIS curriculum is vital for graduates to acquire digital literacy in the different areas and sub-disciplines of information science as represented in Figure 2 by Bwalya (2018: 5). Bwalya (2018: 5) highlights how the rapid changes in many of the sub-disciplines require the Information Science curricula to change in unison to stay relevant in changing times. Therefore, teachers in HE need professional development in more than just their LIS content knowledge: also their knowledge of students' thinking and learning, and knowledge of technology (Koehler & Mishra, 2009: 61) in order to design, teach and assess exit level outcomes of HE programmes effectively.



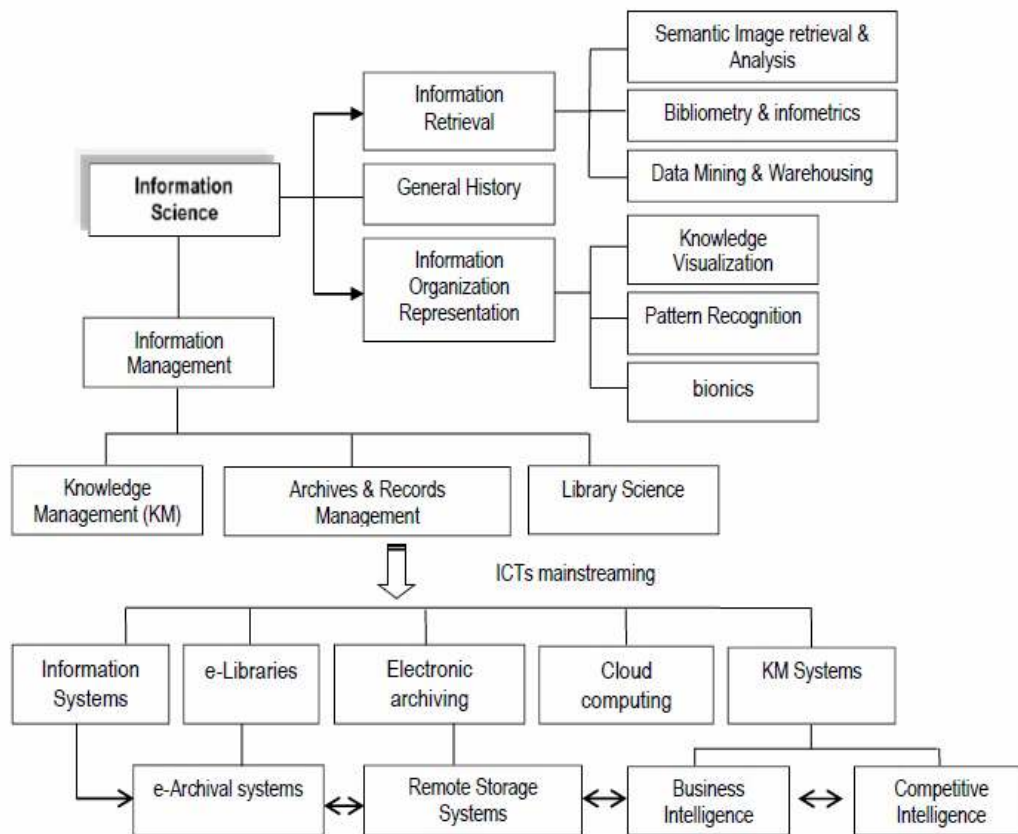


Figure 2: Areas and sub-disciplines of the Information Science domain (Bwalya, 2018: 5)

The development of the technology, pedagogy, and content knowledge (TPACK) framework was built on Lee Shulman's construct of pedagogical content knowledge (PCK) and included technology knowledge, which is considered vital for effective teaching with technology (Koehler & Mishra, 2009: 60). The multifaceted interaction among these three bodies of knowledge, i.e. content, pedagogy, and technology, both theoretically and in practice, produces the trilogy of knowledge needed to effectively incorporate technology assisted blended learning into the 21<sup>st</sup> century classroom (Koehler & Mishra, 2009: 61).

As graphically represented in Figure 3, technology knowledge (TK) requires life-long learning, as it constantly evolves over a lifetime of interaction and use of technology (Koehler & Mishra, 2009: 64). Pedagogical knowledge (PK) is a teacher's knowledge about the processes and practices or methods of teaching and learning (Koehler & Mishra, 2009: 64) like communicating, motivating students and scaffolding information and learning events. Luckin *et al.*'s concept of the pedagogy-andragogy-

heutagogy (PAH) continuum can be used to measure the pedagogical transformation within a programme as the teacher moves from pedagogy (teacher directed) to andragogy (student centred) to heutagogy (student directed) (Blaschke in Cochrane, 2014: 72).

Content knowledge (CK) is a teachers' knowledge about the subject matter to be learned or taught and is of critical importance for achieving the specific module outcomes (Koehler & Mishra, 2009: 63).

According to Koehler and Mishra (2009: 62), pedagogical content knowledge (PCK) is consistent with and similar to Shulman's notion of the transformation of the subject matter for teaching. Specifically, this transformation occurs as the teacher interprets the subject matter, finds multiple ways to represent it, and adapts and tailors the instructional materials to alternative conceptions and students' prior knowledge (Koehler & Mishra, 2009: 64). Technological content knowledge (TCK) is about using new technologies that can provide the representation and manipulation of data in new and productive ways, for example carbon-14 dating and X-rays in the fields of medicine and archaeology (Koehler & Mishra, 2009: 65). Technological pedagogical knowledge (TPK) is an understanding of how teaching and learning can be changed and enhanced when specific technologies are used in different ways (Koehler & Mishra, 2009: 65). TPK includes knowing the pedagogical benefits and limitations of a variety of technological tools as they relate to disciplinarily and developmentally suitable pedagogical strategies and designs (Koehler & Mishra, 2009: 65).

Koehler and Mishra's (2009: 66) perception of technology, pedagogy, and content knowledge (TPACK) goes past all three "core" knowledge components (content, pedagogy, and technology) and is an understanding that emerges from experience and in-depth interactions among content, pedagogy, and technology knowledge. TPACK is the foundation of effective teaching with technology, which requires a good understanding of the depiction of concepts using technologies; pedagogical techniques using technologies in helpful ways to teach content; knowledge of what makes concepts either easy or hard to learn and how technology can enhance learning and minimise some of the problems that students experience; knowledge of students' past knowledge and theories of epistemology; and knowledge of how

technologies can be used to develop new epistemologies or strengthen old ones (Koehler & Mishra, 2009: 66).

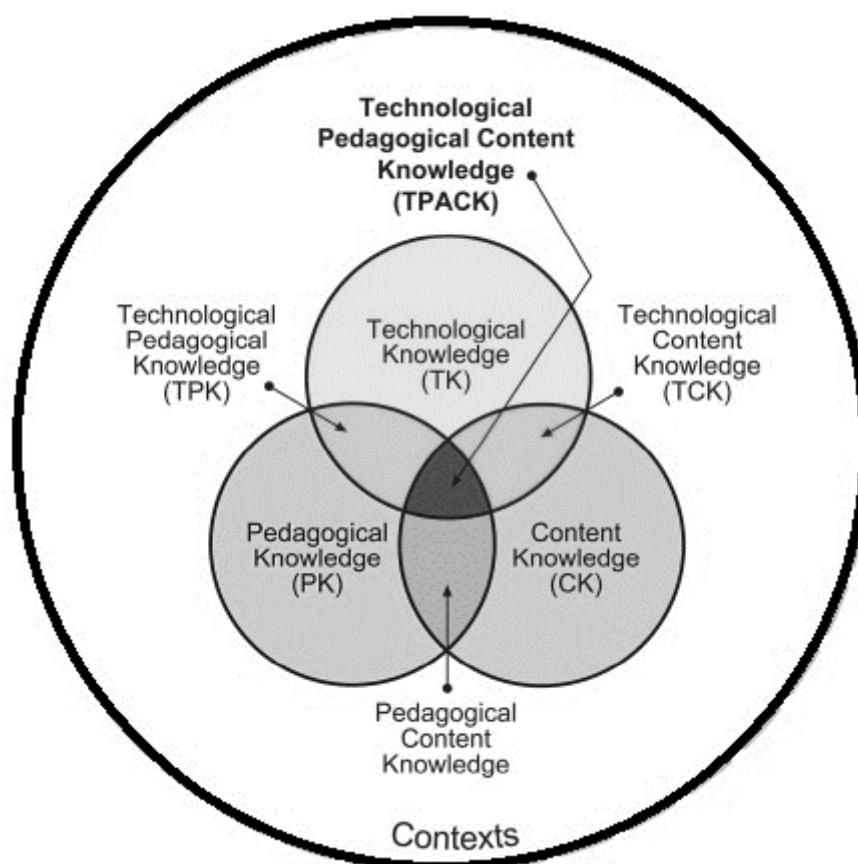


Figure 3: The TPACK framework and its knowledge components  
(source Koehler & Mishra, 2009: 63)

## Designing seamless physical, digital and biological learning spaces in an LIS programme

In a blended HE learning environment students are encouraged to learn in different spaces, i.e. through physical interactions between lecturer and students in the classroom, through digital information and communication models in an online platform like an LMS or social networks, and most importantly using their personal learning styles and biological intellect.

Seamless learning allows students to learn whenever they are curious, in a variety of learning spaces and situations (Berge & Muilenburg, 2013: 98). LIS departments constantly have to assess their teaching and learning practices to implement new

methods and educational technologies that support digital information and communication models favoured by a generation of students with different learning styles, expectations and information literacy needs. These include the traditional language literacies of reading and writing and finding information, and important modern literacies, which include digital literacy, network literacy, media literacy, visual literacy and cultural literacy (Lapuz, 2014: np), with the latter being important to integrate and use when Africanising the LIS curriculum to solve local problems. At UNIZULU the Information Studies department has encouraged the adoption of the pedagogy of Connectivism (Siemens, 2004a in Evans, 2013: 7) where language, media and technology act as the conduits of information, promoting greater student participation, engagement, collaboration and interaction between networked students, who can socially construct an active learning experience within various learning spaces (face-to-face, e-learning, research, self-learning, informal learning, work integrated /experiential learning, mentorship /tutorship and community outreach) in a blended HE learning ecology.

### **The importance of well-designed physical and digital learning spaces**

According to Kampylis and Berki (2014: 10) the way physical or virtual spaces are designed has a major impact on creative thinking and learning and can bring people together and encourage their interaction and collaboration. Designing classroom seating in a conference style layout instead of classroom style in a physical environment has a large impact on the interaction of students in class. Flipping the lecturer and student face-to-face classroom experience by giving the traditional lecture information to the student in the form of online homework and then bringing the creation of projects and assignments that better instil critical thinking and writing skills of the discipline into a leader led classroom environment (Hodges, 2015: np) should also be considered in the design.

Another consideration in designing a good learning strategy is the right combination of learning events, which according to Leclercq and Poumay (2005: np) constitutes a sound learning strategy necessary for the successful transfer of knowledge and skills to a diverse group of students with different learning styles. The eight learning events proposed by the authors places “meta-learns” in the centre, which refers to the student’s all-important self-reflection at the end of a learning process and is vital for

converting contextualising information into knowledge (Leclercq & Poumay, 2005: np). “Creates”, as a learning event, involves creating something new, such as a portfolio. Introducing “experiments” allows the student to test personal hypotheses, for example computer simulations, or visual problem appraisal and solving. “Practices” include formative assessments that allow students to show and learn from their mistakes in a low-stakes environment. “Explores” allows personal exploration by a student, for example the world wide web searches on electronic databases. “Receives” allows the traditional didactic transmission of information, e.g. lecture, content delivery and recommended readings; however, the time and space of this event can be flipped and expanded by also allowing students to receive the same and additional resources via the LMS before class. “Debates” encourages social interactions, collaborative, cultural fluency using online forums and wikis in Moodle. Finally, “imitates”, as a learning event, encompasses learning from observation and imitation.

## **Identifying risks and providing support for biological learning spaces**

Arndt (2012: 41) believes that lecturers should take biological needs and neurobiological processes into account when designing productive and useful learning environments. The author believes that mental resources and characteristics, such as their emotional well-being and a sense of security, will impact on the student’s willingness to learn, (Arndt, 2012).

Learning analytics has recently emerged as a research field that can improve teaching and learning and also identify the causes and effects of student access and success within a HE ecology, which were not well understood and supported before. This includes identifying constructs that are the driving forces behind certain behaviours and academic performances and providing the necessary support structures to offer proactive financial, academic, mentor and often more importantly psychological, wellbeing and health support to improve the student experience.

The Department of Information Studies and UNIZULU have put in a proposal through the South African, Swedish Universities forum (SASUF) to collaborate with Uppsala University (UU), Royal Institute of Technology (KTH) and University of the Witwatersrand (Wits) on a learning analytics project titled "Data, Information and

Knowledge Exchange for Higher Education Development". The purpose of the project is to model data from a South African higher education (HE) ecology to understand and support risks that can affect the quality of students' education and hence their employability. Learning analytics will be used to improve teaching and learning by identifying causes and effects of different underpinning processes that were not well highlighted or supported in HE before. The project envisages solving challenges in accessing large amounts of high-quality data, managing data with privacy preserved settings and developing new methods to analyse the data. The project will identify constructs to both student access and success in HE, where background matters, context matters, support matters and teaching matters (Green, 2018: np).

### **Challenges of integrating technologies into learning events**

There are many challenges posed by integrating blended learning into HE curricula. Ensuring a mainstream technology module stream throughout the length of the qualification would provide students with knowledge, skills and the correct attitude when working with ICTs, multimedia and computer networks in the data, information or knowledge sectors. Hence, key to module development at the micro level will be the integration of appropriate technologies and digital media into the learning events in order to ensure the digital literacy module and programme outcomes are achieved by graduates.

Incorporating engaging technologies into the curriculum at the macro level is supported by appropriate exit level outcomes and requires staff to receive sufficient training in blended teaching and learning theories and the use of the technologies. Any technology integration requires thorough testing and user acceptance before it is rolled out. Poor access to networked devices will definitely impede the participation of students in the e-learning experience and should be a priority in teaching and learning policies and strategy. In other cases, access to these technologies could be a distraction, for instance students accessing social media instead of engaging in a learning event. Plagiarism and the "copy and paste" culture that has arisen in the digital learning environment requires ethical development on the students' part by consciously using similarity checking and referencing software in a formative manner to discourage and improve their writing styles, while better understanding the learning

events content. Protecting user's privacy rights on LMSs and how to distribute the costs of expensive infrastructure required to offer and access e-learning resources are important problems that need to be addressed. For instance, subsidising student devices, and managing the software, which could include a tracking and data recovery solution if the device gets lost or stolen, would at the same time improve the safety and security of students and their data.

Assessment of digital outcomes of academic programmes can also sometimes be problematic. Knight (2001) gives the example of how exam results used to judge students' success are quite reliable but their deceptive objectivity comes from examining students only on those aspects of the module's content that can be reliably graded, while the students' skill at designing, managing and completing practical work goes unmeasured by examinations, even though it is a part of the curriculum and covered in the practical lessons. For instance, the following question which appears in a summative assessment and exam of my third-year networking course:

"Discuss how physical and logical network diagrams are used within networks. (20 marks with max time 36 min.)", could be asked in a way to encourage students to engage with the learning outcome in a more complex manner using the appropriate technologies, which should increase the validity of the module outcomes, e.g.: "Demonstrate how physical and logical network diagrams are used within networks by designing both these diagrams for an Internet café using Microsoft Visio and the product price list provided. Marking criteria requires you to produce an inventory and configuration table designed as a database in Microsoft Access to support your diagrams. All files can be uploaded to their respective links on the Learning Management System (LMS) (40 marks with max time 72 min.)." In doing this, the usability of the assessment decreases because more time is taken; however, the validity of the assessment and module outcomes would increase drastically.

Johnson (2015: np) believes that solvable challenges include blending formal and informal learning and improving digital literacy among staff and students, while competing models of education (like online distance learning versus traditional blended learning), personalising learning and tracking complex thinking are difficult challenges to overcome. Wicked problems include balancing our connected and

unconnected lives, keeping education relevant and introducing rewards for innovative teaching (Johnson, 2015).

## **Conclusion**

One of the core missions of higher education (HE) institutions is to teach and train, and, specifically, to add to the sustainable development and holistic improvement of society (UNESCO, 1998). For LIS departments to fulfil this core mission, they should reflect on their teaching and assessment practices, curriculum development initiatives and educational technologies initiatives. The ever-changing pedagogical-andragogical-heutagogical landscape in HE is demanding greater validity in professional development, learning strategies and events, meta-learning and the assessment of learning. Using the appropriate technologies to facilitate learning and learning analytics requires action research, i.e. practice, reflection, refinement and practice again to establish what works and to accommodate ever-changing student needs and learning styles. Designing and delivering this balance of learning events would depend on training, experience, resources, support and the discipline-specific outcomes that need to be achieved. Faculty's technology, pedagogy, and content knowledge needs to provide students access to engaging content using language, media and technology as enablers of information to acquire knowledge and literacy skills within the 4IR.

LIS departments constantly have to review their teaching and learning practices to implement new teaching methods and educational technologies. In doing so departments will support digital information and communication models favoured by a generation of students with different learning styles, expectations and information literacy needs. However, student background matters, contextual setting where they study matters, the multi-layered support structures matter and faculty preparedness and teaching methods matter when it comes to student success in HE (Green, 2018: np).

Further initiatives to support teaching and learning at UNIZULU include the Vice-Chancellor's Excellence in Teaching awards; the mentorship programme for academic staff and novice and expert staff development capacitation programme; opportunities for staff to complete their PhDs (24 have done so in the past two years);



to professionalise higher education teaching (PGDHE) and plans to introduce an early warning system to identify students at-risk.

The paper concludes that to offer technology assisted learning in HE various resources are required in terms of suitable physical venues with well supported digital technologies, experienced information literate lecturers, who are pedagogically able to design and develop well-structured learning events that scaffold multimedia resources which students are able to seamlessly access and understand on demand via digital technologies and networks. This will facilitate students' conceptual understanding and their ability to apply new meaning to universal knowledge for different contextual settings, i.e. "thinking globally and acting locally" in society and their communities of enquiry.

## **Recommendations for the LIS curriculum**

In order to retain its relevance, the Information Science discipline needs to keep evolving to meet current socio-economic development needs and keep abreast with trends and advancements in information resources management (Bwalya, 2018). This includes how to retrieve, organise, analyse, categorise, manipulate, store and protect data, and also how to design systems that serve the social, cognitive and emotional requirements of the people who access and use information. Information scientists exist in every sector of industry – including the tech, government, education, healthcare and finance sectors. At the macro level the purpose of a generic LIS programme is to produce information graduates that can design, develop and utilise information systems (ISs) using a variety of technologies for various information services. The programme or exit level outcomes of the degree need to be strategically linked to major module streams of information retrieval, information organisation and representation, information management and digital literacy in mainstream information communication technologies (ICTs). Exit level outcomes need to be determined in consulting these sectors and professional bodies (LIASA). A pedagogic shift to incorporate technologies, research, work integrated learning (WIL) and community engagement into all major streams will allow students to find a niche and apply their knowledge and skills within their local communities.

At the meso-level main module streams in information retrieval, information organisation and representation, information management should run from the 1st to 3rd year so module stream outcomes link to and validate exit level outcomes. Academic vacancies in departments need to be filled as a priority. Staff need to professionalise their TPACK and experience in order to redesign learning spaces for engaging seamless learning. TPACK can be facilitated by lifelong learning and a survey of faculty knowledge, where deficiencies can then be developed through various academic support initiatives and UCDP projects.

At the micro-level of the programme, academics and instructional designers should design learning events that complement student learning styles by integrating technologies and digital media into the learning events. Programme reviews should ensure that learning outcomes link to and validate module and programme outcomes.

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# **An analysis of the adoption of e-voting systems at the University of Mpumalanga, South Africa**

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## **Abstract**

*This paper analyses the adoption of e-voting systems at the University of Mpumalanga (UMP) during the 2018 Student Representative Council (SRC) election. The paper used in-depth interviews with Independent Electoral Commission (IEC) officials and the university electoral committee. The study adopted a case study method. The trust theory was adopted as the theoretical framework for this study. The study found that an e-voting system was not adopted during the election because of the students' lack of trust in the IEC and university electoral committee and their negative attitude and belief regarding the e-voting system. Despite the rejection of an e-voting system, the outcome of the SRC election was not influenced by any political parties. The election was successful because of the high level of voter education performed and the competencies of electoral officers demonstrated during the election. However, the paper recommends the adoption of an e-voting system in the future based on the authenticity, reliability, security and completeness of an e-voting system.*

**Keywords:** e-voting, University of Mpumalanga, South Africa

## **Introduction**

This paper seeks to analyse the adoption of an e-voting system by students at University of Mpumalanga (UMP). Factors such as trust in the Independent Electoral Commission and the university's electoral committee, attitude and belief, voters education, influence of political parties, authentication, privacy, security and audit trail, and the skills and knowledge of the electoral officer regarding electoral management were investigated. According to Habibu, Sharif and Nicholas (2017), e-

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voting comprises the use of Information Communication Technology (ICT) for voting purposes. It encompasses several different components, including both the electronic means of casting a vote and electronic means of counting votes (Achieng and Ruhode, 2013, 10). Jamnadas and Farik (2015) define e-voting as the use of electronic computerised tools to aid in the casting and counting of votes. E-voting implies combining technology during a democratic voting processes to make voting efficient and convenient for voters (Nu'man, 2012). According to Gibson, Krimmer, Teague and Pmares (2016) an e-voting system depends on some electronic technology for its correct functionality.

## **University of Mpumalanga (UMP)**

The UMP is a comprehensive university established in 2015 by the South African government in terms of the Higher Education Act, No.107 of 2007. The university is located in Mbombela, Mpumalanga Province. Students at the University of Mpumalanga are enabled, in terms of the Constitution of the UMP Student Representative Council (SRC), to elect their own representatives.

## **The e-voting process**

The following processes were set to be followed for processing the first e-voting system at UMP.

- It was agreed that student cards would be used as a basis of student identification processes.
- After successful identification and authentication, a ballot sheet was issued for every student who was eligible to vote in the election.
- Invalid votes would be determined by either not selecting any choices or by selecting too many.
- The ballot would be used at the end of the election to check whether everyone's vote was counted.

According to Nzoka, Muthama and Mungithya (2013:71), technology and specifically computers and computerised processes have been applied in many countries to improve the efficiency and credibility of voting processes.

## **Voting process**

The project was divided into three phases, firstly the pre-voting, secondly the voting and thirdly the post-voting phase of the project

## **Usability test**

The test of the e-voting system was piloted using twenty students to check whether they will be able to execute a successful voting system. Students were selected from different schools such as Development studies and Agriculture. The system met the requirement of an e-voting system such as security, authenticity, reliability and an audit trail.

## **Vote eligibility check**

Only students registered for the 2018 academic programme approved by the University Council of the UMP were eligible to vote. Only authenticated voters were allowed to vote. Voters were required to prove their identity and eligibility to vote (Shinde, Shukla and Chitre, 2013:204). The voters' roll was printed to verify all registered students. The process of printing the voters' roll required all students to be checked before the voting process.

The e-voting system was designed in such a way that all students could monitor the election process. After the voting system was conducted, verification was done of all the cast votes. This is alluded to by Ya'acob, Azize, Yusof, Sarnin, Naim, Rohaizad (2018) and Daramola, Adefuminiyi and John (2016) who stated that voter identification and authentication is vital and can be applied using both student cards and students' signatures.

## **The importance of e-voting**

According to Shinde, Shukla and Chitre (2013, 203) e-voting has the advantages of lower costs, faster tabulation of results, greater accuracy, a lower risk of human error and mechanical errors, and improved accessibility for people with disabilities. More students including disabled students have opportunities to access the system. An e-voting system also provides multi- language support for a ballot.

An e-voting system is essential to prove completeness, privacy, non-reusability, eligibility, fairness, verifiability and robustness, receipt-freeness and non-coercion.

According to Kogeda and Mpekoa (2013), an e-voting system increases the participation of more students to vote. Habib, Sharif and Nicholas (2017) state that e-voting is a form of empowerment. E-voting has the ability to reduce the logistical and the administrative costs. The university will not spend many resources to print ballot papers to be used during the election.

## **Problem and purpose of the study**

In the past, the manual voting system at UMP has led to missing ballot papers, invalid votes, costs in terms of numbers of ballots printed and miscounts and delays in announcing the election

In the light of the g challenges listed above it was deemed important by the University to introduce e-voting that addresses these challenges and ensures that students vote in comfort and improves the accuracy of election results by eliminating human error. According to Shinde, Shukla and Chitre (2013), several South African universities have not yet developed or implemented e-voting systems.

The purpose of this study is to analyse the adoption of e-voting systems at the University of Mpumalanga (UMP) during the 2018 Student Representative Council (SRC) election. This will be achieved by answering the following research questions:

- What was the credibility of the IEC and electoral committee to conduct free and fair elections?
- How did the political parties influence the voting process?

## **Theoretical framework and literature review**

The research applied the trust theory. The perception of trustworthiness relies on the cognitive and emotional capacity that individual students bring to bear on their experience of service. Avgerou (2013) claimed that trust in e-voting highlights the importance of students' perceptions of the trustworthiness of both the technology of the system and the electoral authorities when e-voting is being developed and implemented.

Pelletier and Couture (2018, p.301) state that if institutions have low levels of legitimacy, there is no expectation for students to 'trust the system'. The fundamental values and norms that they defend do not coincide with our own, and trust in them

therefore cannot be high. The level of political trust that lasts for some time should cause concern.

According to Kogeda and Mpekoa (2013) a trustworthy e-voting system will include elements such as anonymity, authenticity, integrity, accuracy, democracy, verifiability, multi-user, accessibility, availability, simplicity, multilingualism and reliability. A good voting system must be tamper-proof and also assure the anonymity of the voters for their protection and safety (Suwandi, Nasution and Azmi, 2018). According to Anane, Freeland and Theodoropoulous (2009), accuracy, privacy, individual and universal verifiability, eligibility, transparency and fairness are the properties which need to be considered during the process of voting.

Relevant to my research on trust theory in e-voting is the literature on trust in e-voting systems. The trust theory has drawn a distinction between trustworthiness as a set of properties possessed by the trustee and the perception of trust-worthiness. This theory informs this study because students showed high level of lack of trust on the election processes (Independent Electoral Commission, electoral officer, voting process).

The review of the literature is based on the following sub-themes.

### **Trust in the IEC and electoral committee**

The IEC is responsible for all matters pertaining elections (Lai 2010, p.212). IEC stakeholders, including voters, political parties, observers and others, must trust the independence and neutrality of the commission tasked to oversee the election (Jamnadas and Farik 2015, 340). One way in which the IEC are likely to be suspicious is if the members or people in charge of management are appointed by the vice-chancellor of a university (Kimbi, Nkansah-Gyekye and Michael, 2014).

### **Attitude and belief**

The study conducted by Alomari (2016, 530) indicated that attitudes and beliefs influence the adoption of e-voting. This statement is alluded to in other studies (Fukuyama, 1995, Gefen, Rose, Warkentin and Pavlon, 2005: 56) who indicated that the adoption of an e-voting system is dependent on belief or culture. The behaviour of students influenced the intention to adopt the e-voting system. Adesina and Ojo (2014) emphasise the significant role of attitudes and beliefs in change in social



communities. Research conducted in the Jordan during their general election revealed that the highlevel of positive attitudes regarding e-voting contributed to the voters' adoption of an e-voting system (Beroggi, 2014). The voters' perception of the benefits and obstacles of voting technology can be a challenge for organisations in deciding to adopt the e-voting system (Jamnada and Farik, 2015).

### **Voter education**

Voter education plays a role in creating the awareness of the importance of democracy, voting, accountability and transparency (Mapuva, 2013). According to Jamnadas and Farik (2015, 340) the usability of a voting system is essential for a democratic student election. There are perceptions or concerns that the educational level of voters may influence students' acceptance of the voting system (Achieng and Ruhode, 2013).

Absence of voting awareness can do little to promote democratic citizenship and processes (Nicholson 2003:403). Student awareness of elections may grow when there is an increase of news media coverage (Nicholson 2003: 404). During voters' education, political parties compete to inform voters about student leaders. In that sense, voter education can be viewed as an information campaign. Voter education can be achieved through marketing and advertising candidates' activities within the universities (Bakon and Ward, 2015).

### **Influence of political parties**

According to Adekitan, Matthews, John and Uzairue (2018), student politics and elections are partisan, and this could be further intensified by various vested external interests. This statement is alluded to by Parreira, Tavana and Harb (2019: 5), who view the university elections as a site for the contention between different party agents competing for future electoral supporters and active members. The intervention of political parties in the student elections and elsewhere could be responsible for the resilience of *status quo* politics (Parreira, Tavana and Harb, 2019).

### **Authentication**

Any voting system has sufficient capabilities to authenticate users as eligible voters (Ghatol and Mahale, 2014). In e-voting, digital signatures are applied to authenticate the voters as eligible (Ghatol and Mahale, 2014).

## **Privacy**

Introducing e-voting system technology requires the acceptance by a wide range of students and is related to the sensitive issue of the election (Nu'man, 2012: 144). The e-voting system raises questions linked to lawful security and privacy concerns (Habibu, Sharif and Nicholas, 2017). The review of literature shows that voters raised concern about the protection of privacy, counting accuracy and the resources and tools needed for the electoral system (Yao and Murphy, 2017: 107). According to Clarkson, Chong and Meyers (2007) anonymity or secrecy of votes should be maintained to ensure that voters are not to be coerced. A central issue impeding the successful implementation of e-voting is the prevention of fraud and the promotion of voter privacy (Heichler, 2003).

## **Security and audit trail**

The serious concern about e-voting elections is information security (Jamnadas, Farik, 2015). The review of literature conducted by Kogeda and Mpekoa (2013) found that security management and an audit trail are the concerns on the implementation of an e-voting system. Security issues relating to an e-voting system are concerns and there are many possible threats which may be difficult to mitigate (Ghatol and Mahale, 2014)

## **Skills and knowledge on electoral management**

Staff responsible for the management of elections should possess Information Communication Technology (ICT) skills such as programming and systems design to manage elections (Jamnadas and Farik, 2015: 341). Staff who are not properly trained in election management may cause delays of electoral processes such as the counting of ballots from boxes and the announcement of election results (Achieng and Ruhode, 2013). Alomari (2016) in his adoption model stated that embracing e-voting is influenced by the level of staff with ICT skills. Contrary to this finding, Salimonu, Osman and Shittu (2014) found that there was no link between e-voting systems and ICT at the election held in Nigeria. Hence, Bakon and Ward (2015) stressed that staff who are deployed to oversee elections need to attend formal training and workshops on election management.

## Research methodology

The present study adopted a qualitative research method in the form of a case study. *Case studies* are used in exploratory research and help the researcher to generate new ideas and represent an important way of illustrating theories and assisting different aspects of conducting election systems. Case study research is also good for contemporary events such as conducting an election. The author fully explained the study to proposed participants in advance. Clear and accurate information about the research study was given to all participants prior to the start of the research. Participants were informed about the aim and objectives of the study and their decision to participate in the study. The selection of participants was determined by the research purpose, questions, and theoretical context. These include accessibility, resources, and time available. The research strategy was to select a focus group such as people involved in the election processes. Two staff members were from the Independent Election Commission (IEC) and three from the University committee. The strategy of selecting the sample for the study was purposive. The participants were selected based on their familiarity with the legal background of election management and their experience and understanding of the electoral laws such as the Electoral Commission Act 51 of 1996. The primary resource of data for this study were document analysis for the literature review, and interviews.

Qualitative techniques were employed in data collection using focus interviews. These allow participants the time and scope to talk about their opinions respecting an election. Participants were asked about their perceptions, opinions, beliefs and attitudes towards election processes. Before embarking on the data collection process, we sought permission from the research department and authorisation to carry out research at the University of Mpumalanga.

The data is analysed based on the research objectives. Selected verbatim utterances from participants are represented in the findings. In order for the researcher to keep the participants anonymous, symbols (e.g. R1 to R5) were used to show the responses of participants

## Findings

The findings relate to the two research objectives as categorised below.

## **How credible were the IEC and the electoral committee to conduct free and fair elections?**

The IEC and electoral committee need to demonstrate experience, knowledge and understanding of the processes of conducting free and fair elections. The fact that the IEC and electoral committee have extensive experience of conducting elections in South Africa and other parts of Africa shows the creditability of the IEC to conduct elections in South Africa. The IEC and electoral committee were accepted by the student political bodies to conduct elections in universities, a demonstration of the acceptance of conducting student elections in South Africa.

## **Trust in the IEC and electoral committee**

Participants were asked their level of trust and expressed the following views with regard to the IEC and electoral committee conducting e -voting

- R1 “The adoption of e – voting is dependent on the trust of both students and various student political organisations”.
- R2 “The IEC and Electoral Committee are to be trusted by students and student political organisation on handling elections”.
- R3. “To remain open on the process of voting processes.”
- R4. “IEC and Electoral Committee possessed skills to handle student voting.”
- R5. “E-voting system reduces human error elements”. The results imply that the adoption of e -voting is dependent on the IEC and electoral committee being trusted by students and political student formations.

The findings reveal that the IEC and university electoral committee members preferred the adoption of an e-voting system over a paper-based system. They viewed an e-voting system as a method of reducing human errors caused by electoral officers on the voting day. There was a perspective that students’ organisations had less trust in the IEC and electoral committee.

## **Attitude and belief**

Participants were asked their views with regard to attitude and belief relating to conducting elections. Participants expressed the following views:

- R1 “The adopting of e-voting should reduce long queues of voters waiting to cast their votes”.

- R2 "Attitude and belief determine the level of adoption of an e-voting system"
- R3 "What if students reject an e-voting system?"
- R4 "No cheating of votes through e-voting"
- R5 "It will be a challenge to embark on the first e-voting system in South African universities."

Based on the results, it seems that there was some students developed negative attitudes towards e-voting. There was also the perception that students viewed an e-voting system as a form of manipulation by the university management to promote certain student political organisations.

### **Voter education**

Participants were asked their views with regard to the effectiveness of voter education. The participants answered as follows:

- R1 "It was a way of promoting transparency, accountability and democracy"
- R2 "It was a nice way to conduct voter education"
- R3 "Students understand what is expected from them"
- R4 "Voting education was necessary for the students to understand electronic voting"
- R5 "It was a platform for students to understand the processes of handling ballot boxes, electoral rules and procedures"

Based on the results, voter education plays an essential role for students and student political organisations to understand the importance of voter education such as understanding an e-voting system, process and procedures, the importance of voting, conducting election in a free process and procedures.

It seems that voter education plays an important role in influencing students to vote. The large number of students who voted during the SRC election shows that voter's education played a role in the meaning of voting and promotion of democracy. The findings indicated that digital media were used as a form of political communication to various stakeholders to encourage students to vote for a particular political organisation. The research found that during the election period, there was high media coverage regarding voter education.

## **How did the political parties influence the voting process?**

Participants were asked questions about their views on political parties influencing the election. Participants answered as follows:

- R1 “Every students formation understands the role of student political movements”
- R2 “Political organisations are not allowed on the university campus during the election period”
- R3 “Political manifestos to be presented by student political bodies”
- R4 “Main political organisations are not to campaign on behalf of their student formations”.
- R5 “Political organisations ( ANC and EFF) have no influence on student politics”

This findings imply a lack of political influence by the political parties during elections. The findings revealed that no political parties influenced the voting pattern during the elections. Political parties such as the ANC and EFF only provided students with T-shirts as a form of campaigning.

## **Authentication**

Participants expressed the following views with regard to the authentication of ballot papers during the election period:

- R1 “Duplication of ballots is to be avoided”
- R2 “Control mechanism of voters’ rolls is in place”
- R3 “The office of the Registrar was contacted in order to retrieve a list of students eligible to vote during elections”
- R4 “Students with a criminal charge or guilty of any offence were not allowed to vote” R5 “Verification of all information is done to ensure that the election process is legitimate”.

Based on these results, it seems that the election was conducted in a free and fair manner. This implies that the issue of reliability and accountability was taken into consideration. This also means that cheating of votes was limited. Voters’ rolls and student cards were thoroughly checked by the electoral officers to ensure eligible voters were the ones who cast votes. The authentication was used to avoid any duplication of votes. A “one student one vote” principle was applied during the voting

day. Students without a student card or identity book as a form of identity were not allowed to vote.

## **Privacy**

Participants were asked about the privacy of the voters. Some of the participants said the following:

- R1 "Privacy of students during the election was protected".
- R2 "Vote remain secret during the voting processes"
- R3 "One person in a voting booth should be allowed to cast a vote"
- R4 "All students to be protected by an electoral laws and rules and regulations of the elections.
- R5 "Secret voting to be maintained during the election processes"

Based on the above results, privacy during the election was a priority. The privacy of individuals was protected during the voting process by allowing one student in the voting booth area at a time during the day of election. Privacy provided an opportunity for students to vote for their own student choices without any intimidation.

## **Security and audit trail**

When participants were asked about security during election, they indicated the following:

- R1 "The demarcation area will be marked during voting"
- R2 "Signage next to the election area to be installed"
- R3 "Advantages of the e-voting is that electoral system verify the people who casted the vote"
- R4 "All election materials such as ballot boxes, voters rolls were viewed as security materials"
- R5 " Protection of any form of tempering of the materials"

The findings imply that information security was a priority during the student elections. The e-voting system tracks all forms of audit trail during the election period. The lack of trust in an e-voting system is a challenge experienced by the student political organisations such as the EFF and SASCO. There was a perspective that students were not sure about the security and privacy of the technology to be used during the

election. It seems that students felt that the use of technology could influence the outcome of the SRC elections. All voting documents and spoiled ballots were filed after the results of the elections were announced, in case some individuals or parties lodged any complaints against the election processes.

### **Skills and knowledge on electoral management**

When participants were asked about their skills and knowledge on election management, answers were as follows:

- R1 “It is my second year to manage electoral processes”
- R2 “I have extensive experience to run election even in other Africa countries”
- R3 “I worked for the Independent Electoral Commission as a Chief electoral Officer”
- R4 “This is my first time to embark on an SRC election”
- R5 “I know how to run an election even at the national level”.

These results indicate that electoral officers possess skills and knowledge to adequate to manage successful SRC elections. The skills and knowledge of election management include issuing ballot papers, the verification of candidates and management of election stakeholders. However, it was a concern for the University that some electoral staff were appointed without experience and knowledge of voting systems.

## **Discussion**

### **Trust in the IEC and Electoral Committee during election**

The success of an SRC election is dependent on a level of trust by students. It seems that most of the students had little trust on the IEC and the electoral officer to conduct free and fair elections. This implies that the level of mistrust must be taken into account during an election. However, the analysis shows that the IEC plays a role to promote accountability and transparency in elections even though there was a lack of trust by students. The IEC and electoral committee reviewed the student voters’ roll to check and verify all the students’ details during election. This was done to limit complaints during the announcement of results.



## **Attitude and belief**

Student behaviour during and after an election determines the adoption or rejection of the election. This means that attitudes and beliefs influence interpretation and response to a voting system. Given that the University of Mpumalanga conducted SRC elections, it was essential to determine a culture of acceptance or adoption of SRC elections. This statement is alluded to by Netshakhuma (2019b), who indicated that understanding of organisational culture and the implementation of an electronic records management system is essential even though in this case it is referring to an e-voting system. The attitudes and beliefs against the e-voting led to the lack of adoption of an e-voting system. However, the acceptance of the final election result by all students demonstrates the students' belief in the electoral staff. In future elections, it is essential for the University to benchmark an electoral system with the University management.

## **Voter education**

The mandate of the electoral officers was to ensure voter education to ensure free and fair elections. The electoral officers conduct voter education on the handling of ballot papers, election rules and procedures and voting. It seems that voter education contributed to a high turnout. The voter education promotes transparency and democracy and enables students to understand and interpret all processes of voting. Thus the majority of the electorate have been aware of manual voting as a results of voter education. The fact that students rejected an e-voting system indicates that awareness was not enough to convince students and political organisations to participate in a specific voting system. This suggests that voters' awareness level is not adequate to have a significant impact on the electorate's readiness.

## **Influence of political parties**

The political parties such as the African National Congress (ANC) and Economic Freedom Fighters (EFF) were expected to assist student bodies such as the ANC Youth League, the South Africa Student Organization (SASCO) and the Economic Freedom Fighters Student Command (EFFSC) during campaigns and other political activities. This means that mother bodies such as ANC and EFF assist student political organisations with financial and logistical support such as t-shirts. Such

environments create the reality of inefficient and complacent governance, which has been demonstrated — and demonstrated against — across campuses countrywide.

The negative perceptions regarding the influence of political parties was some of the reasons students voted for political organisations which were not their preference. It is therefore advisable that universities investigate how best to enhance positive dimensions of partisan student politics with greater political transparency, while regulating the negative dimensions.

## **Authentication**

The level of transparency during voting was important but was often an overlooked factor. Universities adopted rules governing transparency to protect election integrity. This statement is alluded to by Yablon (2017) who stated that voting regulations are to be transparent. The university student election frameworks provide for oversight and enforcement to make administrators and participants accountable to authentic votes to be legitimate. Continuous oversight of the process by internal and external mechanisms helps detect problems in the system and identify the groups or individuals responsible.

## **Privacy**

A consideration of privacy during elections influence the credibility of elections. The right to an anonymous vote is a cornerstone of elections. It was essential in terms of Protection of Personal Information Act 2013 for students' personal information to be protected during elections. However, the IEC and election officers relied to a certain extent on a student's personal data to verify eligible voters. They also relied on voters' data to inform their decision-making about eligible voters. The voters roll used during Election Day contains private information such as a student's name and surname, and student number. When the IEC and electoral officers verified personal information it raised an issue of the privacy of such information. This statement is alluded to by Netshakhuma (2019a, b) who indicated that privacy of information is to be protected in line with the Protection of Personal Information Act of 2013.

## **Security and audit trail**

With the spotlight on election security, IEC and electoral officers ensured security during elections. Security and audit trails are factors that can undermine election

integrity. The placement of a demarcation board during elections assisted the IEC and election committee to ensure information security. Furthermore, ballot papers were audited to ensure the integrity of the election. The ballot audits were conducted to ensure the accuracy and accountability of the election. The election audit was conducted before official results were certified by an election officer. The procedure that keeps the audit trail complete and intact was secured. Inspections of paper ballots or audit logs to verify the security of ballot papers was conducted. The election observers witnessed the counting of ballot papers. An audit trail provided voters a guarantee that an audit record of their vote was created. Even though students were aware of voting, there should be thorough and massive education on security and the benefits of introducing e-voting so that students are aware of other aspects of electronic voting systems as also emphasised in a related study( Netshakhuma ,2019) which emphasised security of information.

### **Skills and knowledge on electoral management**

Knowledgeable and skillful electoral officers contributed to the successful implementation of an e-election. Voters tend to trust an officer who has previously worked on the election process. The skills personnel contributed to accurate counting of votes were without favour to any political organisation. The electoral officers contributed to the success of the 2018 election.

### **Conclusion and recommendations**

The manual system conducted by IEC and electoral commission led to a successful election. However, the manual voting system is time consuming, a waste of resources, and requires more staff. The successful implementation of a voting system requires the following elements to be considered: authentication, privacy, security and an audit trail, skills and knowledgeable staff.

### **Recommendations**

- Build effective stakeholders relations to improve free and fair election.
- To create an environment of trust during election period by ensuring appropriate structures are in place such as the Independent Electoral Commission and election observers.

- The researcher recommends a further study on e-voting to be conducted at other South African universities.
- The e-voting system should be tested during South Africa's national election.

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# Lotka's Law and GBV literature 2009-2018: a case study of South Africa

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## Abstract

*South Africa is noted for high numbers of reported incidents of gender-based violence (GBV), hence an informetrics analysis was conducted on her GBV research output to fit Lotka's law of scientific productivity over a ten-year window, 2009-2018. Data was harvested from the EBSCO Discovery Service Database. The result  $c = 80\%$  and  $\alpha = 2.78$ ; conceded a greater number of GBV scientists to single contributors even though these values exceeded Lotka's benchmark of  $c = 60\%$  and  $\alpha = 2$ . These marked differences notwithstanding, author's productivity of GBV literature concurs with Lotka's law, in that a large number of researchers contributed one publication each on GBV; while less than 1% of authors contributed 11 articles on average. This could be due to the fact that GBV, being a public health problem, intersects many areas of subject specialty within and outside the medical profession, which could have prompted multi-disciplinary scientific investigations. In addition, a dearth of GBV research was clearly seen, as fewer than three publications in a month were recorded. The implication is that if Gender-based violence (GBV), is not giving adequate research attention, it could jeopardize Government's effort at curtailing the spread of HIV/AIDS because of its many pathways.*

**Keywords:** Informetrics, Lotka's law, Gender-based violence (GBV), South Africa.

## Introduction

The *Dictionary of Bibliometrics* defines Law as "Eponymic statements in Bibliometrics, Informetrics, and Scientometrics" (Diodato 1994:99). The laws are explanations or

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premises of patterns that are clearly seen in the publication and use of information. Three well noted laws are: Lotka's law of scientific productivity, Bradford's law of scattering of journals, and Zipf's law of word occurrence. This set of laws is intended to enhance the status of informetrics from a procedure to a scientific theory different from the conventional laws of the physical sciences (Egghe and Rousseau, 1990) . In 1926, Alfred Lotka, an American statistician, came up with a hypothesis which he derived from a summary of two samples drawn from the Chemical Abstracts 1907-1916 listed in Auerbach's *Geschichtstafeln der Physik*. Lotka used the size-frequency approach to analyse the publications of the chemists and physicists according to their distributions, and concluded that the number of persons making  $n$  contributions is about  $1/n^2$  of those making one, and the proportion of all contributors that make a single contribution is about 60%. He termed this outcome the "inverse square law of scientific productivity" because there is an opposing nexus between the quantities of publications and the number of authors turning out such documents (Coile 1978; Nicholls 1989; Potter 1981). According to Potter (1981), Lotka's article received its first citation in 1941, while his distribution was adjudged "Lotka's law" in 1949. However, the test of the fittingness of Lotka's law materialised in 1973. Since then, the application of Lotka's law to various scientific disciplines has been on the increase, irrespective of divergent shortcomings of the original formulation of the law.

## **Gender-based violence**

Gender-based violence (GBV) is a widely known public health, human rights and human continuity issue that has attracted a global outcry in many places. It happens across the world, irrespective of culture, race, age, and social class (Mcquaid & Mcquaid, 2017; Naciri, 2018). Lange & Young, (2019) describe it as a staggering normalised global phenomenon that has defied education, to unduly harm women and girls especially native women, women of colour, those markedly disabled, gay, and bisexual, transgendered individuals, and women who are poor. According to the authors, gender-based violence is historically embedded in the heart constructs of patriarchy, and commonly reinforced across cultural, economic, religious, educational and political spheres.



Consequently, men have not only being identified as lifelong perpetrators of violence, but also it is claimed that customs and culture shield them from legal penalties and prosecution; while women and girls, on the other hand, are victims of the various forms of gender-based violence and harmful practices, such as gender inequality, child marriage, and female genital mutilation (Casta, Garcý, Herna, Muelas, & Santamaria, 2018; García-Moreno *et al.* 2015; Hillis, Mercy, Amobi, & Kress, 2016, UN Women, n.d.)). However, there is evidence that men do experience gender-based violence too, though occurrence is of incomparable magnitude with resultant risks on the former because it is the common cause of injury to women (Bueno-Hansen 2018; Maquibar *et al.* 2018; Naciri 2018).

South Africa has the highest estimated number of occurrences of GBV in the world. According to Statistics South Africa (Stats SA) in the Crime against women in South Africa Report (2018), an estimated 138 per 100 000 women were raped in 2016/17, being the highest rate in the world (DHET Policy Framework on GBV 2019). Three women get killed by an intimate partner every day (Snodgrass, 2017). This is nearly five times above the global average of 2.6 per 100 000. Evidenced Report revealed that 39 per cent of women have suffered one form of SGBV in their lifetime. Even members of the community of lesbian, gay, bisexual, transgender, queer and intersex (LGBTQI) are violated as well. Mills *et al.* (2015) named the cause of the various forms of violence as the socio-economic inequalities that pervaded the long era of apartheid in the country. The ten-year time frame, 2009-2018, was chosen on the grounds that publications during such periods are relatively recent.

## **Literature review**

Given the fact that Lotka's study was supposedly a mere hypothesis model based on an inverse square law which was not grounded on an empirical law (Nicholls 1989); a number of controversies have arisen in attempts to confirm the validity of Lotka's law empirically. Some of the debates on Lotka's law are largely on issues pertaining to: population of authors; methods of data collection; calculation of the two constants (*a* and *c*); and problems with the validity of the observed data to the theoretical distribution. These methodological inaccuracies have implications on overall assessment of scientists' in that it can underestimate their research productivity. For instance, the issue of population of authors is a common controversy. Whereas, co-

authorship is an acceptable measure of scientific productivity, it was ignored in Lotka's initial hypothesis. Lotka considered only the lead authors (Potter 1981:22).

Early works of scholars such as Chen and Leimkuhler (1986); Pao (1985; 1986); and Potter (1981) acknowledged some methodological deficiency which made the application of Lotka's law more controversial. Pao (1986), stated that bestowing "full productivity" of authorship on lead authors alone is a disservice to the remaining authors. Therefore, the complete count, that is, ascribing equal credit to all authors, is considered ideal because treating co-authors fractionally would markedly downplay the productivity of a substantial number of authors (Ahmed and Rahman 2009). Nicholls (1989) suggested different views on how best to resolve these issues. For instance, Nicholls (1986), stressed that a robust testing methodology is an essential prerequisite to the validation and generalisation of Lotka's law.

Potter (1981:37), on the other hand, stressed that the use of large bibliographic databases could inject some standards into the methods of data collection. Yablonsky (1980:4) claims that Lotka's scientific productivity can be determined through direct statistical counting of frequency and ranking approach; Pao (1985), maintains the need to test the conformity of the observed distribution vis-à-vis the theoretical distribution function with a suitable statistical test of goodness-of-fit, at a specified level of significance. Gupta (1987:45) concluded that applications of Lotka's law should only be treated as estimates of general and theoretical productivity rather than precise statistical distribution.

Some of the recent studies that have confirmed Lotka's law include: Shenton (2017), who applied Lotka's law to investigate the authorship of the original "Doctor Who library" a novelisation series from a small number of writers, while many authors had no more than one contribution each. Nonetheless, there was no evidence that a statistical test for goodness of fit was performed to determine the fitness of Lotka's law to the objects of research. Tsay and Lai (2018), conducted a Scientometrics study on the literature of Heat transfer from 1900 to 2017 based on the 120,628 data harvested from Web of Science. The findings followed Lotka's law, in that 61.3%, (79,655) of 130,037 authors contributed one article only, while 15.9% of the authors had two articles each to their credit; authors of three articles contributed 7.0%, and four articles 4.0%. The outcome of the least square method showed the value of the

exponent  $\alpha$  in a slope of -2.15, which was also near to Lotka's exponent  $\alpha$  value of -2. However, contrary to the suggestion that applicability of Lotka's law to a set of data must be subjected to a statistical test, these values were not subjected to any test-of-goodness to determine the conformity of the data.

López-Muñoz *et al.* (2018) after applying Lotka's law to the analysis of scientific production on second generation anti-psychotic (SGA) drugs in Malaysia, found that the authorship distribution was in accordance with Lotka's law. The authors discovered that a huge number of authors have few publications while a high number of publications clustered around small numbers of researchers.

Similarly, there are several fields of studies in which Lotka's law of distribution did not hold sway, which proves that some scientific disciplines do not tally with Lotka's pattern of authorship distribution. For instance, studies such as that by Ahmed & Rahman (2009), in the field of nutrition research, Bangladesh; Sadik (2018) on research productivity of Annamalai, a higher education institution in India; Merediz-Solá and Bariviera (2019) concluded that authorship in Bitcoin's scientific production is widely and evenly spread. Nunes-silva *et al.*'s (2019) result on the other hand did not conform to the productivity standards suggested by Lotka. Moreover, Savanur (2013) applied Lotka's law in cloud computing research and tested his findings through the three methods, namely: Sen's Method, Pao's Method, and Maximum Likelihood Method using Kolmogorov-Smirnov (KS) Test as a test-of –goodness to measure its validity. He found that the values of exponent ( $\alpha$ ) and constant (C) derived from the three methods contradicted Lotka's Law of pattern of authorship productivity in the field of Cloud computing research.

## **Research purpose**

To examine the validity of Lotka's law, on GBV literature using “full productivity” of authorship, and undertake Two-tailed test- of- goodness to confirm the results. Arising from the above aim, the study shall provide answers to the following questions:

1. Does Lotka's “inverse square law” of scientific productivity hold in the literature of GBV?

2. Does using 2 tailed T-test as goodness-of-fit test confirm Lotka's law in GBV literature?

## Methodology

EBSCO Discovery Service (EDS) was preferred for this study because its services offer a wide range of information from a pool of databases. Only articles in peer reviewed journals were considered as they are the most acceptable and easily measurable source of research (Alcaide and Gorraiz 2018).

This study is based on bibliometrics, therefore terms such as 'gender-based violence' OR 'gender violence' OR 'gender inequality' OR 'women abuse' OR 'women trafficking' OR 'domestic violence', OR 'intimate partner violence', OR 'sexual violence', OR 'child abuse', OR 'child trafficking', OR 'homosexuals' OR 'same sex', OR lesbians OR gay. The LGBTQ were included in the search because they often get abused on the basis of their gender identity. All these terms were searched along with ... 'AND South Africa' from seven databases housed in EBSCO Discovery Service (EDS). The databases were: Business economics, Communication/media, Education, Health Sciences, History, and Life Sciences and Psychology/Sociology. The study employed ENDNote and Microsoft Excel Spreadsheets to capture, clean up and analyse data. EndNote was used to export data from EBSCO to get full view of the bibliographic details of the data for easy counting of the number of publications and the authors. SPSS and Microsoft Excel Spreadsheet, on the other hand, were used to obtain calculations of various values. A total of 300 journal articles were found useful for the study.

## Findings and discussions

This section discusses the findings based on the objectives of the study using publications count to determine productivity pattern of researchers of GBV in South Africa.

| Table 1 Distribution of GBV research publication |    |       |
|--------------------------------------------------|----|-------|
| Year                                             | No | %     |
| 2009                                             | 29 | 9.67  |
| 2010                                             | 29 | 9.67  |
| 2011                                             | 32 | 10.66 |

|                      |     |       |
|----------------------|-----|-------|
| 2012                 | 30  | 10.00 |
| 2013                 | 27  | 9.00  |
| 2014                 | 35  | 11.67 |
| 2015                 | 34  | 11.33 |
| 2016                 | 34  | 11.33 |
| 2017                 | 26  | 8.67  |
| 2018                 | 24  | 8.00  |
| Total no. of authors | 300 | 100   |

Table 1 above shows the trend of GBV research publications for the period under analysis. A total of 300 journal articles were appraised, published in the period from 2009 to 2018. South Africa seemed to have paid much attention to GBV in 2014, 2015 and 2016 as the total publications for the three consecutive years amounted to 34.3% of the total publications. This unprecedented publication output may be attributed to the mounting global outcry against GBV which was also embraced in Africa. The prevailing uproar against GBV at the time could have spurred enquiries. For instance, in 2013, World Health Organisation (WHO) did a multi-country study on global and regional estimates of violence against women; the research revealed stunning findings which could have elicited further research.

| Table 2 Distribution of authors' contributions |                   |              |
|------------------------------------------------|-------------------|--------------|
| Number of Contributions (x)                    | No of authors (y) | % of Authors |
| 1                                              | 488               | 79.09        |
| 2                                              | 71                | 11.51        |
| 3                                              | 24                | 3.89         |
| 4                                              | 10                | 1.62         |
| 5                                              | 13                | 2.11         |
| 6                                              | 6                 | 0.97         |
| 8                                              | 3                 | 0.49         |
| 9                                              | 1                 | 0.16         |
| 22                                             | 1                 | 0.16         |
| Total                                          | 617               | 100          |

Table 2 shows Lotka's distribution in its generalised form. The entire 617 authors were considered and ascribed full authorship based on full-count method. A look at the distribution of articles in Table 2 shows that about 80% of GBV researchers contributed one journal article, while about 12% contributed two articles each, and about 4% contributed three articles each; while a total number of 5 authors (less than

1%) contributed on average 11 items each. This result did in fact reflect Lotka's original results closely.

## Sen's method

Many authors have attempted to apply a variety of methods to verify the applicability of Lotka's law in various fields of research. But the most notable methods are: Least Square Method along with Kolmogorov-Smirnov goodness-of-fit; Pao (1986); Maximum Likelihood (ML) method through a computer program named LOTKA (Ahmed and Rahman 2009) and Sen's method in conjunction with t-test for goodness-of-fit. However, this study follows Sen's method to examine the conformity of Lotka's law on the research productivity of GBV in South Africa, and thereafter validated its applicability through t-test analysis. The Two-tailed test was preferred because it detects the strength of relationship between the means of the observed and expected values (Roy, 2019).

Sen (2010), wrote a short communication in *Annals of Library and Information Studies*, in which he described, and demonstrated through simple equation method how the parameter values of  $c$  and  $\alpha$  could be determined with less tabular columns compared to Pao's Least Squares Method (LSM).

Sen's method is thus represented

$$X^{\alpha} Y = c \quad \text{[Eqn. 1]}$$

Where, Y is the number of authors credited with X (1, 2, 3, 4, 5, 6, 8, 9.....) papers

C is the number of authors contributing one paper.

From the above equation

$$X=1; Y=488$$

$$1^{\alpha} * 488 = C$$

To determine the value of  $\alpha$  apply the data of the second row

$$2^{\alpha} * 71 = 488$$

Divide both sides by 71

$$\frac{2^{\alpha}}{71} = \frac{488}{71}$$

$$2^{\alpha} = \frac{488}{71}$$

$$2^{\alpha} = 6.87$$

Take the log of both sides

$$\alpha \cdot \log 2 = \log 6.87$$

$$\alpha \cdot .3010 = 0.837$$

$$\alpha = \frac{0.837}{.3010}$$

$$\alpha = 2.78$$

Given the values of exponential  $\alpha = 2.78$  and  $c = 488$ , we calculate the number of the expected authors with these values.

E.g. Authors contributing 2 papers:  $Y = \frac{488}{2^2.78}$

$$\begin{aligned} &= \frac{488}{6.87} \\ &= 71.03 \end{aligned}$$

Authors contributing 3 papers  $\frac{488}{3^2.78}$

$$\begin{aligned} &= \frac{488}{21.20} \\ &= 23.02 \end{aligned}$$

| Table 3: Verification of Lotka' s law using Sen's method |                            |                       |                                               |
|----------------------------------------------------------|----------------------------|-----------------------|-----------------------------------------------|
| Papers (x)                                               | No of authors (y) Observed | % of observed Authors | No of authors (y) Expected with $\alpha$ 2.78 |
| 1                                                        | 488                        | 79.09                 | 488                                           |
| 2                                                        | 71                         | 11.51                 | 71                                            |
| 3                                                        | 24                         | 3.89                  | 23                                            |
| 4                                                        | 10                         | 1.62                  | 10                                            |
| 5                                                        | 13                         | 2.11                  | 6                                             |
| 6                                                        | 6                          | 0.97                  | 3                                             |
| 8                                                        | 3                          | 0.49                  | 2                                             |
| 9                                                        | 1                          | 0.16                  | 1                                             |
| 22                                                       | 1                          | 0.16                  | 0.1                                           |
| 617                                                      | 100                        | 604.1                 | 100                                           |

From the foregoing, the calculated values for observed authors were found to be very close to Lotka's generalised law. Whereas Lotka had forecast that, in any given field, 60% of all the authors will have one publication each, 15% will contribute 2 publications, while 7% will contribute 3 publications, etc. this study on the other hand discovered that GBV scientific productivity did not exactly conform to the statistical proportions stated by Lotka's Law. However, there is a reflection of the general patterns of the Law in this outcome. For instance, almost 80% of all the authors had one GBV publication each; almost 12% had 2 publications; 4% contributed 3 publications each.

Table 4: Result of the T-test analysis

|           |                             | Levene's Test for Equality of Variances |      | t-test for Equality of Means |        |                 |                 |                       |                                           |           |
|-----------|-----------------------------|-----------------------------------------|------|------------------------------|--------|-----------------|-----------------|-----------------------|-------------------------------------------|-----------|
|           |                             | F                                       | Sig. | t                            | df     | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference |           |
| NoAuthors | Equal variances assumed     | .000                                    | .991 | .019                         | 16     | .985            | 1.43333         | 75.00868              | -157.57795                                | 160.44462 |
|           | Equal variances not assumed |                                         |      | .019                         | 16.000 | .985            | 1.43333         | 75.00868              | -157.57814                                | 160.44481 |

To further ascertain the credibility of the findings, a Two-tailed statistical analysis was carried out on the data set. Table 4 above confirmed that for a two-tailed test, there is no statistically significant difference between the observed number of GBV authors



and the expected number of GBV authors in South Africa. Thus the above-mentioned results signify that the scientific productivity of GBV literature conforms to Lotka's Inverse Square Law with the exponent  $\alpha=2.78$  and  $C= 488$  respectively.

## **Conclusion and recommendations**

This study explores the productivity of researchers in the field of GBV, with a view to verifying the application of Lotka's law of scientific productivity. The study harvested 300 publications on GBV from EBSCO Discovery Service (EDS) published between 2009 and 2018 in South Africa. Findings reveal that the GBV scientific output adheres to Lotka's law of productivity distribution both in generalised form and in inverse square law using "full productivity" of authorship; using Sen's method, this study found  $n = 2.78$  and  $c = 488$ . When the data set was further subjected to Two-tailed T-test with 16 Degree of freedom (df), the result for equality of means ( $p=0.985$ ) still reveals that there is no statistically significant difference between the observed and the expected number of authors. Hence, Lotka's law holds in the field of GBV and its scientific literature.

This result concurs with a number of studies whose findings correlate positively with Lotka's law of scientific productivity. For instance, Roy (2019), replicated Sen's method with a two-tailed goodness-of-fit tests on the contributions of Indian researchers in the field of Biological Science over a period of 45 years. He discovered that the Biological science literature followed Lotka's law of scientific productivity with  $C$  and  $\alpha$  parameters values of 714 and 1.884 respectively.

Likewise in the field of dentistry, Batcha (2018), showed that the authorship frequency distribution follows Lotka's Inverse Law accurately with the exponent  $\alpha=2$ , and further discovered that with K-S test of goodness, parameters  $\alpha$  and  $C$  2.49 and 0.7433 for dentistry literature, Lotka's law fits the global dentistry research output. Also, the findings were in tandem with Asubiaro (2018), who confirmed that the distribution of publications by biomedical authors is highly collaborative because medical research often require field and laboratory investigations, therefore, a high rate of co-authorship is inevitable (Rotich and Onyancha 2017). Moreover, GBV being a public health issue with physical, reproductive, and mental problems for human lives, especially women and children require more detailed professionalism through

extensive supervision, consultations, cross-examination of decisions and actions which often result in publications (Nwagwu 2006).

However, this finding contradicts Adigwe's (2016) study which reported that productivity distribution for the all-authors and first-authors categories on the subject of HIV/AIDS differs from the distribution of Lotka's inverse square law. Studies have not only reported HIV/AIDS as the most researched topic, but have also confirmed its direct and indirect pathways with different forms of GBV (Krusi *et al.* 2018; Pouris and Ho 2014; Rotich and Onyancha 2017). An average of 30 GBV journal articles per annum over a ten-year window as recorded in this study is a clear indication of a dearth of researchers on GBV. Thus, South Africa's efforts at curbing the spread of HIV/AIDS could be jeopardised if adequate attention is not giving to GBV research. Therefore, the country needs to promote more research into GBV to solve the menace.

This study is aware that other databases could have housed more GBV publications than were found in EDS. Therefore, it is recommended that Lotka's Law be tested on GBV publications from South Africa through other databases.

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# Availability and use of electronic information resources (EIRs) by doctoral students in Nigerian and South African universities

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## Abstract

*The cost of acquiring electronic information resources (EIRs) by tertiary educational institutions in Africa is continually rising against decreasing budgets, yet it has been found that these resources are often underutilised even among doctoral students who are some of the key knowledge producers of the continent's evolving knowledge economy. Needless to say, this limits the role of institutional libraries as important catalysts of development in Africa. Using mixed data collection and analytical methods, this paper compares the extent of use of EIRs by social science doctoral students in the two leading universities in Nigeria and South Africa – Obafemi Awolowo University (OAU), Ife and the University of KwaZulu-Natal (UKZN), Pietermaritzburg, respectively. Data collected from survey questionnaires and semi-structured interviews administered to selected students and library staff was prepared for analysis using content analysis and statistical coding and was subjected to statistical analysis using SPSS. The findings show a low usage of EIRs and greater use of print information resources among participants. The low usage of EIRs is attributed to several factors, notably inadequate library support and low IT competency among library staff and students alike. The effects of these appear to be*

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*more severe on the OAU side than on the UKZN side. It is therefore concluded that the problem of underutilisation of EIRs by social science doctoral students of OAU, Nigeria and UKZN, South Africa, can be addressed by the provision of adequate support and training in the use of EIRs by their respective libraries. In this way, the institutional libraries will be better able to perform their roles as catalysts in the development of the continent's growing knowledge economy.*

**Key terms:** electronic information resources (EIRs), doctoral students, university libraries, Nigeria, South Africa

## **Introduction**

Universities are recognised as the centre of academic and research activities in every part of the world. Accordingly, the need for quality and relevant information resources is ever increasing, and that in diverse formats and large quantity to satisfy the needs of every member of the university community. These members of the university community are diverse and drawn from every sphere of life. So too are their research and academic interests. The implications for the university is a responsibility of creating an environment conducive to proper academic and research work. In the light of the above, the academic library is established by the university to assist in the provision of information resources and services to cater for the academic and research life of the institution, which has been and has remained the time-honoured role of an academic library. However, the "paradigm change" that has taken place in the world of information with its consequent shift from manual library systems to digital (also referred to as electronic or online or virtual) library has introduced a new role to the academic library. Lukasiewicz (2007) points out that the traditional role of the academic library has been transformed by the ever-changing technological environment.

This wave of transformation has affected information production, publication, access, retrieval and use, such that most academic libraries all over the world now acquire electronic information resources (EIRs) for their users. Several studies have attested to the fact that the advent of IT has changed information format, production as well as users' access and use from print and traditional methods of access to electronic format, access and use of information sources (NgeTye and Chau, 1995; Chuttur,

2009; Dzandu and Perpetual, 2012; Gibbs, Jennifer, Jill and Heather, 2012; Gakibayo, Ikoja-Odongo and Okello-Obura, 2013; Obasuyi and Usifo, 2013; Oyedapo and Ojo, 2013; Kwafoa, Imoro and Afful-Arthur, 2014; Okite-Amughoru, Makgahlela and Solomon, 2014; Kwaszo, 2015). Compared to the traditional print information resources, electronic resources are convenient to access, easy to search and downloadable (Wu and Shih-chuan, 2011). EIRs now enable researchers all over the world to have access to global information resources at any time from any location and device that has Internet access. Kibbee (n.d.) pointed out that the Web has the potential to provide information far beyond that which a manual library can, and librarians and patrons cannot afford to ignore its capabilities.

Despite the apparent benefits of EIRs, patrons of academic libraries have identified problems that affect their use (Wu and Shih-chuan, 2011). For example, Korobili, Aphrodite and Sofia (2011) found that graduate (including doctoral) students at the Aristotle University of Thessaloniki made use of EIRs but lacked adequate information literacy skills to make maximum use of them. Perrett (2004) also reports that doctoral students at the Australian National University (ANU) do not arrive at ANU with the requisite computer literacy, and this affects their use of EIRs in their academic and research activities. Similarly, Griffiths and Brophy (2005) report that doctoral students confirm that they get confused while using EIRs because they have difficulty understanding the subject categories and the hierarchical organisation of library electronic resources. Also, Okite-Amughoru, Makgahlela and Solomon (2014) confirmed in Nigeria from their research that PhD students encountered problems while using EIRs. These problems included a lack of adequate skills on the part of the students to use EIRs. Studies also revealed a lack of awareness and inadequate facilities as major hindrances to PhD students' use of EIRs in Nigeria (Fabunmi and Asubiojo, 2013; Oyedapo and Ojo, 2013). Fidzani (1998) in Botswana reported a low use of library resources by graduate students because they lacked adequate skills. Blignaut and Els (2010) confirmed the problem of inadequate skill in their study of 'comperacy' assessment of postgraduate (doctoral and masters) students in South Africa.



## **Problem and purpose of the study**

Many studies such as those by Idowu, in Aina, Adigun, Taiwo and Ogundipe (2010) confirm that most academic libraries in Nigeria face a lot of challenges in the use of ICT to access EIRs. On a general note, many academic libraries are unable to afford and maintain electronic information resources and services; provision of free resources does not mean access is free; the cost of purchasing and maintaining ICT gadgets and managing access must be accounted for (Harle, 2009). The challenge is how to ensure maximum utilisation of the available EIRs. Several studies have therefore been carried out to investigate EIRs use among different groups in the academic community. However, there seems to be a paucity of studies of this nature (comparing doctoral students' use) within the context of Nigeria and South Africa. The outcome of the present study also contributes to the ongoing discussion of the use of EIRs within the university community. The purpose of this study is to investigate the use of EIRs by doctoral students in the social sciences at the University of KwaZulu-Natal (South Africa) and the Obafemi Awolowo University (OAU) in Nigeria. To achieve the above, the study will address the following objectives:

- To investigate how AOU and UKZN academic libraries compare in the provision of EIRs.
- To examine the accessibility and use of EIRs by PhD students in both universities.
- To examine the factors that enhance and hinder usage of EIRs by PhD students.

## **Literature review**

As the awareness of EIRs increases there has also been an increase in the amount of research carried out to investigate its use and disuse. Despite the high cost involved in the acquisition of EIRs, most academic libraries within Africa have made efforts to acquire EIRs for their users. Manda (2005) in Tanzania found that EIRs use is on the increase in the ten academic and research institutions studied. In an earlier study, Dulle, Mulimila, Matovelo and Lwehabura (2002) found that in Tanzania, EIRs use in the thirteen agricultural research institutions and centres is low. This low use is attributed to low information literacy skills. Similarly, in Botswana, studies by Fldzany (1998) and Subair and Kgankenna (2002) revealed an increased awareness of EIRs,

yet users lacked sufficient knowledge and skills to access and use them. It was also revealed in the Botswana study that users still depended heavily on traditional sources of information for their academic and research activities. Fordjour, Badu and Adjei's (2010) findings in Ghana are similar to those of Fildzany (1998) and Subair and Kgankenna (2002) in Botswana. Postgraduate students (PhD and MSc inclusive) claimed to be aware of the availability of EIRs, yet an insignificant percentage (27% for e-mail, 17% for databases, and 16% for World Wide Web representing science, social science and arts faculties) make use of them.

Several attempts have been made in Nigeria as well to investigate EIRs use. Studies that have shown an inclination towards EIRs by undergraduates in Nigeria include those of Ugah and Okafor (2008), Nwezeh (2010), Fasae and Aladenyi (2012), Ibegwam (2004), Yusuf and Iwu (2010), Bamigboye and Idayat (2011), Obuh (2009). Several other studies reveal that respondents encountered some difficulties which hindered their use of EIRs. Institutional factors such as inadequate ICT to access EIR and poor ICT literacy skills on the part of postgraduate students as hindrances (Aderibigbe and Aramide, 2012, Adegbiya, Bola and Ogunsola, 2012). Studies such as those of Fabunmi and Asubiojo (2013) and Oyedapo and Ojo (2013) carried out on postgraduate (PhD and MSc) students revealed a low use of EIRs. Oyedapo and Ojo (2013) found that only an insignificant number (6%) of students surveyed used electronic resources frequently at the Hezeiah Oluwasanmi Library, Obafemi Awolowo University, Ile-Ife. Fabunmi and Asubiojo (2013) also found at Hezeiah Oluwasanmi Library, Obafemi Awolowo University, Ile-Ife the OPAC was less used compared to manual catalogue despite respondents' awareness of the OPAC services. Igun (2005) and Adigun, Zakari and Andrew (2010), Ahaioma, Chimezie and Oluchi (2013) reported from their studies that EIR had not impacted much on the academic and research activities of most Nigerian postgraduate students, as students seemed to depend greatly on print information resources for academic research.

The use of EIR in South African universities seems to reflect similar patterns comparable to Nigerian universities. For example, Constable (2007) reports that the University of South Africa has embraced the change introduced by the ICT in educational environment by making available and providing access to EIRs for students and staff. In the same vein, Mugwisi and Nkomo (2014) investigated the

information and communication technology access by students and staff at the University of Zululand in South Africa and revealed that access has been created to EIRs which the academic community has taken advantage of. Dolo-ndlwana (2013) in a recent study reported an increased use of electronic resources by the majority of the postgraduate students and staff of the Cape Peninsula University of Technology (CPUT) for academic and research purposes and that they considered electronic resources valuable in their academic pursuit. Darries (2004) conducted a study of Internet access and use in reference services in higher education institutions in South Africa. Darries also investigated the impact of the Internet on reference services in 26 higher education institutions in South Africa. The study revealed that all the institutions' libraries with the exemption of one provided Internet facilities for their users. Also, it was evident that an electronic reference service was available in the majority of the libraries but this service was characterised by underutilisation. Hadebe (2010) in a study of electronic databases use by masters' students in the Faculty of Humanities, Development and Social Sciences at the University of KwaZulu Natal revealed that 64% of postgraduates were not satisfied with their access to electronic databases in the library. The findings of Soyizwapi (2005) from a similar study on the use of electronic databases by postgraduate students in the Faculty of Science and Agriculture at the University of KwaZulu-Natal, Pietermaritzburg, revealed that the majority of postgraduate students encountered several problems when using the electronic databases. Ngulube (2010) also reported from his study on Internet use among students at St. Joseph's Theological Institution in South Africa that students did not have access to a wide variety of Internet resources. This resulted in a low use of electronic information resources available on the Internet. The study further revealed that a significant proportion of the respondents (47.3%) had not used the Internet at all.

A cursory view of the reviewed literature on the South African and Nigerian contexts makes it evident that studies on the use EIRs by doctoral students are limited. Instead, there is an increasing number of studies covering postgraduate students in general, undergraduate students and faculty (Dolo-ndlwana, 2013; Hadebe, 2010; Yusuf and Iwu2010; Bamigboye and Idayat, 2011; Ugah and Okafor, 2008; Nwezeh, 2010; Fasae and Aladenyi, 2012; Aderibigbe and Aramide, 2012).

The study therefore compares the use of EIRs by doctoral students at UKZN in South Africa and OAU in Nigeria in order to gain an understanding of the factors that influence their use and non-use of the resource. The purpose of comparative studies, according to Evans, Martina, Bettina, Sursaxby and Peter (1999), is to review multiple cases often with the view of developing typologies or identifying effective practices. It covers two or more cases, such as the present study in a way that produces more generalisable knowledge about causal questions, such as how and why EIRs are used or not used.

In the light of the above, the purpose of comparing the extent of EIRs usage by doctoral students of OAU, Nigeria and UKZN, South Africa is to gain an understanding of the cause(s) of underutilisation of EIRs among the PhD students from the perspectives of their differences and similarities in their pattern and extent of EIRs use.

It should be pointed out that South Africa and Nigeria share certain common profiles as do their universities of KwaZulu Natal and OAU respectively. OAU and UKZN are both ranked as top universities by Webometrics Ranking of World Universities in Nigeria and South Africa respectively. While OAU is ranked first in Nigeria by Webometrics, UKZN is ranked among the best five universities in South Africa (Cybermetrics, 2014). These universities also share features, for example, PhD programmes in the social sciences at OAU are offered in the following disciplines: political science, economics, sociology and anthropology, psychology, geography, demography and statistics (OAU Handbook 2013). Similarly, at UKZN PhD programs in the social sciences are offered in the areas of political science, sociology, anthropology, information studies, economic history, public policy, cultural and heritage tourism management (UKZN, Faculty of Humanities Handbook, 2013). The academic libraries in both universities are equipped with modern ICTs infrastructures to enable patrons to access EIRs.

## **Methodology**

The study adopted a descriptive survey method with the use of mixed data collection and analytical methods. Data were collected from PhD students using questionnaires, and semi-structured interviews were used for library staff. The targeted population is

social sciences PhD students in their second year and above at the University of KwaZulu-Natal (UKZN) in South Africa and Obafemi Awolowo University (OAU) in Nigeria. The study also included the librarians who are in charge of assisting students in the use of EIRs in the respective academic libraries. They are referred to as subject librarians in UKZN and information technology staff (IT staff) at OAU. A census sampling was adopted for the study owing to the small size of the study population. Singh and Masuku (2014) argue that census is more attractive for small populations of about 200 subjects, besides it helps to achieve a desirable precision. PhD students from OAU are 55 in number; from UKZN there are 138, while the six library staff are from OAU and four from UKZN. The entire population for the study therefore is 193 PhD students and 10 library staff. Qualitative and quantitative data collected via survey questionnaires and semi-structured interviews were prepared for analysis using content analysis and statistical coding and the data was subjected to statistical analysis using SPSS.

Regarding response rate, 193 copies of the questionnaire were distributed to social sciences PhD students at the Obafemi Awolowo University (OAU), Nigeria and University of KwaZulu-Natal, (UKZN), South Africa. A total of 134 questionnaires were completed and returned,, of which 130 (OAU-48 and UKZN-82) were found useful for the purpose of the study. An overall response rate of 68% was therefore achieved for the study. A response rate of 70% is considered excellent, 60% is considered good while 50% is taken as adequate for a study of this nature according to Babbie and Mouton (2001). A detailed breakdown of the response rate is presented in Table 1. The overall response rate is 68% as presented in Table 1.

| Table 1 Response rates N = 203   |             |  |                           |                      |                    |      |
|----------------------------------|-------------|--|---------------------------|----------------------|--------------------|------|
| Respondents                      | Institution |  | Data collection tools     | Expected respondents | Actual respondents | %    |
| PhD students                     | OAU         |  | Questionnaire             | 55                   | 48                 | 87.3 |
|                                  | UKZN        |  | Questionnaire             | 138                  | 82                 | 59.4 |
| Subject librarians/<br>ICT staff | OAU         |  | Semi-structured interview | 6                    | 4                  | 66.7 |
|                                  | UKZN        |  | Semi-structured interview | 4                    | 4                  | 100  |
| Total                            |             |  |                           | 203                  | 138                | 68   |

## Research findings

| Table 2 Distribution of respondents according to level of study N = 130 |           |      |           |      |           |      |
|-------------------------------------------------------------------------|-----------|------|-----------|------|-----------|------|
| Level of study                                                          | OAU       |      | UKZN      |      | TOTAL     |      |
|                                                                         | Frequency | %    | Frequency | %    | Frequency | %    |
| Year 2                                                                  | 13        | 10   | 39        | 30   | 52        | 40   |
| Year 3                                                                  | 15        | 11.5 | 38        | 29.2 | 53        | 40.8 |
| Year 4 and above                                                        | 20        | 15.4 | 5         | 3.8  | 25        | 19.2 |
| Total                                                                   | 48        | 36.9 | 82        | 63.1 | 130       | 100  |

The first objective the study addresses is to investigate how OAU and UKZN academic libraries compare in the provision of EIRs.

Respondents were asked to indicate which EIRs are available to them at their institutions libraries. The responses received from both questionnaire and semi-structured interview are presented below.

| Table 3 Electronic information resources (EIRs) available at institutions' library N = 130 (RQ1) |    |      |       |       |      |      |       |        |      |       |
|--------------------------------------------------------------------------------------------------|----|------|-------|-------|------|------|-------|--------|------|-------|
| Electronic information resources (EIRs)                                                          |    | YES  |       |       | NO   |      |       | UNSURE |      |       |
|                                                                                                  |    | OAU  | UKZ N | Total | OAU  | UKZN | Total | OAU    | UKZN | Total |
| OPAC                                                                                             | F. | 17   | 45    | 62    | 2    | 1    | 3     | 29     | 36   | 65    |
|                                                                                                  | %  | 35.4 | 54.9  | 47.7  | 4.2  | 1.2  | 2.3   | 60.4   | 43.9 | 50    |
| E-book                                                                                           | F. | 43   | 73    | 116   | 3    | 4    | 7     | 2      | 5    | 7     |
|                                                                                                  | %  | 89.6 | 89    | 89.2  | 6.3  | 4.9  | 5.4   | 4.2    | 6.1  | 5.4   |
| E-journals                                                                                       | F. | 43   | 76    | 119   | 3    | 3    | 6     | 2      | 3    | 5     |
|                                                                                                  | %  | 89.6 | 92.7  | 91.5  | 6.3  | 3.7  | 4.6   | 4.2    | 3.7  | 3.8   |
| E-journals databases                                                                             | F. | 35   | 73    | 108   | 4    | 4    | 8     | 9      | 5    | 14    |
|                                                                                                  | %  | 72.9 | 89    | 83.1  | 8.3  | 4.9  | 6.2   | 18.8   | 6.1  | 10.8  |
| CD-ROM databases                                                                                 | F. | 5    | 29    | 34    | 11   | 6    | 17    | 32     | 47   | 79    |
|                                                                                                  | %  | 10.4 | 35.4  | 26.2  | 22.9 | 7.3  | 13.1  | 66.7   | 57.3 | 60.8  |
| Abstract to articles in e-journal                                                                | F. | 37   | 68    | 105   | 5    | 5    | 10    | 6      | 9    | 15    |
|                                                                                                  | %  | 77.1 | 82.9  | 80.8  | 10.4 | 6.1  | 7.7   | 12.5   | 11   | 11.5  |

|                                    |      |            |            |             |            |            |            |            |            |            |
|------------------------------------|------|------------|------------|-------------|------------|------------|------------|------------|------------|------------|
| Full-text of articles in e-journal | F. % | 38<br>79.2 | 70<br>85.4 | 108<br>83.1 | 5<br>10.4  | 4<br>4.9   | 9<br>6.9   | 5<br>10.4  | 8<br>9.8   | 13<br>10   |
| Online databases                   | F. % | 31<br>64.6 | 73<br>89   | 104<br>80   | 7<br>14.6  | 4<br>4.9   | 11<br>8.5  | 10<br>20.8 | 5<br>6.1   | 15<br>11.5 |
| E-newspapers                       | F. % | 6<br>12.5  | 38<br>46.3 | 44<br>33.8  | 10<br>20.8 | 8<br>9.8   | 18<br>13.8 | 32<br>66.7 | 36<br>43.9 | 68<br>52.3 |
| E-conference papers                | F. % | 13<br>27.1 | 32<br>39   | 45<br>34.6  | 8<br>16.7  | 10<br>12.2 | 18<br>13.8 | 27<br>56.3 | 67<br>51.5 | 67<br>51.5 |
| E-research reports                 | F. % | 14<br>29.2 | 49<br>59.8 | 63<br>48.5  | 5<br>10.4  | 8<br>9.8   | 13<br>10   | 29<br>60.4 | 25<br>30.5 | 54<br>41.5 |
| E-theses, dissertation             | F. % | 27<br>56.3 | 73<br>89   | 100<br>76.9 | 8<br>16.7  | 3<br>3.7   | 11<br>8.5  | 13<br>27.1 | 6<br>7.3   | 19<br>14.6 |
| E-data archives                    | F. % | 17<br>35.4 | 44<br>53.7 | 61<br>46.9  | 11<br>22.9 | 4<br>4.9   | 15<br>11.5 | 20<br>41.7 | 34<br>41.5 | 54<br>41.5 |

The results in Table 3 show that the OAU and UKZN libraries stock : e-journals (91.5%), e-books (89.2%), e-journals databases (83.1%), abstracts to articles in e-journals (80.8%) and full text of articles in e-journals (83.1%). The scores are comparable among respondents within and between the institutions. Online databases, e-theses/dissertations, e-research reports and OPAC were also reported by many respondents to be available (80%, 76.9%, 63%, 62% respectively). The lowest scores are for e-data archives (46.9%), e-conference papers (34.6%), e-newspapers (33.8%) and CD-ROM databases (26.2%). The findings from the table revealed that most of the respondents are unsure of the availability of some important EIRs such as OPAC (50%), e-research reports (54%), and e-data archives (54%). The analysis reveals the high presence of EIRs in both institutions' libraries with slightly different percentages. It is nevertheless established that the PhD students at OAU and UKZN confirmed the availability of EIRs in their institutions' libraries. It was unexpected though to discover that a lot of social science PhD students are unsure of the availability of relevant EIRs such as OPAC, e-research reports, and e-data archives.

The result from the semi-structured interviews regarding availability of EIRs at universities libraries is consistent with those from the questionnaires. The result reveals that both libraries are equipped with computers, Internet connection and comfortable furniture for students. A subject librarian at UKZN stated that in addition to the general reading space in the library, the library has a separate space called the research commons dedicated to postgraduate students. The research commons is fully equipped with computers and wi-fi connectivity. One IT staff member mentioned that the IT section of the OAU library has about 1000 desktop computers in different departments, with about 140 workstations connected to the Internet.

IT staff from OAU and subject librarians from UKZN stated that their institutions' libraries subscribe to various databases and EIRs which are made available through the Internet to all registered students including social science doctoral students. UKZN libraries provide off-campus access to EIRs as well as interlibrary loan facilities to students. According to the UKZN respondents, every registered student can access UKZN electronic resources from anywhere in the world via the Internet. The electronic resources of OAU library on the other hand can only be accessed within the campus according to ICT staff that were interviewed. It can therefore be inferred that social science doctoral students at UKZN have more access to EIRs than their OAU counterparts.

The second objective addressed by the study is to examine the accessibility and use of EIRs by PhD students in both universities.

Respondents were asked to indicate their extent of use of particular EIRs. The results from the questionnaires are presented in Table 4.

| Table 4 Types of EIRs frequently used by respondents N= 130 |               |               |               |               |                    |               |                              |               |
|-------------------------------------------------------------|---------------|---------------|---------------|---------------|--------------------|---------------|------------------------------|---------------|
| Frequency of use                                            | OAU N=48      |               |               |               | UKZN N=82<br>N=130 |               |                              |               |
|                                                             | Year2<br>F. % | Year3<br>F. % | Year4<br>F. % | Total<br>F. % | Year2<br>F. %      | Year3<br>F. % | Year 4<br>&<br>above<br>F. % | Total<br>F. % |
| Very frequently                                             | -             | -             | -             | -             | 35;<br>49.3        | 32;<br>42.7   | 4; 8.3                       | 71;<br>86.6   |
| Frequently                                                  | 4; 8.3        | 5; 10.4       | 5; 10.4       | 14;<br>29.2   | 4; 4.8             | 5; 6.1        | 1;10                         | 10;12.<br>2   |



|                 |                      |             |             |             |             |             |        |             |
|-----------------|----------------------|-------------|-------------|-------------|-------------|-------------|--------|-------------|
| Sometimes       | 6; 12.5              | 7; 14.6     | 13;<br>27.1 | 26;<br>54.2 | -           | --          | --     | --          |
| Infrequently    | 3; 6.3               | 3; 6.3      | 2; 4.2      | 8; 16.7     | -           | -           | -      | -           |
| Never           | -                    | -           | -           | -           | -           | 1; 1.2      | 1; 1.2 | 2; 2.4      |
|                 | THE INTERNET         |             |             |             |             |             |        |             |
| Very frequently | -                    | -           | -           | -           | 6; 7.3      | 13;<br>15.9 | 1; 1.2 | 20;<br>23.4 |
| Frequently      | 1; 2.1               | 2; 4.2      | 3; 6.3      | 6; 12.5     | 18; 22      | 9; 11       | -      | 27;<br>32.9 |
| Sometimes       | 6; 12.5              | 6; 12.5     | 8; 16.7     | 20;<br>41.7 | 8; 9.8      | 12;<br>14.6 | 2; 2.4 | 22;<br>26.8 |
| Infrequently    | 6; 12.5              | 6; 12.5     | 9; 18.8     | 21;<br>43.8 | 6; 7.3      | 3; 3.7      | 2' 2.4 | 11;13.<br>4 |
| Never           | -                    | 1; 2.1      | -           | 1; 2.1      | 1; 1.2      | 1; 1.2      | -      | 2; 2.4      |
|                 | E-BOOKS              |             |             |             |             |             |        |             |
| Very frequently | -                    | -           | -           | -           | 22;<br>26.8 | 20;<br>23.4 | -      | 22;<br>26.8 |
| Frequently      | 3; 6.3               | 2; 4.2      | 3; 6.3      | 8; 16.7     | 13;<br>15.9 | 12;<br>14.6 | 2; 2.4 | 27;<br>32.9 |
| Sometimes       | 5; 10.4              | 7; 14.6     | 9; 18.8     | 21;<br>43.8 | 4; 4.8      | 6; 7.3      | 3; 3.7 | 10;<br>12.2 |
| Infrequently    | 5; 10.4              | 5; 10.4     | 8; 16.7     | 18;<br>37.5 | -           | -           | -      | -           |
| Never           | -                    | -           | -           | -           | -           | -           | -      | -           |
|                 | E-JOURNAL            |             |             |             |             |             |        |             |
| Very frequently | -                    | -           | -           | -           | 14;<br>17.1 | 16;<br>19.5 | 1; 1.2 | 31;<br>37.8 |
| Frequently      | 3; 6.3               | 2; 4.2      | 2; 4.2      | 7; 14.6     | 13;<br>15.9 | 7; 8.5      | 1; 1.2 | 21;<br>25.6 |
| Sometimes       | 1; 2.1               | 2; 4.2      | 7; 14.6     | 10;<br>20.8 | 10;<br>12.2 | 8; 9.8      | 2; 2.4 | 20;<br>23.4 |
| Infrequently    | 9; 18.8              | 9; 18.8     | 11;<br>22.9 | 29;<br>60.4 | 1; 1.2      | 4; 4.8      | 1; 1.2 | 6; 7.3      |
| Never           | -                    | 2; 4.2      | -           | 2; 4.2      | 1; 1.2      | 3; 3.7      | -      | 4; 4.8      |
|                 | E-JOURNALS DATABASES |             |             |             |             |             |        |             |
| Very frequently | -                    | -           | -           | -           | 1; 1.2      | 4; 4.8      | -      | 5; 6.1      |
| Frequently      | -                    | -           | -           | -           | 5; 6.1      | 1; 1.2      | 1; 1.2 | 7; 8.5      |
| Sometimes       | 1; 2.1               | -           | 1; 2.1      | 2; 4.2      | 3; 3.7      | 6; 7.3      | -      | 9; 11       |
| Infrequently    | 3; 6.3               | 4; 8.3      | 6; 12.5     | 13;<br>27.1 | 10;<br>12.2 | 5; 6.1      | 2; 2.4 | 17;<br>20.7 |
| Never           | 9; 18,8              | 11;<br>22.9 | 13;<br>27.7 | 33;<br>68.7 | 20;<br>23.4 | 22;<br>26.8 | 2; 2.4 | 44;<br>53.7 |
|                 | CD-ROM Databases     |             |             |             |             |             |        |             |
| hh              | -                    | -           | -           | -           | 14;<br>17.1 | 18; 22      | -      | 32; 39      |
| Frequently      | -                    | -           | 2; 4,2      | 2; 4.2      | 13;<br>15.9 | 6; 7.3      | 1; 1.2 | 20;<br>23.4 |

|              |                       |         |             |             |             |        |        |             |
|--------------|-----------------------|---------|-------------|-------------|-------------|--------|--------|-------------|
| Sometimes    | 5; 10.4               | 6; 12.5 | 10;<br>20.8 | 21;<br>43.8 | 10;<br>12.2 | 8; 9.8 | 2; 2.4 | 20;<br>23.4 |
| Infrequently | 8; 16.7               | 7; 14.6 | 7; 14.6     | 22;<br>45.8 | 1; 1.2      | 5; 6.1 | 1; 1.2 | 7; 8.5      |
| Never        | -                     | 2; 4.2  | 1; 2.1      | 3; 6.3      | 1; 1.2      | 1; 1.2 | 1; 1.2 | 3; 6.3      |
|              | Library's e-resources |         |             |             |             |        |        |             |

The result shows that the Internet ranked highest (71 (86.6%)) followed by e-journals (42 (51.2%)), e-journal databases (31 (37.8%)) and library electronic resources (32 (39%)) among UKZN respondents. For the OAU respondents, the majority who used the Internet (26 (54.2%)) do so sometimes, while only 14 (29.2%) use it very frequently. The analysis indicates that respondents make more use of the Internet and library's electronic resources, although respondents from OAU use the resources only occasionally.

The results further reveal that important EIRs such as e-books, e-journals, e-journal databases and library's electronic resources which recorded high use among UKZN respondents are used less frequently by OAU respondents. Many respondents use e-books (20 (41.7%)), e-journals (21 (43.8%)), library's electronic resources (21 (43.8%)) occasionally, while for never used resources e-journal databases, the library's electronic resources and e-books recorded 29 (60.4%); 22 (45.8%) and 21 (43.8%) respectively.

The result of social science PhD students' extent of use of EIRs from the perspectives of IT staff from OAU library and subject librarians from UKZN did not reveal much. The interviewees stated that it was difficult for them to assess and rate the extent of EIRs use by social science PhD students as they lacked records of EIR use filed according to discipline and level. However, they were able to indicate that, in a period of a week, about 20-25 PhD students meet them for assistance. This finding is the same for both institutions.

The third objective addressed by the study is to examine the factors that enhance and conversely hinder doctoral students' use of EIRs

This is addressed in the survey questionnaire by the following specific questions:

- What are your reasons for choosing to use EIRs?
- What are the factors that hinder your use of EIRs?

Table 5 presents the results of reasons for choosing to use EIRs. A list of factors was provided for the respondents to choose from. It can be seen from the results that all the listed factors are highly rated by respondents from both institutions. Access to current and up-to-date information (118 (90.8%)), availability of computers (112 (86.2%)), awareness of the resource (112 (86.2%)), saves time (110 (84.6%)) and quick and easy retrieval (110 (84.6%)) top the list of factors that influence respondents' use of EIRs. A closer examination of the results show that computer skills are rated low among second year (4 (8.3%)) and third year (9 (18.8%)) OAU students. Note that the ostensibly low rate recorded by respondents in the fourth year and above from UKZN could be due to their low representation in the survey. It can be deduced from the analysis that no factor is remarkably rated high enough.

| Table 5 Respondents' reasons for choosing to use EIRs N= 130 (RQ3) |          |     |            |     |               |     |            |     |            |     |                |    |           |     |
|--------------------------------------------------------------------|----------|-----|------------|-----|---------------|-----|------------|-----|------------|-----|----------------|----|-----------|-----|
| Factors                                                            | OAU n=48 |     |            |     |               |     | UKZN n=82  |     |            |     |                |    | N=130     |     |
|                                                                    | Year 2   |     | Year 3 F.% |     | Year4 & above |     | Year 2 F.% |     | Year 3 F.% |     | Year 4 & above |    | Total F.% |     |
|                                                                    | F.       | %   | F.         | %   | F.            | %   | F.         | %   | F.         | %   | F. %           | %  | F.        | %   |
| Saves time                                                         | 12       | 25  | 13         | 27. | 15            | 31. | 31         | 37. | 34         | 41. | 51             | 6. | 110       | 84. |
| Easy to use                                                        | 12       | 25  | 11         | 22. | 13            | 27. | 31         | 37. | 34         | 41. | 44             | 4. | 106       | 81. |
| Availability of computer                                           | 12       | 25  | 14         | 29. | 18            | 37. | 34         | 37. | 30         | 36. | 44             | 4. | 112       | 86. |
| Awarenes s of the resources                                        | 12       | 25  | 14         | 29. | 15            | 31. | 24         | 29. | 27         | 32. | 33             | 3. | 112       | 86. |
| Computer use skills                                                | 4        | 8.3 | 9          | 8.8 | 14            | 29. | 29         | 35. | 24         | 29. | 33             | 3. | 83        | 63. |
| More informativ e                                                  | 13       | 27. | 15         | 31. | 16            | 33. | 15         | 18. | 31         | 37. | 44             | 4. | 94        | 72. |
| EIRs search skills                                                 | 3        | 6.3 | 7          | 14. | 10            | 20. | 25         | 30. | 26         | 31. | 33             | 3. | 74        | 56. |
| Ease of access                                                     | 12       | 25  | 12         | 25  | 18            | 37. | 28         | 34. | 32         | 39  | 33             | 3. | 105       | 80. |
| Quick and easy retrieval                                           | 13       | 27. | 13         | 27. | 18            | 37. | 31         | 37. | 31         | 37. | 44             | 4. | 110       | 84. |

|                                              |    |      |    |      |    |      |    |      |    |    |   |     |     |      |
|----------------------------------------------|----|------|----|------|----|------|----|------|----|----|---|-----|-----|------|
| Access to current and up-to-date information | 13 | 27.1 | 14 | 29.2 | 19 | 39.6 | 36 | 43.9 | 32 | 39 | 4 | 4.8 | 118 | 90.8 |
|----------------------------------------------|----|------|----|------|----|------|----|------|----|----|---|-----|-----|------|

Table 6 presents the analysis of responses to the factors that hinder students' use of EIRs and reveals a distinct dissimilarity in the responses from OAU and UKZN respondents. All respondents (48; 100%) from OAU indicated that poor Internet/network connectivity, slow download rates, limited availability and access to IT facilities as well as limited access to some EIRs hinder their use of EIRs. For the UKZN respondents, the figures are 47.6% (39), 45.1% (37), 40.2% (33) and 63.4% (52) respectively. In terms of the categories 'consumes time', 'difficult to use' and 'less informative', responses from both institutions are similar in the sense that these factors are less of a hindrance than other factors. 'Lack of skills to use' is rated high among all responses (OAU – 38 [79.2%]; UKZN – 66 [80.5%]). The result suggests that most of the factors that constitute hindrances to OAU respondents relate to facilities provided by the institution's library and the respondents' user skills. Fewer respondents, though significant, from UKZN, seem to find the institution's library facilities problematic except with regard to limited access to some EIRs (52 (63.4%)).

The result of semi-structured interviews is somewhat similar to that of the questionnaires. On the issue of EIRs use, the challenges faced by both students and staff alike were raised. Suggestions of possible ways to tackle the challenges were also sought from the interviewees. Three respondents from OAU stated that the challenges they face are both from the side of the students and those from the facilities available to them. The results reveal that IT staff from OAU face the following challenges: insufficient computers, poor Internet connectivity and low EIRs and computer use skills on the part of the students. Two respondents from UKZN on the other hand stated that the major challenge they face, on the part of the students, is low literacy skills. One mentioned having a problem with keeping up with the students because they are so many. The last one said she faces a language barrier which hinders effective communication and also the problem of insufficient subscriptions. Suggestions of how the identified challenges can be tackled are similar for both institutions. All respondents generally suggested improvement in the facilities on the

ground, getting the library to arrange more outreach programmes and training sessions for doctoral students to get trained in the access and use of EIRs.

| Table 6 Factors that hinder respondent/s' EIRs use N = 130 |              |      |       |      |          |      |       |      |           |      |       |      |        |     |       |      |
|------------------------------------------------------------|--------------|------|-------|------|----------|------|-------|------|-----------|------|-------|------|--------|-----|-------|------|
| Factors                                                    | Institutions |      |       |      |          |      |       |      |           |      |       |      |        |     |       |      |
|                                                            | OAU n=48     |      |       |      |          |      |       |      | UKZN n=82 |      |       |      |        |     |       |      |
|                                                            | Year2        |      | Year3 |      | Year 4 & |      | Total |      | Year2     |      | Year3 |      | Year 4 |     | Total |      |
|                                                            | F.           | %    | F.    | %    | F.       | %    | F.    | %    | F.        | %    | F.    | %    | F.     | %   | F.    | %    |
| Consumes time                                              | 2            | 4.2  | 3     | 6.3  | 3        | 6.3  | 8     | 16.7 | 9         | 11   | 4     | 4.9  |        | -   | 13    | 15.9 |
| Difficult to use                                           | 1            | 2.1  | 4     | 8.3  | 5        | 10.4 | 9     | 18.8 | 3         | 3.7  | 2     | 2.4  |        | -   | 15    | 18.3 |
| Lack of skills to use                                      | 11           | 22.9 | 12    | 25   | 15       | 31.3 | 38    | 79.2 | 13        | 15.9 | 14    | 17.1 | 1      | 1.2 | 66    | 80.5 |
| Less informative                                           |              |      | 1     | 2.1  | 1        | 2.1  | 2     | 4.2  | 3         | 3.7  | -     | -    |        | -   | 3     | 3.7  |
| Low skills on use of computer                              | 10           | 20.8 | 13    | 27.1 | 18       | 37.5 | 41    | 85.4 | 8         | 9.8  | 6     | 7.3  |        | -   | 14    | 17.1 |
| Low information literacy skills                            | 11           | 22.9 | 13    | 27.1 | 19       | 39.6 | 43    | 89.6 | 12        | 14.6 | 8     | 9.8  |        | -   | 20    | 24.4 |
| Lack of awareness of EIRs                                  | 11           | 22.9 | 12    | 25   | 19       | 39.6 | 42    | 87.5 | 8         | 9.8  | 5     | 6.1  | 1      | 1.2 | 14    | 17.1 |
| Poor internet/network connectivity                         | 13           | 27.1 | 15    | 31.3 | 20       | 41.7 | 48    | 100  | 18        | 22   | 18    | 22   | 3      | 3.7 | 39    | 47.6 |
| Slow rate of download                                      | 13           | 27.1 | 15    | 31.3 | 20       | 41.7 | 48    | 100  | 21        | 25.6 | 15    | 18.3 | 1      | 1.2 | 37    | 45.1 |
| Limited IT for EIRs access/use                             | 13           | 27.1 | 15    | 31.3 | 20       | 41.7 | 48    | 100  | 17        | 31.3 | 15    | 18.3 | 1      | 1.2 | 33    | 40.2 |

|                             |        |          |        |          |    |          |    |     |        |          |        |          |   |     |    |      |
|-----------------------------|--------|----------|--------|----------|----|----------|----|-----|--------|----------|--------|----------|---|-----|----|------|
| Limited access to some EIRs | 1<br>3 | 27.<br>1 | 1<br>5 | 31.<br>3 | 20 | 41.<br>7 | 48 | 100 | 2<br>9 | 35.<br>4 | 1<br>9 | 23.<br>2 | 4 | 4.9 | 52 | 63.4 |
|-----------------------------|--------|----------|--------|----------|----|----------|----|-----|--------|----------|--------|----------|---|-----|----|------|

## Conclusion

Based on the research findings, it can be concluded that IT and Internet facilities in the libraries under consideration are comparable. EIRs reported to be available at both institutions' libraries are also comparable. The results, however, reveal a divergence in the extent of use of electronic information resources among respondents from the two institutions. Despite the high presence of EIRs at the OAU library, the results show a very low use of the resources compared to what UKZN respondents demonstrated. In the final analysis, the majority of respondents indicated that they make equal use of EIRs and printed resources for the purpose of their theses. Respondents from OAU demonstrated lower levels of computer and IT/information literacy skills than UKZN respondents. The results revealed that most respondents lack adequate search skills to access EIRs, which hinders their effective use.

Results from the interviews were, in some cases, in alignment with the questionnaire results, while in other cases there are stark contrasts. There is a consensus among IT staff from OAU and subject librarians from UKZN that the institutions need to improve the facilities and resources available for students' use.

From the literature review, it is evident that there was no comparative study of this nature that has been done within the specific contexts of South Africa and Nigeria, which is quite significant. This study is therefore significant as its outcome provides an understanding of the factors that influence the use and non-use of the electronic resources among social sciences doctoral students of South Africa and Nigeria. The study has also revealed the quality and quantity of EIRs available to and accessible to the students investigated. The implication is that students in the affected universities will be given opportunities to benefit from the advantages that come with EIRs use.

The study provides information on the causes of underutilisation of EIRs by social science doctoral students in OAU, Nigeria and UKZN, South Africa, particularly to the study's respondents. If this information is matched with timely intervention from

academic libraries' management, the efforts expended on EIRs acquisition and maintenance by OAU and UKZN libraries will be adequately rewarded through increased use.

The study also contributes to the benefit of the general Nigerian and South African society as increased access and use of information enhances research output. By addressing these issues, the research quality and output of social science doctoral students in OAU Nigeria and UKZN, South Africa will be enhanced and improved. This will eventually translate into placing OAU and UKZN on enviable and competitive positions on the international higher educational scene.

This study recommends that:

- OAU and UKZN libraries be provided with further education and enlightenment to social science doctoral students on the importance of EIRs;
- The OAU library provides greater access to her EIRs collections as the apparent cause of underutilisation is not lack of awareness but lack of access.
- Both academic libraries devise means of monitoring and supervising EIR use. This is mostly recommended for OAU library where underutilisation of EIRs is very high.
- OAU should incorporate end-user computer courses into the university's broad curriculum to impart to social science doctoral students computer user skills. OAU library should organise computer literacy programmes for her users.

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# **Adoption of cloud technology services at the National University of Lesotho Library**

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## **Abstract**

*The information landscape across the globe is swiftly changing owing to the latest developments in technology and innovation. One aspect of such technological developments is cloud computing, which over the past few years become the buzzword in the information environment. Libraries are no exception, as they are the powerhouses of information and knowledge. Library and information professionals therefore need to have an understanding of what constitutes cloud computing and, in particular, the issues of data storage, security and retrieval. The purpose of this study is to examine the adoption of cloud technology services at the National University of Lesotho library. This is a qualitative case study which made use of interviews as instruments for data collection. Data was analyzed manually by content analysis using the notes taken by the researcher during the interview sessions. The study provides valuable first-hand insight into the adoption and implementation of cloud computing in the context of libraries in Lesotho.*

**Keywords:** Cloud computing, academic libraries, adoption, implementation

## **1. Introduction**

Cloud computing has been defined differently by various authors. For instance, Wang, von Laszewski, Younge, Kunze, Tao and Fu (2010:139) defined it as “a set of network enabled services, providing scalable, QoS guaranteed, normally personalised, inexpensive computing platforms on demand, which could be accessed in a simple and pervasive way,” while Yuvaraj (2015:570) defined it as “an integrated package of computing services and applications on the web offered as a utility”, where the word “cloud” can be seen as the summation of Internet-based data access

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and exchange along with low-cost computing and applications. However, in the context of this study the adopted definition is that of Quddusi (2014) because it briefly captures all cloud computing features. Cloud computing is defined as a technology that utilises the Internet and central remote servers in order to maintain both data and applications. The “cloud” element of cloud computing, according to Yuvaraj (2015) is an acronym, where the C stands for computing services, L: that are Location independent, O: accessed through online means, U: used as a Utility and D: on Demand availability.

Cloud computing as we know it today was invented by Amazon in 2002. However, other authors trace the existence of cloud computing to as far back as 1960s (Quddusi, 2014; Pal, 2016; Alzahrani, 2016). The adoption of cloud computing services means that instead of owning the entire system, the clients only need to pay for the physical infrastructure. In other words, the client outsources the services by renting from the providers or the third party (Makori, 2016). Das (2014) identified the following five cloud computing principles:

- Shared resources (including applications, processors, storage and databases);
- On-demand (users retrieve and use cloud information resources from the cloud);
- Elasticity, flexibility and scalability (clouds are receptive to user needs);
- Networked access (wide accessibility); and
- Metering use (involve payments and storage efficiency)

The information landscape across the globe is swiftly changing following the latest developments in technology and innovation. One aspect of such technological developments is cloud computing. Cloud computing has over the few years become the buzzword in the information environment and libraries are no exceptions because they are the powerhouses to information and knowledge. Library and information professionals therefore, need to have an understanding of what constitutes cloud computing and in particular, the issues of data storage, security and retrieval.

Cloud computing as conceived by information technologists appears to be the most important model to transform how the World Wide Web (WWW) and the information

systems of the latest generation function (Sharif, 2010; Min, 2012). On the other hand, the librarianship profession is faced by challenges emanating from the latest developments in technology. The emergence of cloud computing and its adoption in libraries according to Liu and Cai (2013) has made librarianship roles more practical and pragmatic in the services they provide to their clients. Makori (2016) cautions that cloud technology is rapidly dislodging the client serverbased technology in the twenty-first century and as a result urges librarians to claim their leadership role in the implementation.

The organisation of this paper is as follows. First, the study's context is presented focusing mainly on the technological evolution that the University library has experienced over the years. The second part presents the problem statement with objectives. Thirdly, the literature review is presented, followed by the methodology adopted by the study. Next are the study results together with an analysis. Finally, the discussion and recommendations for future research conclude the paper.

## **2. The National University of Lesotho's Thomas Mofolo Library**

The National University of Lesotho's Thomas Mofolo Library (TML) is as old as the University itself, established in 1954 as the nucleus collection of the former Pius XII College. NUL is located at Roma, about 34 km south-east of Maseru, the capital of the Kingdom of Lesotho. Since its inception, the library maintained a manual catalogue until the early 1990s when an automation project started using the now defund Stilis library management system that had numerous complications resulting in the acquisition of the Integrated Tertiary Software System (ITS) in 1995. ITS remained in use until it was replaced by INNOPAC Millennium in 2014 "because there was a concern from both the students and staff that it was no longer serving the interest of the modern academic demands while also blaming it for their lack of research" (Motsoeli, 2014:5). All these library management systems were client/server based systems, hosted locally. The decision to migrate to the latest innovative Sierra library management system allowed the library an opportunity to also decide to migrate it to the cloud.

### **3. Problem and purpose of the study**

The concept of cloud computing has recently been attractive to different types of organisations including academic libraries (Wale, 2011). However, there is no literature dealing specifically with the adoption and implementation of cloud computing services in academic libraries in Lesotho. Nonetheless, Liu and Cai (2013:27) argued that, “in order to keep pace with progress, libraries need to switch over to cloud and deliver content, tools and services accessible to mobile users via mobile devices. Migrating core library application to the cloud reduces most or all the local technical issues in managing the infrastructure and Operation systems (Liu and Cai, 2013). This investigation is guided by the following research questions:

- What is the understanding of cloud computing in the context of NUL Library?
- To what extent do libraries benefit from migrating some of their systems to the cloud?
- What are the possible challenges and risks that libraries may face in the adoption and implementation of cloud computing?

### **4. Theory and literature review**

The following section highlights the theoretical framework guiding this study. The rest of the section briefly reviews the literature on the concept of cloud computing in the context of libraries.

This study is anchored on Rogers’s (1962) diffusion of innovation theory. This theory is relevant to the current study because cloud computing is a new technology being adopted for the first time at the National University of Lesotho Library. Kenton (2018:5) defined the diffusion of innovation theory as a “supposition providing a definition on how new technologies and other advancement permeates societies and cultures from inception to wider adoption”. This innovation theory is mostly appropriately applied in investigating the adoption of a new technology in higher education and other educational milieus (Medlin, 2001; Parisot, 1995). This theory is one of the oldest social sciences, originally from the communication sciences with the specific purpose of outlining how, over time, an idea or product gains momentum and diffuses through a specific population or social system. According to this theory, “the acceptance of any technology/information system by users is influenced by such

characteristics as compatibility, complexity, trialability, observability and relative advantage of the technology as well as to the intensity of promotion by individuals, known as change agents”(Adegbilero-Iwari and Hamzat, 2017:12).

Vaquero, Rodero-Merino, Caceres and Linder (2009) argue that cloud computing and collaboration via the web are the two important concepts characterising the new innovative library automation. A number of benefits have been identified resulting from the adoption of cloud computing services by the libraries. For instance, Yuvaraj (2015:570) remarked that cloud technology enables “optimal resource utilisation, easier access and more effective cost reduction”. Furthermore, Yang (2012) opined that the new cloud-based generation of integrated library systems (ILS) enables the sharing of library resources by multiple libraries such as full text articles from electronic databases. Makori (2016) noted that the cloud service providers handle and support all cloud services.

Moreover, the adoption and use of cloud services appears to be cost effective. It is very expensive to install and maintain IT infrastructure. For instance, Wasike and Njoroge (2015) hold the view that clouds permit libraries to save more money for normally expensive software overhead costs and accordingly focus on other tasks. Bezos (2014) further remarked that when the library migrates some of its major services to the cloud, they save more than 70% of their time and money to improve and grow other library services. According to Makori (2016) in the cloud-based services, the cloud service provider is responsible for issues of support like installation, licensing, upgrading as well as system maintenance. Essentially, “this allows librarians to handle service needs with minimum costs” (Makori, 2016:20).

Enefu (2015) argues that unlike the old systems, the latest technologies offer the possibility of open-oriented architecture. By moving to the cloud, libraries are in a position to make use of this possibility. Several cloud solutions also offer this type of openness with the published applications program interfaces (API's). Mandas and Kumar Das (2013:75) defined API's as “a specification intended to be used as an interface by software components to communicate with each other”. In other words, API's enable integration with other systems, and libraries will no longer depend on a vendor to take advantage of this technology.



There are many factors affecting the adoption and implementation of cloud computing services in library environments, and one of the single biggest threats concerns security issues (Kajiyama, Jennex and Addo, 2017; Makori, 2016). Cloud computing is susceptible to security lapses which may compromise library services. According to the Deloitte East Africa 2012 study report, “nearly 40% of African organisations in East Africa are hesitant to adopt and implement cloud technology as a result of data privacy, legislation and security concerns” (Awale, 2012:37). One of the risks associated with cloud computing, according to Kajiyama *et al.* (2017), is that the cloud environment is not wholly impervious to outages and other problems. In fact, Tsidulko (2016) identified and listed the top ten outages of 2016. Furthermore, the fact that the cloud computing facility is entirely under the control of the vendor means the client cannot do anything if at any time the server becomes unresponsive for some reason (Widyastuti and Irwansyah, 2017).

Another challenge or risk of moving services to the cloud relates to Lock-in. Lock-in according to Dhaka (2017) refers to the case where once the client is using a particular cloud service provider, it becomes difficult to switch to another service provider and that results in dependency. This dependency also applies to the availability of the Internet, where the continued availability of Internet services means the continued availability of cloud services. This also means that any problem with Internet services leads to the problem of accessing the cloud services (Kumar, 2017).

## **5. Methodology**

Taking into account the objectives, the current study followed the qualitative approach with a case study design. A qualitative approach was considered appropriate for this study because it focuses on observing events from the perspectives of those who are involved and is aimed at understanding the attitudes, behaviour and opinions of those individuals (Powell & Connaway 2004). In investigating the adoption of cloud computing by small and medium enterprises (SMEs) in the North-East of England, Alshamaila, Papagiannidis and Li, (2013) also made use of a qualitative approach. Structured interviews were used for data collection. According to Leedy and Omrod (2005), the use of structured interviews in a qualitative study approach may facilitate exploring all the factors and the communication with all stakeholders within an Information and Communication Technology (ICT) innovation adoption process. The

interview process was conducted with five staff categories, mainly the library staff as the users of the system, some ICT staff who were directly involved in the migration process and the library management who had made the decision to migrate from the physical servers to the cloud ; therefore, a purposive sampling technique was used to select the study population. The table below represents the characteristics of the study's interviewees.

| Table 1 : Characteristics of interviewees |                       |                           |
|-------------------------------------------|-----------------------|---------------------------|
| Sampling                                  |                       |                           |
| Gender                                    | Designation           | Respondent classification |
| Female                                    | University Librarian  | Respondent A              |
| Male                                      | Systems Librarian     | Respondent B              |
| Female                                    | Librarian Cataloguing | Respondent C              |
| Male                                      | Assistant librarian   | Respondent D              |
| Male                                      | Network Admin         | Respondent E              |

The interviews were recorded with the permission of the participants and were immediately transcribed on completion. Data were analysed manually by content analysis using the notes taken by interviewers. The researcher did not discuss issues related to the response rate of the study because this is qualitative research and therefore results will not be generalised (Neuman, 2006).

## 6. Findings and discussion

The following section presents the findings of the investigation based on the interviews held by the researcher. The interviews were conducted with all the respondents as presented in Table 1 above.

### 6.1 Understanding of cloud computing in the library context

Wada (2018:20) defined cloud computing as different services that are remotely provided over the Internet. This seems to be the general understanding of what constitutes cloud computing among Thomas Mofolo librarians. Below are the responses regarding the understanding of cloud computing in the library context.

#### Respondent A

Cloud computing refers to services provided by third party over the internet and these services can be accessed anywhere with the help of internet connection.

**Respondent B**

The way I understand it is that it has to do with outsourcing of internet based services instead of acquiring the expensive IT equipment and connect all system from there.

**Respondent C**

Cloud computing particularly in the context of libraries may mean that libraries may no longer have to buy their own IT equipment to host whatever systems they have but rather have them hosted somewhere at the vendor's fees.

**Respondent D**

Cloud computing is like Google where a lot of services are rented without necessarily acquiring own IT equipment

**Respondent E**

It refers to all services provided by the vendor through data centres and can be accessed over the internet.

On the question of security of data that is not hosted on local servers, the general observation and understanding was that there is a binding contract between the Library and the cloud service provider and so there was also an element of trust that data was as safe in the hands of the service provider as it was when hosted on local servers. Respondents provided the following responses.

**Respondent A**

I think the issue of trust is very important in any business. This is actually the same as e-mails because we do not know where and who manages them but all business correspondence goes through emails including financials.

**Respondent B**

I don't think there is a problem as long as there is a binding contract between the two parties and they also need to trust each other.

**Respondent C**

I don't think service providers can run the risk around security of client's data because their business with them be at stake.

### **Respondent D**

Those are professional businesspeople who would not want to jeopardise their business in any way, so yes we are not worried at all about our data.

### **Respondent E**

Cloud computing has always been there and so I think service providers are trusted now.

On the question of motivation of moving to the cloud, the IT staff mentioned the issue of a lack of resources to host the system locally such as servers. The IT staff provided the following responses:

### **Respondent B**

The university is currently facing financial problems and therefore we thought by migrating to the cloud, we will have saved the costs.

### **Respondent D**

IT equipment is very expensive because the new system comes with its new specifications in the form of servers so we did not have the financial muscle to take that option.

This seems to be consistent in the literature. For instance, For example, Makori (2016) argues that the cloud service provider is responsible for all support services including issues of installation, licensing, upgrading and maintenance of all systems;,, this permits libraries to focus on their service needs with lower costs.

## **6.2 Benefits of cloud computing in libraries**

Wada (2018:25) posited that cloud computing is the cornerstone cooperation for organisations and particularly libraries. He argued, “cloud computing serves as an engine that allows different institutions and private organisations to invest in information resources consortiums, applications and infrastructure that benefit all”. By means of cooperation, libraries can exploit information resources in the cloud and divert their efforts, time and different resources, avoid duplication thereby improving service delivery. According to the library IT staff members; one of the benefits the library derived from migrating to the cloud is the issue of saving costs because they did not have to purchase any IT infrastructure when the migration decision was made. The following are responses from IT staff:

### **Respondent B**

Adoption of cloud computing services means we are saving costs in terms of buying new servers and other equipment for the new system. We will also save in terms of system maintenance and software updates, because the service provider will take care of everything.

### **Respondent C**

The most important benefit according to me is that we can use the money intended for IT equipment for other equally important library activities such as paying for more databases or books.

These responses are in line with what Makori (2016) has alluded to, that cloud computing helps in diverting the cost structure from capital expenditure and also assists in making IT systems more agile. Similarly, Scale (2010) argues that cloud computing allows information professionals to shift from the custodianship and maintenance of resources towards the provision of information controlled and maintained by others.

Furthermore, according to the librarians, the move to the cloud allowed the library to always be functional in terms of minimal downtime, if any at all. In fact, Respondent A argued that:

Since migration to the cloud which was five months back, the library had not experienced any downtime except the one caused by no internet connection.

## **6.3 Challenges and risks associate with cloud computing**

Despite its ever-growing popularity, several concerns surround cloud computing. One of the obvious challenges of this technology is that it relies on the Internet and therefore if there is no Internet connection, there is no cloud computing. This is the first concern of both the IT library and the University IT staff. In fact, the University IT staff did not encourage the library at all to undertake this migration process as, in the view of respondent E

*“This project is going to fail because of our low bandwidth.”*

Doherty, Carcary and Conway (2015) also showed the importance of Internet connection for cloud computing. Neethu and Vanaja (2017:3) argue that “with the

multiplicity of mobile and personal devices such as smartphones and tablets there has been an increase in the cloud-based storage services like Google Drive, Dropbox or Microsoft Dropbox which has raised the issues of data privacy and confidentiality, putting the user at a legal risk”.

Another challenge raised by the library IT staff is that of cyberattacks targeted specifically at the cloud computing services According to Turab, Taleb and Masadeh (2013) there are several threats and different levels, listed below:

- Guest-hopping attack
- Defined as any separation failure between shared infrastructures. An attacker will try to get access to one virtual machine by penetrating another virtual machine hosted in the same hardware.
- SQL injection:
- Is often used to attack websites. It is accomplished by injecting SQL commands into a database of an application from the web to dump or crash that database.
- Side channel attack: when the attacker places a malicious virtual machine on the same physical machine as the victim machine; in that way the attacker can access all the confidential information on the victim machine.

The responses on the challenges of cloud computing from IT staff are listed below:

### **Respondent B**

The data centre can be attacked at any time and it means our data may be lost as well, but also it is the same as in the case where our local server may catch fire or any disaster.

### **Respondent D**

The challenge we are likely to face is that we are relying on the availability of the internet otherwise if there is no internet; it means we are not going to have access to our data.

On the challenge of security, Thomas (2011) suggests that organisations with serious data security concerns should consider building their own private cloud services to minimise the costs over time. However, it should be noted that cloud computing challenges should not overshadow its benefits. After all, cloud computing is no less secure than our traditional IT delivery model (Thomas, 2011).

## 7. Discussions and conclusions

Cloud computing has brought change, thus replacing the traditional IT practices for organisations including academic libraries wishing to cut IT costs while also striving for efficiency. Due to its benefits, cloud computing is considered the engine of innovation because of its potential benefits to academic libraries. According to this study, the following key findings deserve a mention:

- There is a strong awareness in as far as cloud computing is concerned although staff members were not particularly aware of its drawbacks.
- The findings also revealed that the library management decided to go ahead with the migration project based on the fact that they could not afford the IT infrastructure that comes with local implementation. This is also despite the fact that the University IT personnel tried to discourage them to and their bases was the low internet bandwidth.
- It has been revealed that cloud computing has benefits mainly pertaining to cost saving as the University is currently in a financial crisis.
- On the challenges, the study revealed internet connectivity as the main concern because cloud computing relies on its availability

Overall, the NUL library staff have shown a positive attitude towards the cloud based Sierra system and seem to be consistent with the study's theory that the innovation is generally accepted and is now part of their daily routines.

Data collection for this study did not cover all university libraries and different campuses because of resources. This study investigated the adoption of the Sierra library management system on the cloud. It is important to remember that academic libraries are part of the entire university and therefore should not be perceived as if they operate in isolation. It has emerged from the study's findings that the university IT personnel did not encourage the library to undertake the migration project based on their perceived low Internet bandwidth. This may be the result of not having enough knowledge of cloud computing. It therefore becomes important to investigate cloud computing from the perspective of the entire university. Moreover, the study does not cover private academic libraries, but is limited to the National University library.

Arising for the study findings, the following recommendations are made:

- It is recommended that the whole University should adopt cloud computing. This will save them from worrying about system crashes, viruses and loss of data while saving on money and time.
- It is also recommended that in order to connect the entire university to the cloud, the University should increase the internet bandwidth.
- This study was only limited to the National University of Lesotho library and its findings cannot be generalized to other academic libraries in Lesotho. It is therefore recommended that a study be undertaken encompassing all academic libraries.

The study can help libraries transform their current paradigm from their traditional client/server-based technological operations to the modern cloud-based technological operations. The study results may further inform policy in other industries with regard to the adoption and implementation of cloud computing services.

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# Research data management challenges in Kenya: The case of private universities in Nairobi County

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## Abstract

*This research paper is a spinoff from a doctoral degree study that was carried out at the University of KwaZulu-Natal between 2017-2019. The aim of the study was to establish the role private university libraries in Nairobi, Kenya play in supporting e-Research and the challenges that librarians and researchers face in the process of managing data. The study employed both qualitative and quantitative epistemological approaches with semi-structured interviews and survey questionnaires to collect data from a population consisting of university librarians, faculty members and doctoral students. The population was sampled purposively. The qualitative and quantitative data sets were analysed using SPSS and content analysis respectively. The findings revealed several challenges, which included the lack of strategies and policies to guide research data management support, the lack of integrated RDM policies, a research process that was fragmented, and limited ICT policies and infrastructures. The institutionalisation of RDM in the private universities in Kenya is therefore urgent and imperative. The findings have policy, practical and theoretical implications for the effective RDM in Kenyan private universities in order to enhance scientific and scholarly communications. While the focus of the study limits generalisation of the*

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*findings, other universities may gain insights from RDM challenges within university settings.*

**Keywords:** Research Data Management; RDM challenges; University Libraries; Kenya.

## **Introduction**

Research data management (RDM) involves organising data from its entry into the research cycle through to disseminating and the archiving of valuable results (Whyte & Tedds, 2011:1). RDM is, therefore, a critical part of the research process that aims at enhancing and making this process as efficient as possible (University of Leicester, 2017). It involves the planning, creation, documenting, organising, improving analysis procedures, securing, storing, backing up, providing access, and effective sharing of data to enhance publishing, citations and reusing of data for new projects (University of Leicester, 2017; Briney, 2015:17).

RDM is a moderately new term within the research arena, having been established in the mid-2000s (Briney, 2015:13). The growth and development of RDM has mainly been the result of funders' and publishers' mandates requiring that researchers submit their generated raw data that has been used to report their findings in open access data repositories to enable the public to access, browse, share, re-use and even validate reported research (Borghi, Abrams, Lowenberg, Simms & Chodacki, 2018:2; Tripathi, Shukla & Sonker, 2017:417; Ahlfeldt & Johnsson, 2015:12). Furthermore, there has been an increase in the data-sharing culture among researchers and an ongoing shift in policies that require not only open access to scientific publications, but also open access to research data, leading to discussions on both national and international level about the significance of making research data publicly available and accessible, particularly from publicly financed research (Ahlfeldt & Johnsson, 2015:12).

According to Briney (2015:13), "such mandates gained momentum in the UK with the 2011 Common Principles on Data Policy from Research Councils UK (Research Councils UK, 2011) and in the United States with the National Science Foundation's data management plan requirement in 2011 (NSF, 2013)." Two key funders in the United States, namely the National Science Foundation (NSF) and the National

Institutes of Health (NIH) are provided as examples of organisations that require data sharing plans in order to provide funding (Zotus, 2017:291). This trend has been caught up on a global scale. For instance, Kahn, Higgs, Davidson and Jones (2014:296) state that the National Research Foundation (NRF) which hosts the South African Data Archive (SADA) advocates proper RDM especially to researchers who are receiving research funding. According to Chiware and Mathe (2015:3), in March 2015, the NRF in South Africa “released a statement on open access for data retention, mandating that their funded research publications and supporting data be deposited in an accredited open access repository”. Thus, it is becoming evident that researchers must deposit their data in open access repositories, necessitating increased support in RDM practices.

Significant benefits arising from RDM and open access data have been reported. Tripathi, Shukla and Sonker (2017:417) assert that properly stored data results in easy access, browsing, consultations, usage and building upon it in future for academic, research and scientific purposes. Additionally, data sharing enables researchers to reanalyse, re-evaluate and revalidate research findings, enabling them to add their viewpoints which can enhance the creation of new knowledge. Ahlfeldt and Johnsson (2015:12) note that researchers can easily build on previous research results, thus enhancing quality; collaborations can be nurtured to increase efficiency in research; reinventing the wheel can be curbed; the acceleration of innovations and increased transparency in the research process as there is citizen and society involvement.

According to Macquarie University (2016:8); Heidorn (2011:664); Henty, Weaver, Bradbury and Porter (2008:1), effective management of data enhances the validation of the accuracy of results, which can only be enhanced through direct access to original data; reproduction of data; progression of solutions; sharing of data; re-use of published data especially for distinct research problems; enhanced collaborations and communications among researchers; and the possibility of unearthing unique data that cannot be replicated. Henty *et al.* (2008:1) add that the expensive nature of data collection necessitates the effort to manage it in order to avoid duplication. Given the benefits and increasing funding mandates, RDM thus becomes essential in universities.

## **RDM in universities and the role of libraries**

The management of research data has now posed a challenge for organisations. Universities are increasingly experiencing a vast production of diverse born-digital data (Pinfield, Cox & Smith, 2014). For this data to be made available and useful, there is a need to format, document and organise it in a way that will enable it to be examined and re-used (Borghi *et al.*, 2018:2). The dramatic changes in the research landscape demand that researchers in universities change how they work with and document their data, and, as well, they are required to ensure accuracy, completeness and authenticity in their data (Ahlfeldt & Johnsson, 2015:18; Baykoucheva, 2015:72). As a result, researchers need support to manage their data appropriately. Lyon (2012:127) asserts that libraries “have been positioned around a long-established publication process tailored to deliver the peer-reviewed scholarly article or monograph.” Given the increasing mandates from funding agencies, university libraries have a greater responsibility to support researchers in the management of data and increasingly in the creation of data management plans (DMPs).

A study by Brown, Wolski and Richardson (2015:225) indicated that university libraries are confronted with the new roles for supporting research data. Ray (2014:6-7) reported that libraries had begun to pay attention to supporting data management in order to enable preservation and re-use of data and also, to enable researchers to find their own data after the initial use. According to Borghi *et al.* (2018:2), library-based data management support to researchers has mainly been focused on “data management planning, metadata and documentation, data organisation, storage and backup procedures, and long-term preservation.” Libraries could have more involvement in educating students and researchers on metadata creation but this could pose a challenge as most datasets have very few of these (Baykoucheva, 2015:81). A more focused approach for RDM could be for libraries to provide support across the data lifecycle. Shearer and Arguez (2010:3) state that to enhance long-term preservation, data ought to be created and maintained consistently; this would involve the vigorous management of data in its entire lifecycle. Ahlfeldt and Johnsson (2015:15) emphasise this by stating that:

*A data life cycle model is a process to describe the different stages and transformations that data will undergo from its creation to its final sharing and preservation. Using a data life cycle model can provide a useful framework to present and communicate the different stages of data, in order to deliver support for RDM in an organization. The process of research data management is often complex and it involves coordination between people, agencies and resources.*

However, Borghi *et al.* (2018:2) and Briney (2015:17) allude to the fact that the focus can not only be on the data lifecycle, but rather, given the wide range of practices in data management, there is a need to take steps in planning for RDM before the start of a research project or earlier in a research process; during the project; and, after its completion. It is clear that there are enormous activities to be considered that are critical to the successful management of data in universities, with university libraries being viewed as critical in these endeavours. According to Cox, Kennan, Lyon and Pinfield (2017), while institutional support for RDM has been drawn from libraries' previous involvement with digital services and open access endeavours, RDM has presented major challenges for library managers. It is evident that libraries have begun to offer RDM support, but the nature and extent of their role remains blurred.

The purpose of this research paper is to present findings that the researcher sought in relation to problems of data management, organisation, dissemination and preservation that existed in six private chartered universities, namely: Africa International University (AIU); Africa Nazarene University (ANU); Catholic University of Eastern Africa (CUEA); Daystar University; Pan Africa Christian University (PAC); United States International University (USIU). These universities were purposively selected because they met the requirements of the study which included: private chartered universities based in Nairobi County and offering PhD programmes as the study targeted faculty members and PhD students (researchers). The study sought to explore private university libraries as they are reported to head other universities in adopting technologies (Herbling, 2012; Kavulya, 2003:156; Nganga, 2012; Otando; 2012:4), which is a critical enabler of RDM support services within an eResearch context. Table 1 highlights the status of the selected universities in terms of the schools or faculties in place, PhD programmes on offer and the total population of the PhD students (308), faculty members (622), university librarians (6), reference

librarians (13), and, the IR Managers (7). Furthermore, the availability of an RDM policy has also been indicated, reflecting that only one university had one.

| Table 1: Universities selected for the study |                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                      |                                             |                 |                       |                      |             |            |
|----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|-----------------|-----------------------|----------------------|-------------|------------|
| Universities                                 | Schools/<br>Faculties                                                                                                                                         | PhD<br>programs                                                                                                                                                                                                                                                                                                                                      | Population of researchers<br>and librarians |                 |                       |                      |             | RDM policy |
|                                              |                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                      | PhD Students                                | Faculty Members | University Librarians | Reference Librarians | IR Managers |            |
| AIU                                          | -School of Business and Economics<br>-School of Education, Arts and Social Sciences<br>-School of Theology                                                    | Doctor of Ministry Program<br>PhD in Biblical Studies<br>PhD in Business Administration & Management<br>PhD in Education<br>PhD in Intercultural Studies<br>PhD in InterReligious Studies<br>PhD in Leadership & Governance<br>PhD in Systematic Theology<br>PhD in Theology & Development<br>PhD in Translation Studies<br>PhD Theology and Culture | 40                                          | 60              | 1                     | 1                    | 1           |            |
| ANU                                          | -Business School<br>-Law School<br>-School of Humanities & Social Sciences<br>-School of Religion and Christian Ministry<br>-School of Science and Technology | PhD in Religion<br>Doctor of Ministry.                                                                                                                                                                                                                                                                                                               | 35                                          | 50              | 1                     | 1                    | 1           | ✓          |



|         |                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                  |     |     |   |   |   |  |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|---|---|---|--|
| CUEA    | <ul style="list-style-type: none"> <li>-Faculty of Arts &amp; Social Sciences</li> <li>-Faculty of Business</li> <li>-Faculty of Education</li> <li>-Faculty of Law</li> <li>-Faculty of Science</li> <li>-Faculty of Theology</li> <li>-School of Business</li> </ul>                          | Doctor of Business Administration<br>Doctor of Philosophy Counselling Psychology<br>Doctor of Philosophy in Curriculum Studies and Instruction<br>Doctor of Philosophy in Education<br>Doctor of Philosophy in Education Planning and Administration<br>Doctor of Philosophy in Religious Studies<br>Doctor of Philosophy I Philosophy<br>Doctor of Philosophy in Theology<br>Doctorate in Sacred Theology<br>PhD in Mathematics | 141 | 237 | 1 | 4 | 1 |  |
| Daystar | <ul style="list-style-type: none"> <li>-School of Arts &amp; Humanities</li> <li>-School of Business &amp; Economics</li> <li>-School of Communication</li> <li>-School of Human &amp; Social Sciences</li> <li>-School of Science, Engineering &amp; Health</li> <li>-School of Law</li> </ul> | PhD Communication<br>PhD Clinical Psychology                                                                                                                                                                                                                                                                                                                                                                                     | 20  | 120 | 1 | 1 | 1 |  |
| PAC     | <ul style="list-style-type: none"> <li>-Graduate School</li> <li>-School of Humanities &amp; Social Sciences</li> <li>-School of Leadership, Business &amp; Technology</li> <li>-School of Theology</li> </ul>                                                                                  | PhD in Marriage & Family Therapy<br>PhD in Organizational Leadership                                                                                                                                                                                                                                                                                                                                                             | 25  | 35  | 1 | 1 | 1 |  |

|      |                                                                                                                                                                                                                                                                           |                                                                                                              |     |     |   |    |   |  |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|-----|-----|---|----|---|--|
| USIU | -Chandaria School of Business<br>-School of Communication, Cinematic, and Creative Arts<br>-School of Graduate Studies, Research and Extension<br>-School of Humanities & Social Sciences<br>-School of Pharmacy and Health Sciences<br>-School of Science and Technology | Doctor of Business Administration<br>Doctor of Psychology<br>Doctor of Philosophy in International Relations | 129 | 120 | 1 | 5  | 2 |  |
|      |                                                                                                                                                                                                                                                                           |                                                                                                              | 380 | 622 | 6 | 13 | 7 |  |

## Literature review

The research question and literature for RDM challenges was guided by the element of data as derived from the eResearch Capability Model (eRCM) that was adopted from the Victoria University of Wellington (VUW). “Data is the management of all research inputs and outputs that are in a digital format. This includes the collection, curation, analysis, and provenance (metadata) of both basic data and information produced by research” (Whakamuri, Whakaaro & Aro, 2014:13). At VUW, it was found that due to the lack of an organisational policy, researchers chose what to do with their data. The increasing pressure from the government to researchers to make their data accessible, and publishers asking for data to support work that researchers want to publish, created a need for data management. It is based on the VUW study and the resulting report by Whakamuri, Whakaaro and Aro (2014) that the current research question on RDM challenges was underpinned, particularly to seek gaps in RDM and, therefore, propose the way forward for effective RDM implementation.

Despite the depicted benefits, managing research data presents a range of challenges within university settings. Pinfield, Cox & Smith (2014:3) assert that RDM encompasses a wide range of technical, cultural, managerial, legal and policy challenges. According to Yu (2017:793), academic libraries view the provision of research data services as a great additional service for its clientele but find that the lack of formalised RDM infrastructure and policies, inadequate training for staff,

unpreparedness and funding form a challenge to self-starter university-wide RDM support. As a result, RDM-related services continue to be determined by funding agencies' mandates.

Empirical studies have uncovered some challenges in relation to RDM. A recent study by Piracha and Ameen (2019) assessed the policy framework and planning in relation to RDM among 30 highly ranked universities by the higher education commission in Pakistan. The study found a lack of knowledge and awareness about RDM among library heads, a lack of willingness, motivation and coordination by researchers, insufficient professional skills for RDM support, poor infrastructure and networking. Faniel and Connaway (2018) conducted interviews from 36 academic library professionals in the United States of America (USA) to establish librarians' perspectives on factors that influence RDM. It was established that technical resources, human resources, researchers' perceptions about the library, leadership support and communication, coordination, and collaboration influenced RDM activities. On the other hand, a survey carried out by Cox *et al.* (2017) carried out in higher education libraries in Australia, Canada, Germany, Ireland, the Netherlands, New Zealand, and the UK indicated that libraries had taken leadership roles to provide RDM support in universities, but there was a greater focus on advocacy, policy development, advisory and consultancy services. Technical advancements to support RDM were found to be still wanting. Other concerns included inconsistency in terms of available skills to support RDM, resourcing, a lack of collaborations with other support services, and challenges in involving key stakeholders like researchers and top management.

A lack of awareness and training among librarians and researchers has been presented as a hindrance to effective RDM. Borghi *et al.* (2018:3) find a communication gap existing between researchers and library-based data service providers with a lack of user-friendly guides to enable researchers to advance their RDM practices. They propose that RDM should be integrated as part of a researcher's day to day activities, but possible barriers such as language, terminologies and priorities among various research communities ought to be observed. Heidorn (2011:668) noted insufficient training for researchers towards long-term data access and preservation, while indicating that libraries have the

opportunity to actively engage in assisting researchers, failing which they may turn to other institutions to be offered the necessary data management support. This can especially occur with researchers who require data management plans in order to secure grants with funding agencies. Baykoucheva (2015:80) reports that some academic institutions have considered the introduction of data management training for graduate students as mandatory, with libraries taking the initiative to offer this training through workshops or integration in existing library instructions.

Appropriate skills and competencies for academic librarians will help enhance RDM support. Baykoucheva (2015:81), Cox and Pinfield (2013:301) identify the lack of technical knowledge, domain-specific expertise, and limited research experience as potential barriers to librarians taking up a critical role in RDM support. Lyon (2012:132) posits the need for librarians to have “a working knowledge of the research practices and workflows, an understanding of the specific technical standards, metadata schema and vocabularies routinely used in practice, an awareness of the national and international data centres where research data in that domain are deposited, and a good grasp of the data publication requirements of the leading scholarly journals”. According to Heidorn (2011:667), having all the skills required to represent all the information and descriptions for data can be problematic for academic libraries because data extensively varies, requiring a range of schemes to create appropriate metadata. This may require a close working relationship with data creators in order to understand their data and a need to work with other institutions in order to identify appropriate standards and practices for various datasets. Baykoucheva (2015) discussed the issue of data standards and noted that it is vital to have well established standards in order to describe data content and format appropriately. However, while there are established conventions for citing published papers, acceptable uniform standards for research data are lacking. This poses a challenge to libraries as it is difficult to create new data standards. Furthermore, while some libraries have been able to adopt the use of institutional repositories to manage data, bibliographic metadata for datasets may vary.

Adopting effective data management requires that researchers and librarians make changes in how they handle data, and this may be difficult since there is a cultural aspect that may hinder both individuals and organisations. Morgan, Duffield and Hall

(2017:302) reveal that even in situations where the benefits of RDM are clearly known and appreciated, changing how people do things is challenging. For instance, researchers may not be willing to invest more time in the processes required to ensure that their data is well managed. Consequently, this calls for continuous engagement as the pace of change and adoption to RDM is not instantaneous. Deninson, Kethers and McPhee (2007:9) also express the same concern by asserting that researchers regard themselves as time-poor and would want services that are interoperable with their usual work practices and technologies. Therefore, there is a tendency to avoid non-core tasks unless they are proved to have considerable benefits. In relation to librarians, Cox and Pinfield (2013:300) point to the increased staff time required for librarians to provide this service in the midst of already over-stretched library services. Supporting RDM may push libraries to downgrade other services and additionally, there is still instability in terms of infrastructure, policy, and governance, which leaves the library in a stalemate in terms of positioning itself to support RDM.

It is apparent that advances in technology have hastened the amount of data produced, its accessibility, analysis and data protection (Mackie & Bradburn, 2000:2). In spite of this, technological challenges have arisen. Briney (2015:14) indicates that digital files are fragile, thus the study notes, problems such as the corruption of storage devices, losing files, and obsolescence may easily be experienced. According to Baykoucheva (2015:73), preservation and storage present big challenges. He reports that surveys of researchers have indicated that their research data is most often on spreadsheets, which limits manipulation and furthermore, the data is stored on computers and external hard drives without having backup. In addition, “a whole range of other activities commonly associated with datasets, such as reformatting them for analysis in various software packages, shipping them between sites, processing them for potential reuse, and carrying out various preservation actions upon them” as highlighted by Cox and Pinfield (2013:299) would need attention. Technological infrastructure is, therefore, a challenge in itself and requires careful planning to avoid loss of data.

Ethical issues have also come into play as a challenge in RDM. Data about humans may raise privacy concerns, while some data may be classified by a nation based on

security concerns, thus requiring a library to apply appropriate access controls (Heidorn, 2011:668). “Data may be sensitive, containing personal information for example, and so needs to be managed with appropriate security measures in place” (Cox & Pinfield, 2013:299). For data that has to be stored externally, there have been concerns with regard to the level of trust that can be placed on external agencies to be in control of the long-term preservation of data (Lewis, 2010:11). Trust in the technology used in terms of being reliable and stable is also of concern to researchers. They want to be able to trust the organisation that is managing their data, and as well, believe that the research community will not “misuse, alter, or steal the data” hence libraries managing such data have to ensure that there is sufficient security in order to build trust in the systems and infrastructure being used in RDM (Denison, Kethers & McPhee, 2007:9). Briney (2015) notes that while researchers are not expected to be security experts, they have a role to play, hence they need to have the basic tenets of security, to ensure the protection of data that has been entrusted to them, and ensure that data is always stored securely in an environment that is controlled.

Luce (2008) noted that adequate and sustainable funding is crucial in RDM, as posed in the question below:

*The cost of owning and managing data, hardware, and software is very high. How do we offset and share multi-institutional infrastructure investments? Because it takes a community to meet these challenges, how many research libraries need to work together to meet specific eResearch needs, and how do we collaborate in new, more effective ways?*

It is clear from this literature that there are vast challenges for RDM that would affect the entire university community. These challenges would require collaborative efforts both at the national and international levels. According to Levine (2014:129), there exists a gap between aspiration and reality as there are complexities in terms of making data available and usable; all questions are yet to be figured out.

## **Research methodology**

The present study sought to identify the challenges relating to RDM in private university libraries in Nairobi County, Kenya. Six private chartered universities, namely the Africa International University, Africa Nazarene University, the Catholic

University of Eastern Africa, Daystar University, Pan Africa Christian University, and the United States International University, were selected for the study. The study employed both quantitative and qualitative epistemological approaches. Self-administered questionnaires were used to collect data from a population consisting of 306 PhD students, 462 faculty members, 13 reference librarians, and 7 Institutional Repository (IR) managers which had been achieved using survey monkey sample size calculator at a confidence level of 95% and a margin of error of 5%. The survey questionnaires integrated both closed and open-ended questions. Three sets of questionnaires were developed for i) PhD students and faculty members who were provided with closed-ended questions on RDM challenges and furthermore were asked to specify any other challenges they faced; ii) Reference librarians whose open-ended question sought to establish challenges in the provision of RDM services, and iii) IR managers whose question on RDM was open-ended and sought to establish what RDM challenges the libraries experience.

Semi-structured interviews were used to collect data about RDM challenges and barriers faced by the libraries from six university librarians. A response rate ranging between 71%-92% was achieved. The population was sampled purposively targeting librarians as providers of e-Research support, as well as faculty and doctoral students, because they are most likely to be involved actively in research. The quantitative and qualitative data sets were analysed using SPSS and content analysis respectively.

## **Research findings**

The findings are based on data collected in 2018 for a doctoral thesis. The findings from the PHD students and faculty members indicated that privacy and confidentiality of research data was a challenge to 328 (53.1%) respondents, 301 (48.7%) indicated that they have challenges in creating metadata, 299 (48.4%) are facing difficulties when it comes to locating datasets, and 254 (41.1%) find data storage a challenge. An average 52% of the respondents did not confirm if they were affected by these aspects. Furthermore, while respondents were given a chance to provide additional RDM challenges, none was provided. Table 2 shows the results.

**Table 2: RDM challenges faced by PhD students and Faculty members (n=618)**

RDM challenges Selected (%) Not selected (%)

Privacy and confidentiality issues

associated with research data 328 (53.1) 290 (46.9)

Creating metadata 301 (48.7) 317 (51.3)

Locating datasets 299 (48.4) 319 (51.6)

Storage of data 254 (41.1) 364 (58.9)

Total % of cases      1182 (191.3)      1290 (208.7)

\*Multiple responses possible

Using open-ended survey, reference librarians were asked to indicate the challenges they face when providing research data management services. Table 3 presents the findings.

| Table 3: Challenges faced by reference librarians when providing RDM services (n=11) |            |                                                                                                                                                                                                                                        |
|--------------------------------------------------------------------------------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| University                                                                           | Respondent | Responses                                                                                                                                                                                                                              |
| A                                                                                    | RL1        | "We have not engaged in formal RDM services"                                                                                                                                                                                           |
| A                                                                                    | RL2        | "Insufficient access"                                                                                                                                                                                                                  |
| A                                                                                    | RL3        | "Some databases are a bit complicated and need much knowhow, the internet is guaranteed and the computer software and hard disk are not current for fast processing or downloading of work"                                            |
| A                                                                                    | RL4        | "Lack of administrative and academic support from the institutions. Lack of finances - cannot attend trainings off-campus, economic strains of institution who's going to pay for archiving and access, adopting new technologies etc" |
| B                                                                                    | RL5        | "Inadequate staff and skills, lack of willingness from the researchers to share".                                                                                                                                                      |
| C                                                                                    | RL6        | "Dealing with research students who don't understand what technologies they need to use; Finding time to work consistently with research centre thus creating a gap on any new concepts"                                               |
| C                                                                                    | RL7        | "Stereotypes, work overload, one may not deliver in time; lack of skill and knowledge; librarians could lack time to keep abreast of new tech; there are no policies around RDM; we may not see it as our work"                        |
| C                                                                                    | RL8        | "Training, [it is a] new field - institutions of higher learning should develop a curriculum"                                                                                                                                          |



|                            |      |                                                                                                                                                                                       |
|----------------------------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| C                          | RL9  | "Network failure"                                                                                                                                                                     |
| D                          | RL10 | "A lot of consultation back and forth in order to establish suitable RDM policies acceptable across the universities; poor attendance to RDM training session offered to researchers" |
| F                          | RL12 | "It is a full-time job" and "equipment tools are inadequate".                                                                                                                         |
| * RL = Reference librarian |      |                                                                                                                                                                                       |

The IR Managers were asked to indicate the challenges that the library experiences while managing data. Three of them cited the following:

*Copyright issues, plagiarism, fear of data being copied [and] awareness (IR2).*

*Poor attendance to RDM training sessions offered. A lot of consultations back and forth so as to establish suitable RDM policies acceptable across the universities (IR4).*

*Information overload (IR5).*

The University Librarians were also interviewed and asked to outline any research data management challenges and obstacles that their libraries face. The majority indicated that they did not have RDM but cited potential challenges as highlighted in Table 4.

| Table 4: RDM challenges outlined by University Librarians (n=6) |                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------------------------------------------------|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| University                                                      | University Librarians | RDM challenges                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| A                                                               | UL1                   | <p>"Developing the right skill set especially in RDM so that we can provide adequate services"</p> <p>"Adaptation of e-publishing even within the university. Adaptation of OA publishing"</p> <p>"Lack of awareness among researchers and students where they can publish their work quality areas or quality publishers. Sometimes you see areas they have published in their works which are really journals that are not peer-reviewed"</p> <p>"...what we need is how to create awareness, how to sensitize, how to upgrade on knowledge of how to go about the eResearch"</p> |

|   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| B | UL2 | <p>"I think availing of the data for research is one of the challenges"</p> <p>"Lack of understanding what it is all about and why do I have to give my own data, what for? Maybe someone will be worried that if I give it then someone is going to use it"</p> <p>"The issue of space for data storage and we'd need to look for external servers for high level securing of data"</p> <p>"Then of course budget".</p>                                                      |
| C | UL3 | <p>"I think researchers are protective of their data. I do not see how they would want to keep it in a library"</p> <p>"Once somebody has got the data and analysed it, most of the time it is not stored anywhere. Even mine, if you ask me I don't know where it went. So there is that challenge of thinking that it is not important once you have already used it"</p>                                                                                                   |
| D | UL4 | <p>"I think the issue of attitude"</p> <p>"Probably lack of support, I mean, we'll even have to lobby the university management and I would imagine some platforms that would call for money and the library budgets are so slim"</p> <p>"There is a gap in terms of skills. Your typical librarian may not be able to hack some concepts. I believe that there are some desires to competencies so for the typical librarian there will be a need for capacity building"</p> |
| E | UL5 | "Need for more awareness and advocacy"                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| F | UL6 | <p>"...I think maybe technological in terms of capacities unless we build technological capacities that will be able to store such data, but not only to store but also to make it more available when required..."</p>                                                                                                                                                                                                                                                       |

\*UL = University Librarians

## Discussion

The findings in Table 2 indicate that 53.1% of the PhD students and faculty members faced privacy and confidentiality data dilemmas which are ethics-related challenges associated with RDM. Studies by Cox and Pinfield (2013:299); Heidorn (2011:668); Lewis (2010:11); Denison, Kethers & McPhee (2007:9) indicate ethics as a challenge in RDM. citing privacy issues of the participants, security, sensitivity of data and trust. Consequently, ethical issues have to be observed at all the stages from data collection to preservation and re-use, if researchers' trust in RDM has to be earned. The issue of ethics was also highlighted by a university librarian (UL2) who said that, "I think availing of the data for research is one of the challenges." UL2 reiterated, a *"lack of understanding what it is all about and why do i have to give my own data,*

*what for? maybe someone will be worried that if [they] give it then someone is going to use it".*

The PhD students and faculty members also indicated having challenges in metadata creation (301, 48.7%), locating datasets (299, 48.4%), and data storage (254, 41.1%) as shown in Table 2. While the research study established that some libraries support researchers in metadata creation, it also revealed that the majority of them were not aware of that service in the particular libraries. This could have been attributed to a lack of awareness and also the lack of a policy, as this service was provided by individual librarians in an *ad hoc* manner. Baykoucheva (2015:81) advises that libraries take a more proactive role in educating students and researchers on metadata creation. With regard to locating datasets, 48% of the respondents indicated that this was a challenge, while the rest (52%) could not even determine this as a service provision. Furthermore, the study revealed a gap in data storage. These challenges can be attributed to the lack of data storage facilities in the libraries as expressed by the IR managers. In general, more than 46.9% of the respondents could not establish RDM challenges, possibly due to the lack of conscious RDM practices both by the researchers and their libraries.

From the library perspective, the University Librarians indicated that they do not have formal RDM in the libraries. Regardless, the study established that some minimal RDM support, such as data entry and analysis, were provided by individual IR managers and reference librarians. A reference librarian confirmed the lack of formal RDM by saying that "we have not engaged in formal RDM services" (RL1). Nevertheless, reference librarians from five universities (A, B, C, D and F respectively) identified challenges to RDM as including: insufficient access to data, poor technological infrastructure, lack of university support, lack of funding, inadequate skills of librarians, unwillingness to share data by researchers, lack of awareness among researchers, lack of RDM policies and lack of curriculum on RDM. On the other hand, two of the IR managers from universities B and D respectively identified challenges to managing data as: ethical issues, lack of trust, awareness and interest from researchers and a lack of policies (see Table 3). University librarians on the other hand cited likely RDM challenges as: the lack of knowledge about RDM and appropriate skill sets among librarians, a lack of awareness among

researchers, inaccessibility of data, lack of storage space, lack of funding and institutional support, trust, attitude and inappropriate technological infrastructure (see Table 4).

The findings from the researchers and library staff are inconsistent with the RDM challenges raised in the literature reviewed in this study. For instance, insufficient time for data management (Pinfield, 2013:300; Deninson, Kethers & McPhee, 2007:9); lack of training (Borghi *et al.*, 2018:3; Yu, 2017:793; Heidorn, 2011:668); inadequate library support, ethical and storage concerns (Baykoucheva, 2015:81; Briney, 2015; Cox & Pinfield, 2013; Heidorn, 2011; Lewis, 2010:11) and technological challenges (Baykoucheva, 2015:73; Briney, 2015; Denison, Kethers & McPhee, 2007:9). In Overall, the findings unearthed several RDM challenges in the universities studied that included: the creation of metadata; locating datasets; data storage; lack of RDM strategies and policies; insufficient access to data; poor technological infrastructure; lack of funding and institutional support; inadequate skill sets among librarians; unwillingness to share data by researchers; lack of awareness and knowledge of RDM; lack of curriculum for RDM; lack of trust; lack of interest from researchers; inaccessibility of data; attitude and inappropriate technological infrastructure. Evidently, this study has established that researchers are met with a wide range of challenges that are impeding RDM practices at the universities. Consequently, the university libraries are faced with the challenge of RDM mainly due to a lack of strategies.

## **Conclusions and recommendations**

Research data management is increasingly becoming crucial in universities, with libraries being tasked to provide RDM support. Private universities in Nairobi, Kenya are yet to have formalised RDM support services for the university community, hence the university libraries did not have established RDM support services. This was clear in the responses provided, with on average 52% of the researchers not indicating if they were supported while none of the 618 (100%) researchers provided an answer when they were provided with an open-ended question to indicate RDM challenges. University librarians and reference librarians confirmed this status. Despite this, minimal support for some RDM aspects were established, including support in data entry and analysis, but this was insufficient compared to the vast data practices that

cut across the research data lifecycle. The findings revealed several challenges, which included the lack of strategies and policies to guide research data management support, the lack of integrated RDM policies, a research process that was fragmented, and limited ICT policies and infrastructure, ethical dilemmas and a lack of awareness and training. In view of these findings, it can be concluded that the management of RDM at the six private universities will remain an obstacle to e-Research if they are not addressed. The study proposes firstly that librarians be made aware and trained on all aspects of RDM to enable their understanding of RDM and thereafter enhance their ability to set up appropriate strategies and policies, RDM support services and training and support for researchers. The study finds that the institutionalisation of RDM in the private universities in Kenya is urgent and imperative.

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# Characteristics of big data produced by the Technical University of Kenya and Strathmore University

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## Abstract

*This study investigated the characteristics of big data produced by the Technical University of Kenya (a public university) and Strathmore University (a private university) in Kenya. The two universities provided contextual insights into the differences and similarities between the characteristics of big data from the perspectives of private and public universities in Kenya. The study adopted convergent parallel mixed methods research design. Quantitative and qualitative data was collected using questionnaires and key informant interviews. The target population for the study was 22,050 respondents consisting of clients (students) as well as ICT staff, directors and managers from both TUK and SU. Information-oriented purposive sampling was used to select information-rich subjects. This gave TUK a sample size of 580 and 114 for SU. Quantitative data was analysed using Statistical Package for Social Sciences (SPSS) while the qualitative data was analysed using thematic analysis. It was established that both institutions generate big data which can be described in terms of Volume, Variety and Velocity (3Vs) of big data. The volume of big data is produced in terms of Gigabytes, Terabytes, Megabytes and Kilobytes. The velocity of processing this big data was using real time, periodic, batch and near real-time approaches. The institutions had different varieties of big data ranging from email-based data, photos, video, audio, social media data, MS Office data, cell phone data, financial data, web-log data, and gaming related data. The results of the study can be used by academic institutions to leverage on the data they produce through analytics to improve their performance. This study is original in terms of its subject matter, scope and application.*

**Keywords:** big data, big data characteristics, Technical University of Kenya, Strathmore University, Kenya.



## Introduction

Organisations are daily producing unstructured and multi-structured data. This has brought about an increase in the volume and diversity of the data produced as the years go by (Savvas, 2011). This growing data has been described as big data. Whereas Jacobs (2009) asserts that big data is data whose size and density force manipulators to use advanced technologies to gain insight from it, Russom (2011) states that it is the quantity of information resources an organisation generates or acquires over time, and that the continuous accumulation of big data may lead to an information explosion. Laney (2012) views big data in terms of velocity, volume and variety, commonly known as “3Vs”. This means that these datasets are not only voluminous; they are also generated fast, and are found in diverse formats. Therefore, big data prevails in different sizes and formats. The description of big data differs from organisation to organisation subject to the existing procedural, organisational and infrastructural capacity to manage the data an organisation produces, conveys or collects. In most organisations, big data is dispersed in different locations and with diverse personnel. The existence of big data is dictated by the rising ability of people and organisations to create and share content easily on the Internet and other Information and Communication Technology (ICT) platforms. Similarly, the increase in the advancement and ubiquity of technologies such as mobile devices has enabled users to connect to the Internet in real-time leading to the production of large amounts of data.

## Literature review

According to Mayer-Schoönberger and Cukier (2013), advancements in digital technologies and the ubiquity of smart devices have created big data that traditional tools cannot manage efficiently. Besides big data, the present-day society experiences infobesity<sup>1</sup> occasioned by increased information generation and sharing (Demirkan & Delen, 2013). The rapid development of information technologies has made the generation of large amounts of data easier, hence the information explosion (McAfee, Brynjolfsson, Davenport, Patil & Barton, 2012). Frizzo-Barker, Chow-White, Mozafari and Ha (2016) explain that big data is believed to change many aspects of

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1. Infobesity is the occurrence in information overload acquired when vast amount of information is input into a system exceeding its processing capacity.

an organisation. Organisations which embrace big data tend to shift towards thinking about data and its infrastructure, big data analytics and business intelligence. Such organisations develop strategies to help them to understand big data as a technological phenomenon. As explained earlier, Laney (2012) articulates the meaning of big data in terms of the “3Vs”. He also places the “Vs” in a framework seeking to determine how big data is and the technologies required to process each of the dimensions as presented in Figure 1. The levels determine the corresponding region for each characteristic of big data generated by organisations which are between zero and three. The higher the level, the broader the characteristics and technology required for analysing the data. The sum of the levels in the digital magnitude index is generated in order to identify the technology required for big data analytics. Once the sum is generated, and the value is situated between one and three, the traditional technologies can then be used for analysis. However, if the value is between four and six the advanced technologies like NoSQL are appropriate for analysis.

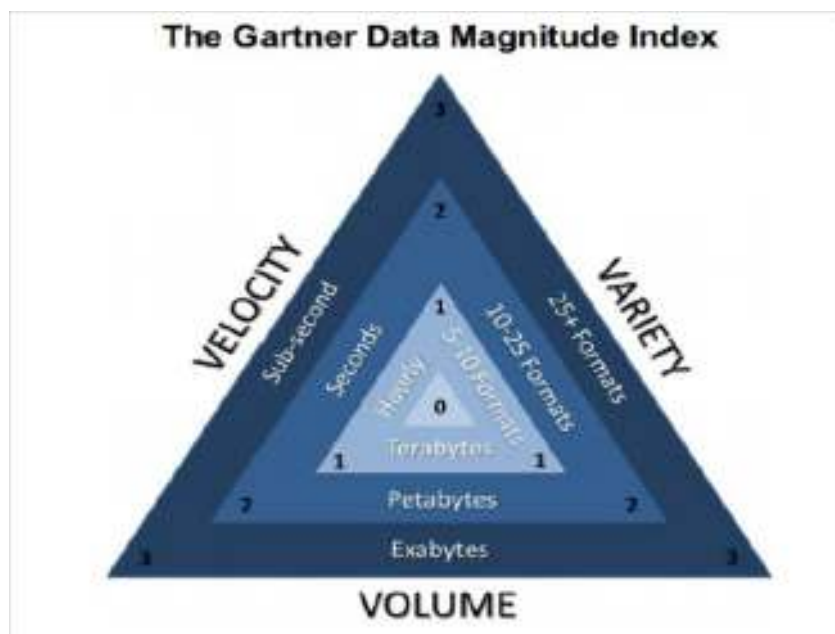


Figure 1: Data magnitude index

Source: Laney (2012)

According to Rich (2012), big data comes from various channels such as posts on social networks, photos, audio-visual and mobile phones, satellites and Global Positioning Systems indicators. Besides Laney (2012), a number of other scholars

(Russom 2011; Kwon & Sim, 2013; Sagioglu & Sinanc, 2013) also view big data in terms of volume, velocity and variety as discussed below.

## **Volume**

According to Sharma (2016) the quantity of data has grown explosively and it is expected to continue growing as years go by, and Sharma asserts that it grows at the rate of about 2.5 Exabyte<sup>1</sup> each day. This results in data which is too large to manage using the traditional technologies. The situation is exacerbated by the fact that the volume of big data grows at an alarming rate. The large volume of big data can be attributed to the accessibility of devices like smart-phones and machines. Similarly, there have been an expansion and use of social network platforms which have facilitated the sharing of information more widely than before (Assunção, Calheiros, Bianchi, Netto & Buyya, 2015).

Academic institutions generate vast volumes of data. The data is generated by students and staff conducting research and from the day to day processes of the institutions. In the late 1980s and early 1990s, academic institutions invested in student information management systems which led to the accumulation of large volumes of data comprising various records of students including financial and academic records (Karani & Moturi, 2013). Enhanced data creation capacity has enabled academic institutions to be data-rich and to generate and use enormous volumes of data each day. However, most of these institutions have not exploited the opportunities brought about by the massive data they produce. Therefore, this data does accord them a competitive advantage. Unless academic institutions manage their large volumes of data by availing resources and employees with skills to manage the data, the institutions may not be able to meet the expectations of their clients. The “missing marks syndrome” is a direct result of an institutional lack of capacity to manage big data which continues to plague many academic institutions in Kenya.

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1. It is a multiple of the unit byte for digital information in international system unit (SI). Exa indicates multiplication by sixth power of 1000( $10^{18}$ ).

## Velocity

According to Frizzo-Barker *et al.* (2016), velocity is the swiftness with which the examination of big data is conducted. It specifies the speed of data creation and processing thereby enhancing the availability of information when needed by clients. Real-time information processing can enhance an organisation's competitive advantage. Velocity also relates to the speed at which data seekers are able to search and retrieve the data they require (Porche, Wilson, Johnson, Tierney & Saltzman, 2014). Goes (2014) asserts that the concept of big data enables an advanced control speed of systems leading to new information termed as real-time information. Several researchers are of the view that the speed at which data is created is more important than the volume of data because the speed of data creation and retrieval gives an organisation the competitive advantage (Davenport & Harris, 2007). The speed of big data is based on the advancement of processors which permits the dispensation of real-time information.

## Variety

Variety denotes the different forms of data available. This can be expressed in terms of structured, unstructured or semi-structured data (Frizzo-Barker *et al.*, 2016). Big data is manifested in diverse formats, such as social media where data takes different forms such as notifications, messages and status updates (Sharma, 2016). Academic institutions produce big data from various activities which yield different varieties of big data such as videos, images and text documents. In academic institutions the variety of data can be categorised as follows:

- Students and staff data;
- Social media data;
- Institutional marketing data;
- Website browsing patterns data;
- Research data gathered by all staff; and
- Institutions' process data such as financial and admissions data, among others

Vesset, Woo, Morris, Villars, Little, Bozman and Eastwood (2012) added a fourth "V", which stands for *value*, to the notion of big data. Value relates to the benefits and usefulness of data in an organisation. Quality data enables decision making in an organisation to be effective and efficient (Zhou, Fu & Yang, 2016). In addition, White

(2012) recommended a fifth “V”, for *veracity*, to the big data concept. Veracity entails an assessment of the quality of data and the level of trust of various data sources. The quality of data is important because it determines the accuracy of information generated from it. For instance, an incorrect link can lead to an institution having inappropriate analysis of an organisation’s opportunities. According to Assunção *et al.* (2015), veracity is linked to reliability and the quality of data. Failure to use reliable or quality data leads to limited value or negative influence on an organisation’s performance.

According to Quitzau (2013), big data brought into being the concept of open data, and introduced another “V”, for *visibility* of open data, as regards the issues of privacy and security. Open data is data provided with no cost or license constraints. Organisations have to decide what to make open and what remains as closed data based on their privacy, commercial and security concerns. Quitzau (2013) observed that the concept of big data can be explained as illustrated by Figure 2 below.

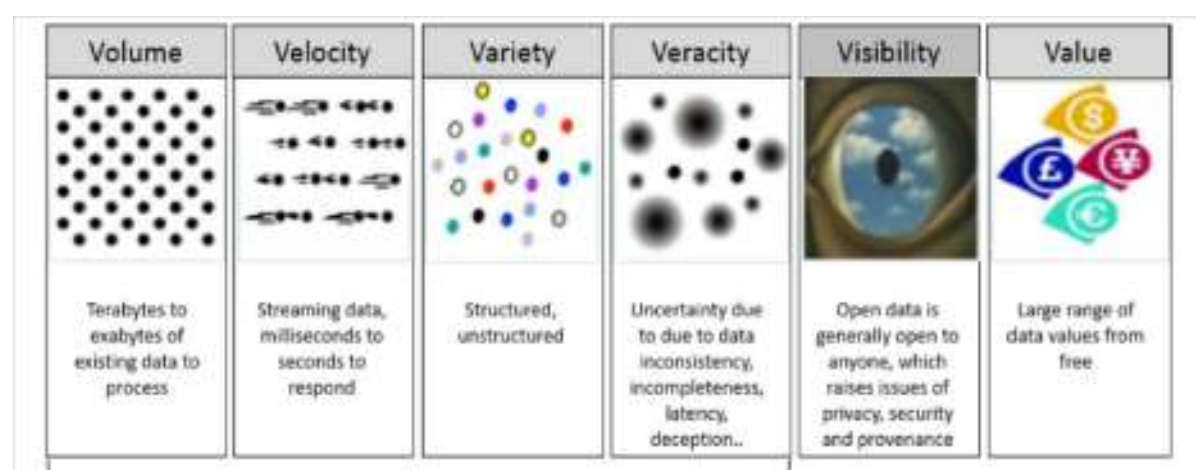


Figure 2: The six V's of big data  
(Adapted from Quitzau, 2013, slide 24)

## Background of the study

In academic institutions, big data comes from various academic, managerial and operational processes. On 25th July 2015<sup>1</sup> International Business Machines (IBM) invested six billion Kenya shillings (USD 60 million) in a skills venture platform in

1. <http://mobile.nation.co.ke/business/IBM-to-spend-Sh6bn-on-training-in-universities/1950106-2808272-format-xhtml-ooogskz/index.html>

academic institutions (universities and polytechnics) in East Africa. The fund was used to develop cloud systems for over fifty institutions of higher learning in Kenya to enable the development and management of study material. The programme was undertaken in partnership with Kenya Education Network (KENET) (Ochieng', 2015). The skills imparted included cyber-security, mobile education and business analytics. The training began on September 2015<sup>1</sup> with technology and engineering students to prepare them for the job market and to arrest the situation where some students do not get jobs due to non-recognition of their degrees by the Engineers Board of Kenya arising from non-registration of the engineering courses offered by their universities. In December 2016, Dell Egan, Marino and Curly (EMC) held a meeting with Information Technology (IT) faculty from Kenyatta University, Riara University, Moi University, Multimedia University, Jomo Kenyatta University of Agriculture and Technology, Kenya College of Accountancy University, Strathmore University, United States International University – Africa and Africa Nazarene University. The faculty were trained on data science and big data analytics with the aim of empowering them to deal with the large amount of content their universities were generating and to improve the quality of service offered by the universities to their clientele (Sang, 2017).

These initiatives demonstrate that universities in Kenya are not new to the concept of big data and big data analytics. Nonetheless, it is also evident from the foregoing that universities in Kenya are commencing to experiment with big data, including its characteristics, tools and procedures. This study was conducted with that background, and specifically, in the contexts of private and public universities in Kenya. Two universities, that is, Strathmore University and The Technical University of Kenya, were used to provide the contexts. These two institutions were used to facilitate an understanding of the differences and/or similarities between characteristics of big data from the perspectives of private and public universities in Kenya.

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1. <http://www.nation.co.ke/lifestyle/smartcompany/IBM-Sh6bn-plan-to-train-tech-students-takes-off-/1226-2890260-kwht3c/index.html>

## **Rationale of the study**

Academic institutions have not been left behind in the production of big data in terms of student and staff records, research output and innovations, as well as administrative, logistics, financial and procurement records. These records are produced fast, in vast volumes and diverse formats. Mayer-Schonberger and Cukier (2013) affirmed that big data is the new petroleum that will power the future knowledge economy. Academic institutions are operating in increasingly complex and competitive environments and need to respond to the changing world around them. The institutions need to exploit the data they generate to respond better to the changes around them. To do this, they need to overcome challenges associated with big data management. Some of these challenges revolve around difficulty to analyse, capture, curate, search, share, storage, transfer, visualise, and protect big data. The value of big data to organisational performance can only be unleashed through effective analytics. To analyse the data, new approaches must be used to process it. However, before analysing it, there is a need for organisations to identify the different characteristics of the big data they produce or own. This study investigated the characteristics of big data produced by two academic institutions in Kenya.

## **Methodology of the study**

This study was designed as a mixed methods research project. According to Creswell and Plano-Clark (2015), mixed method design enables the understanding of a problem of study by gaining different corresponding data and enhancing their validation. This study adopted a convergent parallel design. Both qualitative and quantitative data was collected and analysed. The authors merged the results from both sets of data for comparison and validation to enhance the interpretation of similar and dissimilar concepts. Primary data was collected through structured questionnaires and interviews from the Technical University of Kenya (TUK) and Strathmore University (SU). The study population was 22,050. It comprised 15,020 students and information communication technology (ICT) staff from TUK and 7,030 from SU. Information-oriented purposive sampling technique was used in the selection of information-rich subjects. Thus, class representatives in all academic programmes in both universities were selected to participate in the study, while all the ICT staff, directors and managers were chosen. The sample size for the study was

694 respondents, of which TUK was 580, while SU was 114. Questionnaires were distributed to all the students using a drop and pick technique. Face to face interviews was used to collect data from all ICT staff in both universities as shown in Table 1. The staff acted as key informants in the study.

| Table 1: Sample size          |             |            |             |
|-------------------------------|-------------|------------|-------------|
| Institution                   | Respondents | Population | Sample size |
| Technical University of Kenya | ICT Staff   | 20         | 20          |
|                               | Students    | 15,000     | 560         |
| Strathmore University         | ICT Staff   | 30         | 30          |
|                               | Students    | 7,000      | 84          |
| Total                         |             | 22,050     | 694         |

Quantitative data was analysed using statistical analysis by the help of SPSS and presented using descriptive statistics while qualitative data was analysed using thematic analysis.

## Findings of the study

The response rate was obtained by calculating the number of respondents who successfully completed the questionnaire or participated in the interview divided by the sample size, multiplied by one hundred to get the percentage. The research involved a total sample size of 694, comprising 580 from the Technical University of Kenya and 114 from Strathmore University. The research response rate per university is shown in Table 2 below.

| Table 2: Research response rate |             |             |                     |               |
|---------------------------------|-------------|-------------|---------------------|---------------|
| Academic institutions           | Respondents | Sample size | Number of responses | Response rate |
| TUK                             | Staff       | 20          | 15                  | 82%           |
|                                 | Students    | 560         | 459                 |               |
| SU                              | Staff       | 30          | 24                  | 89%           |
|                                 | Students    | 84          | 78                  |               |
| Source: Researcher (2018)       |             |             |                     |               |

Data analysis for this study was based on responses from questionnaires administered and interviews conducted by the researchers. TUK had a response rate of 82% while SU had 89%. The difference in response was due to the challenge of



administering the questionnaires to respondents at TUK, because there was no drop-off and pick-up point while SU had a drop-off pick-up point hence the slight difference. Overall, 576 respondents participated successfully in the study, giving a response rate of 83%. Of the sample, 118 (17%) did not provide responses, that is, they did not return the data collection tools while some pulled out of the interviews. According to Mugenda and Mugenda (2012), a response rate of at least 50% is adequate for analysis; a 60% response rate is generally good while a 70% response rate is excellent. This is in agreement with Kothari (2014) who asserts that a response rate of above 70% is deemed to be very good for data analysis.

### **Characteristics of big data at TUK and SU**

Identifying the characteristics of big data is essential to the understanding of the different forms of big data generated by institutions on a day-to-day basis. The majority of the respondents 32 (86%) from both institutions described big data as data drawn from a combination of multiple sources and consisting of multiple formats that require advanced technology to process. The following are some of the verbatim reports of the respondents:

*I can't add much to the usual definitions of big data. However, what big data makes special to me is the combination of multiple data sources as well as multiple types of data and how it is unstructured. [SU]*

*Big data is hard to process, and comes from even unstructured elements like social media and blogs. [TUK]*

*All the forms of data that were difficult to process by computers, for certain reasons, but which we are now able to process. [SU]*

The study also found that big data in academic institutions comes from various units which are scattered within the institution. Some of the respondents, 28 (72%), suggested that this data should be brought together and analysed to get insights that can help to improve the institutions. They said that:

*Big data in the academic institutions is often discussed in relation to the scattered data [TUK]*

*Big data is actually like a cloud solution, which makes data more accessible. [TUK]*

*Big data is not about the technology and is not about the data. At a certain point you have a goal and you want information for this goal. Many sources of*

*data are not integrated. What you want is a data environment that integrates these data sources, which allow data sharing to be faster and more flexible. [SU]”*

Views of the respondents in the category of students on big data characteristics are shown in Table 3. The results displayed in Table 3 indicate that most of the respondents, 358 (33%) from TUK and 56 (29.6 %) from SU, handled big data volumes in terms of Gigabytes (GB). The minority, 190 (17.5%) from TUK and 34 (18.0%) SU, dealt with Terabytes in terms of the volume of big data. For characteristics related to velocity, most of the respondents use real-time processors to enable them to gain insights from big data. This was according to 273 (42%) from TUK and 47 (42%) from SU. Most respondents from TUK, 363 (14.8%), dealt with photo, video and audio varieties of big data, while SU dealt with e-mails, 67 (15%). This showed that both the academic institutions and their clientele understand the concept of big data and its characteristics.

| Table 3: Students’ responses on the characteristics of big data |                       |         |                               |         |
|-----------------------------------------------------------------|-----------------------|---------|-------------------------------|---------|
|                                                                 | Strathmore university |         | Technical university of Kenya |         |
|                                                                 | Response<br>s         | Percent | Responses                     | Percent |
| Volume of big data                                              |                       |         |                               |         |
| Kilobytes                                                       | 44                    | 23.3%   | 223                           | 20.6%   |
| Megabytes                                                       | 55                    | 29.1%   | 314                           | 28.9%   |
| Gigabytes                                                       | 56                    | 29.6%   | 358                           | 33.0%   |
| Terabytes                                                       | 34                    | 18.0%   | 190                           | 17.5%   |
| Velocity of big data                                            |                       |         |                               |         |
| Real time                                                       | 47                    | 42%     | 273                           | 42%     |
| Periodic                                                        | 31                    | 28%     | 178                           | 27%     |
| Batch                                                           | 28                    | 25%     | 127                           | 20%     |
| Near real time                                                  | 6                     | 5%      | 71                            | 11%     |
| Variety of big data                                             |                       |         |                               |         |
| Email                                                           | 67                    | 15.40%  | 329                           | 13.40%  |
| Photo, video and audio                                          | 61                    | 14.00%  | 363                           | 14.80%  |
| Social media data                                               | 55                    | 12.60%  | 362                           | 14.80%  |
| Ms. Office data                                                 | 54                    | 12.40%  | 333                           | 13.60%  |
| Cell phone data                                                 | 53                    | 12.20%  | 327                           | 13.30%  |
| Financial data                                                  | 44                    | 10.10%  | 96                            | 3.90%   |
| Website content                                                 | 40                    | 9.20%   | 173                           | 7.10%   |
| Blogs                                                           | 32                    | 7.40%   | 219                           | 8.90%   |
| Gaming related data                                             | 18                    | 4.10%   | 86                            | 3.50%   |
| Web logs data                                                   | 6                     | 1.40%   | 82                            | 3.30%   |

|                   |   |       |    |       |
|-------------------|---|-------|----|-------|
| Click stream data | 3 | 0.70% | 39 | 1.60% |
| Sensors data(GIS) | 2 | 0.50% | 43 | 1.80% |

## Discussion of the findings

The objective of the study was to identify the characteristics of big data produced by TUK and SU. The main goal was to determine whether the institutions generated the “3Vs” of big data. The results of the study indicate that the two institutions generate big data in terms of volume, variety and velocity. These findings support the views of Laney (2012) that the 3Vs are the most common characteristics of big data that organisations generate. A number of scholars (Russom, 2011; Kwon & Sim, 2013; Sagioglu & Sinanc, 2013) also concur with Laney (2012) that big data is characterised in terms of volume, velocity and variety. The results are similar to the findings of Daniel (2015) who also observed that big data in academic institutions is perceived in terms of volume, velocity and variety.

The most commonly produced volume of big data was GB (TUK 33% and SU 29.6%) and least was TB (TUK 17.5% and SU 18%). This is because they are producing data from similar clients such as students as well as teaching and non-teaching staff. The volume of big data can differ from institution to institution based on the activities and the number of clients they serve on a day-to-day basis. Thus, some institutions can generate gigabytes of data while others generate terabytes (Jakub, 2015). The findings further indicated that TUK and SU did not have major differences in the volume of big data they generate. This can be attributed to the fact that they have clients with similar characteristics. Smolan (2013) asserts that as the amount of big data rises day-by-day, it is expected that the institutions concerned begin to face challenges associated with managing and getting meaning from the data, hence the need to undertake big data analytics.

The study found that TUK and SU produce various forms of big data. The varieties include data generated from e-mail, photos, videos and audio, social media, MS Office applications, cell phones, financial transactions, website content, blogs, gaming and related applications, web logs, click stream, and GIS utilities. The most generated formats of big data from TUK are photos, video, audio and social media data 363 (14.8%) while SU mainly generate e-mail-based data 67(15.4%). Photos,

videos, audio and social media data are examples of unstructured big data. According to IBM (2017), 80% of the data organisations currently generate are unstructured and consist of diverse formats such as text, video, audio, diagrams, images and combinations of any two or more formats. The results of the study also concur with Basu (2013) who observed that most organisations today run on unstructured data. Similarly, these results compare favourably with Shacklock (2016) who averred that academic institutions generate data of different varieties coming from students and staff log-in, research and day-to-day processes.

In terms of velocity, the study found that the two universities process big data using real-time, periodic, batch and near-time approaches. Real-time processing for big data was preferably used by 42% of the respondents because they wanted to get meaning from the data as fast as possible. Real-time processing technology captures, processes, and responds to big data as the events generating that data are happening in the real world. It deals with a continuous stream of inputs and has strict deadlines for completing the tasks. The approach of processing of big data in real-time is termed as a best practice because it enables immediate retrieval and use of data (Ounacer, Talhaoui, Ardchir, Daif & Azouazi, 2017). The approach enables institutions to keep abreast with data generation speeds and to respond to the needs of their clientele (Borkar, Carey & Li, 2012). The results were also in agreement with Frizzo-Barker *et al.* (2016) who asserted that to get meaning from big data, real-time data processing is the best processing technique. Porche *et al.* (2014) also argue that there is need for the clientele to be able to retrieve data they require as fast as possible. Davenport and Harris (2007) were of the view that the speed at which data is created and retrieved is important because speed of data creation and retrieval helps an organisation to get meaning from the data promptly. The respondents indicated that real-time approach of big data processing enables the institutions to take immediate action when responding to events, issues or scenarios. The short response time span and access to up-to-date information gives the institutions the ability to gain insight from the updated data to detect patterns of either opportunities or threats to their operations in a timely manner.

## Conclusion

The study concludes that the two institutions generate big data in terms of the 3Vs (volume, variety and velocity). This is an indication that both institutions and their clientele understand the concept of big data and its characteristics.

## Recommendation

Both TUK and SU produce large volumes of big data as indicated by the results of the study. These volumes come from students' information, including the enrolment, academic and disciplinary records and also from staff and research. The academic institutions should leverage on these big data through big data analytics to improve the life of students in their institutions. The universities can address student needs with customised modules, assignments, feedback and learning trees in the curriculum that will promote better and richer learning.

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# **Applying DeLone and McLean information systems success model in the evaluation of e-government initiatives: a literature review**

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## **Abstract**

*This paper is a review of existing literature on the use of DeLone and McLean's (1992, 2003) information systems success model in evaluating e-government initiatives. Electronic governments' practices are universally acknowledged to aid service delivery to the citizens. The e-government evaluation is considered important because of the enormous investment by governments to deliver effective services. E-government evaluation is complex both in theory and practice and the debate amongst researchers is not only in the evaluation complexity but also about the most appropriate approach to use. The DeLone and McLean information systems success model is one of the most widely used for measuring information systems' success. Many studies have utilised this model to evaluate the success of information systems over the years. This paper confirms that the model has been applied in various IS domains, but in e-government evaluation the usage is low; e-government is seen as being at a cross-roads between various research domains such as computer science and information systems. The analysis established that even when the model is applied in e-government, some of the dimensions are selected and combined with others closely related to the study.*

**Keywords:** DeLone and McLean Model, e-government success evaluation, e-government; information systems success

## **1. Introduction**

Governments across the world have embraced the implementation of electronic government systems with the aim of realising many benefits, for themselves as providers of public services as well as for the citizens who are the users of the



services (Weerakkody, Irani, Lee, Hindi, & Osman, 2016). E-government is commonly defined as the use of information and communication technologies (ICTs) by the government, to deliver services and information to the citizens, the business community and all other branches of government (Nam, 2014).

E-government initiatives have become effective tools for governance reforms in confronting public service-related challenges. This has resulted in an increase in transparency, reduction in corruption, improved efficiency, reduction in administrative cost, and overall better quality of life for citizens (Ali, Hoque, & Alam, 2018). Deng, Karunasena, & Xu, (2018) observed that the rapid development of e-Governments projects all over the world has created an urgent need for continuous evaluation. In addition, e-government initiatives consume a significant amount of public funds hence concerned government agencies should be able to justify some form of return on investment.

It is therefore essential that such major government initiatives undergo post-implementation assessment. Shan, Wang, Wang, Hao, & Hua (2011:174) assert that, based on the outcome of the results; government could take necessary and relevant action. This kind of evaluation can assist government agencies to establish whether or not they are performing the required tasks and delivering effective and efficient services to meet the citizens' expectation.

The evaluation of an information system's success is considered an important aspect of the information system field both in practice and research. E-government project evaluation helps to identify the strengths, weaknesses and best practices for both local and international integration. However, the approaches used for the evaluation have changed over the years, as context, purpose and IT impact evolve (Delone & Mclean, 2016). Although various information success models have been applied in different contexts, in the area of e-government insufficient research has been carried out to identify the success of e-government measures from citizens' perspectives.

Belanger & Carter (2012) analysed 30 e-government peer reviewed journals, and only two used citizen- based data, confirming that the impact of e-government on the citizens has not been well researched. From the e-government research available, little is known about the impact and result of e-government projects or their capacity

to bring about real changes in organisation that would improve public service delivery. Luna-Reyes *et al.*, (2012) acknowledge that efforts have been made to evaluate different dimensions of electronic government systems. Most of the areas covered have focused on the impact of e-government on employees (Gable, Sedera, & Chan, 2008; Scott, H., & Golden, 2009 ; Stefanovic, Marjanovic, Delic, Culibrk, & Lalic, 2016) on government-to-citizen systems (Wang & Liao, 2008), and e-government websites (Teo, Srivastava & Jiang, 2008; Huang & Benyoucef, 2014; Verkijika & De Wet, 2018)

Scott, Delone, & Golden (2016) point out that more research needs to be done to ascertain the impact and results of e-government projects. The e-government success measurements are not well understood by the research communities as well as by practitioners. More research focusing on the holistic approach of examining e-government initiatives from the citizens' perspective, as the users of the system, needs to be carried out.

Rana, Dwivedi, Williams & Lal, (2015:42) acknowledge that DeLone and McLean's IS model has gained much attention among researchers, but point out that not much research has been done on the evaluation of the success of e-government systems, using the IS model. This review provides an understanding of the extent to which DeLone and McLean's information system success model is being utilised in the evaluation of e-government initiatives.

## **2. Purpose**

This literature review seeks to answer the following research questions: (1) what is the extent of the use of DeLone and Mclean's IS success model in e-government evaluation research? (2) Are the six dimensions of DeLone and McLean's IS model being used in e-government evaluation research? (3) What are the challenges of using the D&M Model in evaluating e-government information systems?

## **3. Theoretical background**

The evaluation of information systems (IS) success has been discussed widely in the field of information systems. (Shan *et al.*, 2011:176) point out that the evaluation of e-government projects pinpoints strengths and weaknesses, tracks national progress

and moves toward an inclusive information society. Moreover, the rapid development in e-government has created an urgent need for continuous performance evaluation of e-government projects in the world (Alcaide-muñoz & Bolívar, 2015).

Wang, Wang, Lin & Tsai, (2019) note that research in the field of information systems' (IS) success has been informed by a number of models which include: the original D&M IS success model, which was a comprehensive review of different IS models (Delone & Mclean, 1992); the updated D&M IS success model comprising six dimensions (Delone & Mclean, 2003 ); e-commerce systems' success model adopted from a D&M updated model (Wang, 2008); model of e-government systems success based on the updated D&M model IS success model (Wang & Liao, 2008); modified D&M IS success model introduced educational equality instead of net benefit (Zheng & Liang, 2017); and modified D&M IS success model for the assessment of cloud e-bookcase system (Chiu, Chao, Kao, Pu, & Huang, 2016).

This review is mainly informed by the use of DeLone & McLean's (2003) updated information success model which was introduced by DeLone and McLean in 1992. In their search for information systems' success measures, they found a wide variety of measures in different studies. However, after comprehensively reviewing literature in 180 empirical studies, they grouped the IS success dimensions into six main categories: (1) systems quality (2) information quality (3) use (4) user satisfaction (5) individual impact and (6) organisational impact (Delone & Mclean, 1992). Later, the model received considerable criticism by Seddon (1997). Among other things, the author claimed that the model is confusing because it mixes processes and casual explanations of information systems.

Ten years later, DeLone and McLean published an updated version of the IS success model, which added service quality as a new dimension of measuring IS success, and they merged organisational and individual impacts into a single impact variable called "net benefit" (Stefanovic *et al.*, 2016). The emphasis of the DeLone & McLean, (2003) updated model is on the importance of measuring the success of information systems. The model comprises six dimensions of success. Ondego & Moturi ( 2016) state that the model can be used to show a causal relationship: how ICT project implementation affects IS quality, and in turn affects the perceived benefits.

Stefanovic *et al.* (2016:19) point out that the D&M model is the most widely used model in evaluating IS success, and that it has been used to measure the success of various information systems. The model has been used in the assessment of e-government projects, as e-government systems are considered to be an aspect of information systems. Within the e-government context, citizens use web-based applications to search for government information, and to conduct transactions. This web-based application is an information system phenomenon that is best evaluated using the IS success model. According to DeLone & McLean's (2003) model, there are six attributes of successful information systems, which are multidimensional and closely interrelated, as illustrated in Figure 1 below:

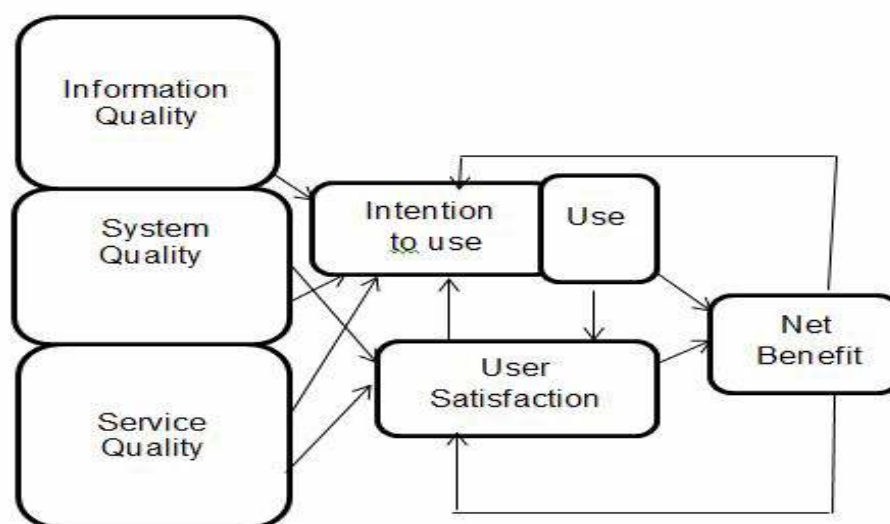


Figure 1: DeLone and McLean (2003:24)

System quality in an e-government system is about the performance of the system in terms of its ease of use and learning integration. System quality is a key determining factor of e-government system use (Teo *et al.*, 2008): how flexible and reliable the e-government system is to the users; and how friendly and usable the system is in terms of accessing government information (Wang & Liao, 2008). In an e-government setup, system quality symbolises the perceptions of citizens on the technical performance of the information system, in terms of information retrieval and delivery.

Information quality is defined as the quality of e-government output, and it is associated with the routine requirements of the user (Petter, DeLone, & Mclean,

2013). Increased information quality has an impact on the level of openness and transparency citizens have with the government (Grimsley, Meehan & Tan, 2007). The desirable factors that are associated with quality in an e-government system are: continuous access to government information and services, provision of accurate, relevant and updated information, and the provision of efficient and effective services to the citizens (Ondego & Moturi, 2016).

Service quality can be described as the overall support the users of an e-government system receive from the service provider (DeLone & McLean, 2003). This construct measures the general perspective of e-government systems, from the perspective of how ready the staff is to provide the required service, and examines the accessibility of the system, as well as the safety of transactions undertaken. The availability of the system to users, provision of individualised attention by the IT personnel and the specific needs of users are evaluated under this construct (Stefanovic *et al.*, 2016). The focus of this construct is to measure how well the e-government services are delivered, and whether or not they match the expectations of the users.

The intention to use/use is the degree to which customers and staff use the capabilities of an e-government system. Petter, Delone, & Mclean, (2008) assert that the use and intention to use construct can be used alternatively, depending on whether the context of usage is voluntary or mandatory. For the e-government system, use is more relevant since citizens' utilisation of the system is voluntary. The "use" construct evaluates the attitude to, and the general satisfaction of, users with the e-government system.

User satisfaction is the means of measuring customer's opinion of the information system; it should capture the entire customer experience, in terms of the reports produced and the support services provided to the users (DeLone & McLean, 2003).

Net benefit can be described as the extent to which e-government information systems contribute to the success of clients and organisations using the system such as greater efficiency, improved decision-making, and improved productivity (DeLone & McLean, 2003).

## **DeLone and McLean (2003) model as more widely used information systems success model**

The revised DeLone and McLean IS success model has been used for various aspects of information systems success, and it is considered widely used in the evaluation of IS success (Khayun, Ractham, & Firpo, 2012; Stefanovic *et al.*, 2016). E-government is considered to be an aspect of an information system and the D&M Model can be applied to assess its effectiveness. The key primary purpose with which the two scholars, DeLone and McLean, came up with the model was to synthesise the previous information systems research into more coherent knowledge, which can be used as a guide for future researchers. Although the model has not been empirically tested, it has guided many researchers in assessing the success of information systems (Khayun *et al.*, 2012) Lowry, Karuga, & Richardson's ( 2007) fifteen-year scientometric analysis of articles from three premier IS journals between 1990 – 2004 indicate that DeLone and Mclean are among the most highly cited authors in the field of information systems. They used the citation analysis to demonstrate the impact of articles on individual authors in the field of information systems.

Hussein, Karim, Mohamed, & Ahlan, (2007:2) opine that DeLone and McLean's model was a major breakthrough in the IS field, as the model has become universal and instrumental in evaluating information systems performance. A number of studies have used the model to evaluate different aspects of the e-government system: Wang & Liao (2008) successfully used the model to study on citizens' perspectives of e-government system. In another study, Teo *et al.* (2008) examined the role of trust in e-government success using 214 Singaporeans e-government website users. In a related study, Connolly, Bannister, & Kearney (2010) evaluated the quality of Irish revenue online e-government system.

According to Schaupp (2010:47), the D&M model is the most predominant in information systems literature, and it is a widely cited framework that providing a comprehensively review the success of IS. It has been cited in over 300 referenced journals as the basis of measuring different valuables in information systems research. The author explains that users make use of an information system and then evaluates it on the basis of either being satisfied, or not, with the outcome. Floropoulos, Spathis, Halvatzis, & Tsipouridou, ( 2010) used the model to measure

the success of Greek e-government taxation information system, from the employees perspectives.

In a similar study, Hsu & Chen (2007) assessed the e-government model in Taiwan, on user behaviour. Chiu *et al.*, (2016:240) explain that evaluating information system' success is difficult, but based on DeLone and McLean's strong foundation and extensive literature review, the model has a concrete definition of success, and the capability to explain the success factors that influence both individual and organisational users of information systems.

Some recent publications on the satisfaction of e-government services (Rana, Dwivedi, Williams, & Lal, 2015; Floropoulos et al., 2010; Formunyuy & De Wet, 2018; Rana, Dwivedi, Williams, & Weerakkody, 2015; Veeramootoo, Nunkoo, & Dwivedi, 2018) have used different approaches of the D&M model to evaluate the success of information systems. Rana, Williams, Dwivedi, & Williams, (2012:42) assert that DeLone and McLean's (1992, 2003) IS success model has been instrumental in establishing the primary factors that influence the use and acceptance of e-government services by citizens.

### **Critiques of D&M model**

The main critic of the Delone & Mclean, (1992) model was Seddon, who claimed that "the inclusion of both variance and process interpretation in the model leads to so many potentially confusing meanings" (Seddon, 1997:240). Another critic observed that the measures of IS effectiveness focus more on the product than the service of IS. The argument was that IS researchers will not determine IS effectiveness if service quality is not included in the assessment package (Pitt, Watson, & Kavan, 1995:173).

DeLone and McLean addressed the criticism by proposing an updated model (DeLone & Mclean, 2003), which grouped all the "impact" measures into "net benefit " and also added another measure "service quality" as a new dimension. Seddon, (1997) further claimed that the use construct in D&M model is a not a success measure, but that of behavior. The argument was that non-users of a system may not indicate that it is not useful, but that potential users are engaged with other tasks.

Other researchers have mentioned the difficulties of applying the D&M model in the area of defining and implementing the IS model in some specific research contexts. Jiang & Klein (1999) claim that users have different preferences of measures, depending on the type of system being evaluated. Despite the criticisms, the D&M model makes important contributions to understanding IS success. It provides a scheme for categorising various IS success measurements that are used in literature, and suggests a model of casual dependencies between the categories (Seddon, 1997).

#### **4. Approach /method**

To conduct this review, Webster & Watson's (2002) approach was used. The approach recommends the following guidelines to be considered when conducting research on systematic literature review, especially in information systems related research; (1) to select and use the right keyword for searching the databases (2) to select the most relevant publications with matching criteria (3) in-depth reading to identify irrelevant publications. The literature search for this study concentrated on the period 1992-2018, the choice of 1992 as the baseline is because that was when the first DeLone and McLean (D&M) model appeared. To retrieve relevant updated literature for this review, EBSCO Discovery Service and SCOPUS databases were used. A number of search strings were used to conduct the searches and these include: D&M IS success model, e-government success evaluation and information systems success.

A ten-year analysis of D&M Model application was conducted by carrying out a search on two online databases. The focus of this analysis is to explore the application of the model in e-government research. The literature selection process is presented in Figure 2 (below).



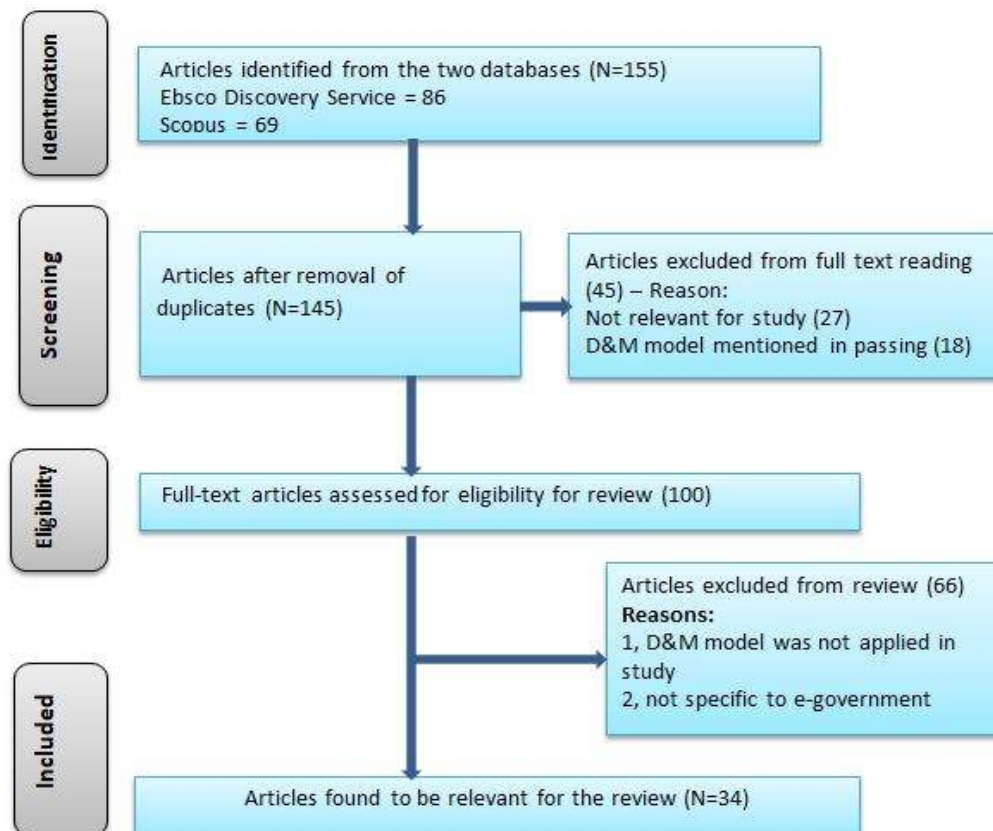


Figure 2: Flow chart of the literature selection process  
(Sampson *et al.* 2009:948)

**Step one:** The search was carried out using these two reliable and reputable online journal databases. The databases are updated daily, have diverse field coverage and contain peer reviewed articles. The two databases allows the use of delimiters to refine the search .The databases of choice for the literature analysis are

1. Ebsco Host Discovery (<https://ebSCO.com>)
2. Scopus (<http://www.scopus.com>)

**Step two:** The study was restricted to articles published from 2009 to 2019

**Step three:** To extract the articles, the study search included only open access articles published in English language, that are peer reviewed and full text between 2009 and 2019. The advanced search strategy was performed on the databases using the Boolean operators, ‘AND’ and ‘OR’ to filter the search. To be included for review, both DeLeon & McLean model or IS success AND e-government must feature in the title, keywords by author or in the abstract. Some of the articles were irrelevant

and were further filtered. A summary of the inclusion and exclusion criteria is presented below in Table 1.

| Table 1 Inclusion and exclusion criteria                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Inclusion criteria:</li> <li>• Open access articles about DeLone &amp; McLean model</li> <li>• Articles about information systems model</li> <li>• Articles written in English</li> <li>• E-government articles that applied D&amp;M IS success model in the study</li> <li>• Articles that can answer the research question</li> <li>• Articles published from 2009 - 2019</li> </ul> | <ul style="list-style-type: none"> <li>• Exclusion criteria:</li> <li>• Duplicate articles</li> <li>• Articles that are not written in English</li> <li>• Articles that are not full text</li> <li>• Articles that are not dealing with e-government</li> <li>• Articles that did not apply D&amp;M IS success model in the study</li> <li>• Unpublished articles</li> </ul> |

Step four: The remaining full text articles were then analysed to determine whether they met the stipulated criteria. Articles that met these criteria were the ones included for review in the study. Data extraction

Table 2 below presents the result of data extracted from the two databases.

| Table 2 Number of studies in the two selected sources |                       |                        |
|-------------------------------------------------------|-----------------------|------------------------|
| Source                                                | Direct search results | Selected for the study |
| Ebsco Host Discovery                                  | 86                    | 23                     |
| Scopus                                                | 69                    | 11                     |

For the eligibility, all extracted data was screened as presented in Table 3.

| Table 3 Screening of extracted data |                 |                   |
|-------------------------------------|-----------------|-------------------|
|                                     | Screening label | Number of studies |

|   |                                              |     |
|---|----------------------------------------------|-----|
| A | Directly eligible articles                   | 34  |
| B | Model discussed but not applied in the study | 66  |
| C | Mentioned in passing                         | 18  |
| D | Not relevant                                 | 27  |
| E | Duplicate                                    | 10  |
|   | TOTAL                                        | 155 |

## 5. Findings and discussions

The analysis findings are presented according to the three research questions the study sought to answer.

### 5.1 What is the extent of use of DeLone and Mclean IS success model in e-government evaluation- research?

The study findings as indicated in Figure 2 show that of 100 articles eligible for the study, 66 were excluded because they were not related to e-government evaluation. This analysis shows that the model has not been applied in e-government like in other areas dealing with IS. The analysis also shows the highest number of the articles (16) that discuss various aspects of D&M model application in e-government originated from Asia; followed by Europe, then North America. The least are from Africa.

This is not surprising, because according to the 2018 e-government survey (United Nations, 2018) Asia has a noticeable improvement in e-government development, 37 out of 47 countries in Asia scored above the world average e-Government Development Index (EGDI). In the same report, countries in the African regional's average EGDI scores were significantly lower than the world average. Africa is making progress, but can learn from the countries with high EGDI. The highest number of the papers reviewed, dealt with the subject of e-government preformation and user satisfaction, which are key indicators of an e-government system success as presented in Table 6.

| Table 6 Geographical & subject distribution of articles of study |        |      |        |               |        |
|------------------------------------------------------------------|--------|------|--------|---------------|--------|
| Subject                                                          | Africa | Asia | Europe | North America | Totals |
| E- Filing                                                        |        | 1    |        |               | 1      |
| E-government systems Adoption                                    |        |      |        | 2             | 2      |

|                                          |   |    |    |   |    |
|------------------------------------------|---|----|----|---|----|
| E-government performance / satisfaction  | 2 | 6  | 4  | 1 | 13 |
| Transparency in government               |   | 2  | 1  |   | 3  |
| Online public grievance redressal system |   | 2  |    |   | 2  |
| Internet in public administration        |   | 2  | 2  |   | 4  |
| Website evaluation                       | 1 | 1  | 2  | 1 | 5  |
| Information storage & retrieval system   |   | 2  | 2  |   | 4  |
| Totals for each region                   | 3 | 16 | 11 | 4 | 34 |

## 5.2 Are the six dimensions of DeLone and McLean IS model being used in e-government research?

The results of the analysis reveal that the six dimensions of the model were not applied in the studies reviewed as presented by DeLone and McLean. Studies which used all the dimensions of the model had to make some modification to suit the IS being evaluated. Information quality, service quality and user satisfaction constructs were highly used in the reviewed articles.

The results of this review show that most e-government evaluation studies in Africa use some of the dimensions of D&M model and add others that complement the IS being assessed. Both the Ebsco Discovery Service and Scopus review results showed that no study had adopted the D&M model for e-government performance evaluation in Kenya.

## 5.3 What are the challenges of using D&M Model in evaluating e-government information system?

The evaluation of e-government initiatives like all other information systems has proven to be important and complex, both in theory and practice. The complexity arises because of the many perspectives involved; the difficulties in identifying and quantifying benefits; not being familiar with evaluation techniques; and the difficulties in the interpretation of results from the data collected (Grimsley & Meehan, 2007; Alshawi & Alalwany, 2009 ; Shan *et al.* 2011)

In the e-government context, determining stakeholders is complex because of the diversity (government officials, elected representatives, public and private organisations). This requires the researcher to be clear on who the stakeholders for the study are. The context of measuring net benefit needs to be clear for each study. Confusion arises as to what constitutes net benefit, whether it should be looked at

from the individual perspective, the government or that of business community or citizens. Different stakeholders may have varying opinions on what constitutes net benefit to them.

Table 4 presents the key findings for each article extracted from Ebsco Host Discovery.

**Compendium of D & M Model application in e-government as reflected  
by Ebsco discovery service (2009-2019)**

| Table 4: Key findings from the reviewed Ebsco Discovery articles |                                                    |      |                                                                                                                                           |                                                                                                                                                                                                                                                                 |
|------------------------------------------------------------------|----------------------------------------------------|------|-------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| S/<br>N                                                          | Author                                             | Year | Title of publication                                                                                                                      | Focus of publication                                                                                                                                                                                                                                            |
| 1.                                                               | Akram,<br>Malik,<br>Shareef,&<br>Goraya,<br>Shakir | 2019 | Exploring the interrelationships between technology predictors and behavioral mediators in online tax filling: the role of perceived risk | The study investigates the relationship between technology and behaviour mediators in explaining users' continuance intention for using online tax filing. D&M model construct information, systems & service quality were used in evaluating the e-tax system. |
| 2                                                                | Chen, Hu,<br>Tseng,<br>Juang, &<br>Chang,          | 2019 | Cross-boundary e-government system: determinants of performance                                                                           | Focus is on the cross-boundary e-government system studies in order to develop a framework for key performance measures (efficiency, effectiveness and accountability) using some of D&M model constructs                                                       |
| 3                                                                | Veeramootoo <i>et al.</i>                          | 2018 | What determines success of an e-government Service? Validation of an integrative model of e-filing continuance usage                      | Study validated continuous usage of the integrated e-filing model, which has its basis in D&M Information system Success Model                                                                                                                                  |
| 4                                                                | Zaidi,<br>Muneerah, &<br>Aminah                    | 2018 | Relationship between service quality and e-government acceptance: the role of gender as a moderator                                       | The paper investigates the factors that contribute to continued use of e-government in Malaysia. Findings show that quality of service a construct of D&M model is important in the uptake of e-government services                                             |
| 5                                                                | Hasan <i>et al.</i>                                | 2018 | A proposed conceptual success model of citizen-                                                                                           | Aim of the study was to find e-government system success, using theoretical approach. Information and service quality D&M success model                                                                                                                         |

|    |                                       |      |                                                                                                                                                      |                                                                                                                                                                                                                                                                       |
|----|---------------------------------------|------|------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    |                                       |      | centric digital government in Malaysia                                                                                                               | constructs were used to measure the overall quality of the government system                                                                                                                                                                                          |
| 6  | Suh, Chung, & Choi                    | 2017 | An empirical analysis of a maturity model to assess information system success: a firm-level perspective                                             | Particular focus of the study is on factors that influence citizens' trust in e-government adoption. It's a review of six databases, from the findings, a conceptual framework is proposed by developing D&M model further, and adds trust as an additional construct |
| 7  | Alzahrani, Al-karaghoul, & Weerakkody | 2017 | Analysing the critical factors influencing trust in e-government adoption from citizens' perspective: a systematic review and a conceptual framework | Provides a critical and systematic review on factors that influence citizens' trust in the adoption of e-government. Based on the review, a conceptual framework was proposed, using the D&M model constructs                                                         |
| 8  | Weerakkody <i>et al.</i>              | 2016 | Are U.K citizens satisfied with e-government services? Identifying and testing antecedents of satisfaction                                           | Focus of the study is on UK citizens' satisfaction with the e-government services by examining the impact of information quality, systems quality & trust using D&M model to establish user satisfaction with the services.                                           |
| 9  | Sharma & Jayasimha                    | 2016 | Assessment of e-government services quality: an emerging market perspective                                                                          | A review of existing models of e-government, including D&M model on service quality and service delivery were used. From the findings, a new conceptual model for measuring service quality of e-government is proposed.                                              |
| 10 | Stefanovic <i>et al.</i>              | 2016 | Assessing the success of e-government systems: an employee perspective                                                                               | Examines IS success of e-government system from employees' perspectives. The results confirm the validity of D&M model in the context of e-government employees                                                                                                       |

|    |                                |      |                                                                                                             |                                                                                                                                                                                                                                                           |
|----|--------------------------------|------|-------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11 | Rehman, Kamal, & Esichaikul    | 2016 | Adoption of e-government services in Pakistan: a comparative study between online and offline users         | Study investigates the critical factors that influence citizens' intention to use e-government services at the information and transaction level. D&M model construct was utilized in the study.                                                          |
| 12 | Agrifoglio, Metallo, & Lepore  | 2016 | Success factors for using case management system in Italian courts                                          | Focuses on understanding the effectiveness of e-court application system. Study applied the D&M model constructs of information & service quality to establish the systems effectiveness to court users                                                   |
| 13 | Mellouli, Bentahar, & Bidan    | 2016 | Trust and e-government acceptance: the case of Tunisian online tax filing                                   | The paper identifies trust as a determinant of intention to use the online tax filing system by combining construct of both TAM and D&M model                                                                                                             |
| 14 | Rana, Dwivedi, Williams, & Lal | 2015 | Examining the success of the online public grievance redressal system: an extension of the IS success model | The study examines the success of the online public grievance redressal system, from the citizens' perspectives, using information, system quality and user satisfaction D&M model constructs in order to improve on transparency and minimise corruption |
| 15 | Fan & Yang                     | 2015 | Study on e-government services quality: the integration of online and offline services                      | Focus is on establishing the key factors affecting the perceptions of users on the quality of e-government services, using three D&M model construct information, system and service quality.                                                             |
| 16 | Ritchi, Wahyudi, & Susanto     | 2015 | Research program on key success factors of e-government and their impact on accounting information quality  | Multi-years research on 27 municipalities to measure the implication of e-government on the accounting information quality using the theoretical foundations of D&M IS success model and TAM                                                              |
| 17 | Rana, Dwivedi,                 | 2015 | Investigating success of an e-government initiative:                                                        | The paper focuses on measuring the intention of use and user satisfaction of                                                                                                                                                                              |



|    |                                       |      |                                                                                                       |                                                                                                                                                                                                                                                                                                                  |
|----|---------------------------------------|------|-------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | Williams, & Weerakkody                |      | validation of an integrated IS success model                                                          | system, from Indian citizens' perspectives, using D&M IS success model to ascertain the success.                                                                                                                                                                                                                 |
| 18 | Dwivedi, Wastell, Laumer, & Henriksen | 2015 | Research on information systems failure and successes; status update and failure                      | The focus of the study was to bring out the need for new perspective and to provide insights on the factors that enable IS success, as well as the factors to consider, in order to avoid IS failure.                                                                                                            |
| 19 | Venkatesh, Hoehle, & Aljafari         | 2014 | A usability evaluation of Obamacare website                                                           | Investigates the usability and satisfaction of US citizens with the Obamacare website. The approach used has its theoretical basis on D&M model, especially on the quality of information received by citizens                                                                                                   |
| 20 | Jukic, Vintar, & Bencina              | 2013 | Ex-ante evaluation: towards an assessment model of its impact on the success of e-government projects | The research tries to fill the gap between the theoretical and empirical approach on issues of ex-ante e-government evaluation using some of D&M success constructs; service quality, use & user satisfaction. Results prove that the ex-ante evaluation of e-government projects has impact on project success. |
| 21 | Alawneh, Al-refai, & Batiha           | 2013 | Measuring user satisfaction from e-government services: lessons from Jordan                           | A review to identify key factors which determine the satisfaction of citizens with Jordan's e-government service portals. Information and service quality D&M model constructs were considered for the review.                                                                                                   |
| 22 | Rana <i>et al.</i>                    | 2012 | Theories and theoretical models for examining the adoption of e-government services                   | The study systematically explores existing body of literature in e-government. The use of D&M model analysis indicated that system quality was not used to measure intention of use                                                                                                                              |

|    |                  |      |                                                                                                    |                                                                                                                                                                                                                                |
|----|------------------|------|----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 23 | Kaisara & Pather | 2011 | The e-government evaluation challenge: a South African Batho Pele-aligned service quality approach | The paper focuses on evaluating e-government service quality in South Africa e-government websites. Information quality, a D&M dimension, has been used to evaluate the quality of information being accessed by the citizens. |
|----|------------------|------|----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Compendium of reviewed D & M Model application in e-government as reflected by Scopus (2009-2019)**

| Table 5: Key findings from the reviewed Scopus articles |                                      |      |                                                                                                                                                         |                                                                                                                                                                                                                                                                           |
|---------------------------------------------------------|--------------------------------------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| S/<br>N                                                 | Author                               | Year | Title of Publication                                                                                                                                    | Focus of Publication                                                                                                                                                                                                                                                      |
| 1                                                       | Tegethoff, Santa, Granobles, & Hoyos | 2019 | Does trust have impact on system and operational effectiveness? The implementation of e-government in Colombia                                          | The focus is on investigating trust in e-government system after implementation. Three D&M model construct: information, system and service quality were used in the evaluation. From the findings, system and service quality had no impact on operational effectiveness |
| 2                                                       | Santa, Macdonald, & Ferrer           | 2019 | The role of trust in e-government effectiveness, operational effectiveness and user satisfaction: lesson from Saudi Arabia in e-government to business. | Explores the effect of trust on online e-government system satisfaction by the users. Information, systems and service quality of the D&M IS success model measures were considered as key drivers of user satisfaction                                                   |
| 3                                                       | Idoughi & Abdelhakim                 | 2018 | Developing countries e-government services evaluation identifying and testing antecedents of satisfaction case of Algeria                               | The impact of systems, information and service quality D&M model constructs were considered key factors in establishing users' satisfaction with the e-government system in Algeria.                                                                                      |

|   |                                                |      |                                                                                                                                                                                  |                                                                                                                                                                                                                                                     |
|---|------------------------------------------------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   | Idoughi & Abdelhakim                           |      | antecedents of satisfaction case of Algeria                                                                                                                                      | in establishing users' satisfaction with the e-government system in Algeria.                                                                                                                                                                        |
| 4 | Wirtz & Kurtz                                  | 2018 | Local e-government service: quality aspects and citizens usage preferences.                                                                                                      | Investigates the role trust plays between operational and system effectiveness. D&M constructs: information systems and service quality, were applied in the study and the quality of information was the most significance.                        |
| 5 | Mirchandani, Kathawala, Jr, Hayes, & Chawla    | 2018 | A comparison of perspectives of Kuwait and Indonesian residents towards e-government.                                                                                            | The study focused on assessing the importance of e-government services and the website features, using residents of both countries. D&M IS success measures were used and the results showed that residents' feedback on the website was important. |
| 6 | Aminah <i>et al.</i>                           | 2018 | E-procurement system success factors and their impact on transparency perceptions: perspectives from supplier side                                                               | Study focus analyses the determinants of e-procurement systems' success and the impact on expected transparency from the suppliers. D&M model constructs system and service quality, and user satisfaction, were considered for the study           |
| 7 | Widiyanto, Sandhyaduhiti, Hidayanto, & Munajat | 2016 | Exploring information quality dimensions of e-government agency's information services through social media: a case study of the ministry of Education and culture in Indonesia. | Aim of the study is to investigate the dimension of information quality that affect user satisfaction with government services. Information quality was found to be a determinant of IS success                                                     |
| 8 | Rana, Dwivedi, & Williams                      | 2013 | Evaluating the validity of IS success models for electronic government research: an                                                                                              | Focus is to compare and evaluate the validity of information systems' success models, using both D&M and Sheldon's 1997 model, on Online                                                                                                            |

|    |                             |      |                                                                                                                                   |                                                                                                                                                                                                                      |
|----|-----------------------------|------|-----------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    |                             |      | empirical test and integrated model                                                                                               | Public Grievance Redressal System. Four constructs of D&M model were used for the study.                                                                                                                             |
| 9  | Chen & Zhang                | 2012 | Citizen-centric e-government performance satisfaction with e-information                                                          | Aim is to develop a citizen-centric e-government performance measurement scheme, using some of the D&M model constructs of information and service quality                                                           |
| 10 | Luna-Reyes <i>et al.</i>    | 2012 | Towards a multidimensional model for evaluating electronic government: proposing a more comprehensive and integrative perspective | The article analyses the current state of how e-government is evaluated. Information systems success (Wang model) construct was included in the evaluation. It has its theoretical foundation from the D&M IS model. |
| 11 | Helbig, Gil-garcía, & Ferro | 2009 | Understanding the complexity of electronic government implication form the digital divide life.                                   | The paper focuses on the parallels and connections between e-government and digital divide in relation to understanding e-government projects                                                                        |

## Conclusion

It is evident that none of the articles had used all the six dimensions of D&M ISsuccess model. In some studies, the D&M constructs were replaced, or added, with other dimensions from other models that are closely related to the IS under evaluation. The findings showed Asia leading in the application of D&M Model in e-government research, while Africa showed the least utilisation of the model. The analysis review shows the highest number of papers dealt with the subject of e-government performance and user satisfaction.

DeLone & Mclean (1992) suggest that the success of information systems evaluation requires the performance of all the six D&M model dimensions. From this study, it appeared that most of the e-government evaluation research works have not adhered to this suggestion; as most of them used few of the D&M dimensions and added their own, closely related dimensions to their studies. The review show that two of D&M

model constructs highly used in the e-government evaluations were information quality (15 articles ;44%) and Service quality (13 articles; 38%).

From the review, 100 articles (64.5%) used D&M model for IS evaluation in various fields, while only 34% of the articles were in e-government, and made use of the dimensions of D&M model for IS evaluation. This corroborated the submission that D&M is a widely used model in evaluating IS success (Stefanovic *et al.*, 2016) though in e-government the utilisation is still very low. The study analysis shows that information systems, service quality and user satisfaction construct of D & M model were highly utilised in e-government research and not the complete set of the six constructs. This implies that there is partial application of the six dimensions of D&M model in e-government IS success research. According to Delone & Mclean, (1992) information systems success evaluation is multidimensional and requires the performance of all the six construct of D&M model. The results of such an evaluation would provide the policy makers with comprehensive review that would enhance e-government service delivery to the citizens.

This study limits the search to only two databases; it is suggested that future studies consider a more comprehensive review by using more databases. Also, there is a need for more empirical studies on the application of D&M IS success model in e-government research in Africa.

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# **An appraisal of nursing informatics research and the influence of the unified theory of acceptance and use of technology**

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## **Abstract**

*The study recognises the importance of healthcare informatics in today's dynamic health systems, and indicates how nursing informatics, a component of healthcare informatics, can provide efficient and effective healthcare delivery. Hence, underpinned by the unified theory of acceptance and use of technology (UTAUT), the study aimed at situating research activities on nursing informatics within existing studies that have applied the theory to investigate healthcare informatics in general. The study adopted a systematic review of literature to explore online databases: Google Scholar and Ebscohost from 2014 to 2019. The search returned a total of 205 articles for the specified period. However, only eight eligible studies were found to be related specifically to nursing informatics. The study also revealed that performance expectancy and effort expectancy (respectively), both being constructs of the UTAUT, are the dominating factors influencing the acceptance/adoption/use of nursing informatics among the papers under review. The study recommends that researchers should further explore the use of nursing informatics technologies in healthcare. In addition; nursing informatics system designers should factor in the effectiveness and ease of use of the technologies for easy usage. On the other hand, the stakeholders in the medical field are called upon to provide the enabling infrastructure to enhance the use of nursing informatics technologies.*

**Keywords:** UTAUT, nursing informatics technologies, performance expectancy, effort expectancy, social influence, facilitating condition

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## Introduction

Though technology has been a major part of our lives, it is only recently that the medical field became influenced by the speedy pace of technological innovation in the digital age. Hence, advances in medical technology are changing the practice of medicine, leading to more specific specialised care and access to more real-time information and specific data (Topol, 2012). According to the author, heartbeats can be remotely monitored with the use of technology. With the rapid development of new technologies, health information systems (HIS) are required to keep up with current trends, and this has led to the recognition of health informatics, which in the view of Hersh (2009), is more comprehensive than HIS. There is no single universal definition for the concept of health informatics. For instance Fenton & Biedermann (2014) describe health informatics as a study within the field of information science that deals with the application computer technologies and management of all related health data and information; while according to Dinya and Tóth (2013) it is a meeting point of information science, computer science and health care, and it comprises nursing, medical and biomedical informatics, among others.

Health informatics plays a major role in the health care system, creates and maintains a culture of safety and reduced medication and prevents treatment errors. Health informatics tools include procedures and strategies undertaken by clinicians, prescribed medical terms, computerisation, communication of information systems, which can be applied to nursing care, dispensary, dentistry, professional therapy, community health, medical care, medical research, other medicine, and physiological therapy. Selected innovations in health informatics include: health information exchange (HIE) systems; electronic health/medical records (EHRs); digital blood pressure; Computerised physician order entry (CPOE); computerised decision support system; diagnosis image archiving (Owolabi, Mhlongo & Evans, 2016). While studies in healthcare informatics are gaining a wider audience, studies specifically targeting nursing informatics, a subsect of healthcare informatics, are not as readily available (Hersh 2009). Hence, Owolabi, Mhlongo & Evans (2016) recommended that more studies on other types of health informatics such as nursing informatics should be explored. The present study is a step in the response to this call.

The American Nurses Association (ANA, 2008), defines nursing informatics (NI) as a field that combines the application of information science and nursing science, computer science, to manage information and communicate data, and knowledge in nursing practice. NI supports patients, nurses and other providers in their decision-making through facilitation and integration of data, information and knowledge in all roles and settings. NI cuts across all areas of nursing care, which comprises medical practice, management, training, and research. Career Gut (2013) identifies NI technologies as tools specifically used for nursing practice and clinical information systems. These include staff reminder work lists, planned nursing interventions, computerised generated client documentation, vital signs monitoring devices, electronic medical records, computer automatic billing documentation. ii) Nursing Administration- these include automated staff scheduling, communicated e-mail and budgetary system; and iii) Nursing Education- these include e-record-keeping, e-assisted instruction and interactive video technology.

There are various advantages to using nursing informatics tools, which include the efficient discharge of daily routines, improving quality of care, patients' safety, cost cutting and time saving (Kuo, liu and Ma, 2013: 2). Greenwood & Kwiatkowski (2018) attest to the fact that nursing informatics technologies, such as BP monitors, resuscitators, ventilators, and many others, have led to adequate healthcare delivery to patients and the reduction of medical errors. Kuo, liu and Ma (2013:2) assert that the acceptance of NIT can support nurses in achieving their day-to-day care and practices more quickly in an efficient and effective manner.

From the point of view of Fridsma (2018), while many health professionals see the potential that these technologies can bring to improving the quality and cost effectiveness of healthcare, Vollmer (2016) observes that the adoption rate is still very poor in many countries.,e.g. over 60% of the nurses in Germany could not use nursing informatics systems (NIS). This makes it pertinent to ascertain the factors that promote or hinder the use of the technologies (Kim, 2016:2). Different models have been used to capture the factors that influence the acceptance and use of informatics in the healthcare domain. The models are identified in Table 1, from the most recent to the oldest.

| Table 1: Most cited influential theories and models in technologies acceptance research                                        |                   |      |
|--------------------------------------------------------------------------------------------------------------------------------|-------------------|------|
| Model                                                                                                                          | Author            | Year |
| EMRs HIMSS Adoption Model                                                                                                      | Hersh & Wright    | 2008 |
| UTAUT                                                                                                                          | Venkatesh et al   | 2003 |
| TAM2                                                                                                                           | Venkatesh & Davis | 2000 |
| TAM, TPB and the decomposed theory of plan behavior comparison                                                                 | Taylor & Todd     | 1995 |
| Information Systems Success Model (ISSM)                                                                                       | Delone & Mclean   | 1992 |
| Diffusion of innovation theory (2)                                                                                             | Moore & Benbasat  | 1991 |
| Model of the ICT Implementation Process                                                                                        | Cooper & Zmud     | 1990 |
| Diffusion of innovation theory (1)                                                                                             | Rogers            | 1983 |
| TAM and TPB comparison                                                                                                         | Mathieson         | 1975 |
| Source: Author generated from multiple sources (Mellikeche <i>et al.</i> , 2019:4) and (Aljohanil, Davis & Connolly, 2018:598) |                   |      |

In order to understand the acceptance and use of healthcare informatics, especially as it concerns the nursing informatics component, the present research is premised on the UTAUT model (Venkatesh, Morris, Davis & Davis, 2003). The rationale for this is discussed in the next section.

### **Unified theory of acceptance and use of technology (UTAUT)**

Venkatesh *et al.*, (2003) formulated the UTAUT. The model was designed to unify the various models used by researchers to appraise their literature on acceptance and use. The UTAUT model is said to be the most appropriate and relevant model in understanding user intention and adoption of technology (Monilakshmane & Rajeswar 2018: 153-154). Many researchers have adopted and employed the model to explore technology acceptance in different fields of study, especially in healthcare. According to Tan & Ooi, (2018:1619), this is because of its performing power, over the previous eight models, to explain the discrepancy in users' intention to adopt healthcare informatics technologies.

Despite the importance of UTAUT in users' intention to adopt healthcare technologies, the model is not without its limitations. Prior to the present study, as suggested by past scholars, they claim that the UTAUT model is capable of explaining only 0.3% of behavioural intention to use technology in the medical field (Vollmer, *et al.* 2016:122). Kim *et al.* (2016:2) report the internal discrepancies

between the factors of UTAUT and the use of technologies. Tan & Ooi (2018:1619) identifies that UTAUT only considers the behaviour of an individual, which is dependent on the context only, neglecting other behavioural factors such as the psychological perception of an individual's use of technology; the combination of different theories into one single framework is also seen as constraint.

In spite of the criticisms, Venkatesh *et al.* in 2003 created the UTAUT to measure the intention and actual usage by disintegrating and fusing eight, mostly intention-based existing technology adoption theories and models that can provide a succinct model to further understand and improve on the adoption of technology in a professional setting. The combination of the competing models will enable researchers to understand more fully users' intentional behaviour and usage of technologies in any setting such as the hospital (Ooi and Tan, 2016). The competing models include: theory of planned behaviour (TPB) (Eagley & Chaiken, 1993); theory of reasoned action (TRA) (Fishbein & Ajzen, 1975); innovation of diffusion theory (IDT) (Rogers, 2003); social cognitive theory (SCT) (Bandura, 1977); technology acceptance model (TAM) (Davis, 1989); extended technology acceptance model (TAM2) (Taylor & Todd, 1995); model of personal computing utilisation (MPCU) model of PC utilisation (Thompson, Higgins, & Howell, 1991); and the motivation model (MM) (Davis, Bagozzi, & Warshaw, 1992).

The eight theories were empirically tested and validated for six months in four different universities in business and management studies. These are the University of Maryland, University of Virginia, University of Minnesota and University of Arkansas (Owolabi, 2017). The results of the six-month study show that the eight individual models explained 17% to 53% of variance in behavioral user intentions to use technologies, but UTAUT was considered to have better explanatory power than the eight individual models (Williams, Rana, & Dwived, 2015:444). Extant literature supports the application of UTAUT to technology acceptance in major fields of studies, especially in the healthcare industry. Owolabi & Evans (2017:75) argue that UTAUT is the “easiest and simplest theory that is most appropriate and relevant in the prediction of end-user intention and adoption of informatics technology”. In addition, Kim *et al.* (2016: 2) supports the assertion that the combination of different models has given UTAUT a positive scorecard in predicting user intention in any given study

such as nursing informatics. Vollmer *et al.* (2016: 122) added that UTAUT constructs are the best analyses of the acceptance and use of informatics technologies. Hence, this study is supported by the UTAUT theory and considers the four main constructs that determine the behavioural intention and actual utilisation of informatics technologies as: performance expectancy (PE), social influence (SI) and facilitating conditions (FC), as identified by Evans (2013: 56).

### **Performance expectancy (PE):**

PE is related to the acceptance of an individual as to whether using technologies would improve task performance (Venkatesh *et al.*, 2003). In other words, nurses' intention to use informatics technologies tends to change with their perceived benefit satisfaction (Monilakshmane & Rajeswari, 2018: 157).

### **Effort expectancy (EE):**

This refers to friendliness' and ease of use when using a system (Venkatesh *et al.*, 2003). Aljohanil, Davis and Connolly (2018:601) put it this way, "easy of learning, little effort and less time, improving the quality of services by simple words and phrase and providing health web based assistance tools which declare the procedures and instructions for all services".

### **Social influence (SI):**

This refers to "degree to which an individual perceives that important others believe he or she should use the new system" (Venkatesh *et al.* 2012:451). It is measured by the perception of how social communications impact on users' intentions to use technologies and services.

### **Facilitating condition (FC):**

Simply put, facilitating conditions represent the evidence of technical infrastructure and other internal support that are made available to users by top management for up to date activities of the healthcare system (Ifinedo, 2012:2939). Consequently, Hsiao and Chen (2017:9) view FC as resources such as time, budgetary allocation, and human resources provided by health care management to nurses to improve their diagnostics skills.

The present study aims at situating nursing informatics in the existing literature that has used UTAUT, as the framework, to investigate the available literature on nursing



informatics; be it in terms of intention to use, acceptance, adoption or actual use. Hence, the study answers the following research questions: i) What is the level of use of UTAUT in exploring NIT, compared to healthcare informatics in general? ii) What are the predominant factors that determine the intention to use, the acceptance or adoption, or the actual use of NIT?

## **Methodology**

This paper adopted the systematic review of literature, using both Google Scholar (GS) and Ebscohost discovery databases to analyse the number of articles that employed UTAUT to inform their research between 2014 and 2019 in a health informatics study. The reason for using Google Scholar was based on the Scientometrics research analysis by Gusenbauer (2019: 177-214), who currently reported GS as the most comprehensive academic search engine. On the other hand, the Salem Encyclopedia (2018:1-2) describes Ebscohost Discovery Service (EDS) as a current, accurate and relevant subject areas search engine which ranges from science and medicine to literature and history. EDS has numerous and comprehensive collection from a wide range of publisher partnerships, superiorly indexed from top subject indexes, full text, and the all-inclusive library collection, customisable discovery stratum practice. To access the relevant studies that have used UTAUT in health informatics, the author searched using the following keywords: “health informatics” OR “nursing informatics” OR “medical informatics” AND “UTAUT” between 2014 and 2019 to view the extent to which UTAUT has been used in healthcare in the specified period.

The full text review to identify the studies that actually used the original UTAUT to investigate healthcare informatics returned a total of 205 articles (Table 2), but with delimited search to isolate the studies that majored on nursing informatics, 31 articles were found. However, after critically examining the two databases (GS and EBS), eight (8) articles from the relevant selected studies that emanated from Ebscohost Discovery were duplicated in Google Scholar, leaving 22 supposed eligible articles. It should be noted that after the attempt to read through the 22 studies that would have been eligible, 8 studies were excluded because they were not open access journal

articles. This limited the articles to 15 (Table 3), of which only 7 were found to be nursing informatics-specific studies (Table 4).

## Findings

The findings are discussed as follows:

This section presents the findings from the search of databases. Table 3 indicates that only 15 of the 31 eligible articles were found relevant to the subject of interest. And of the 15, only 7 (Table 4) were specifically on nursing informatics.

This answers the first research question of this study, as it shows that the level of use of UTAUT in Nursing Informatics in comparison to other areas of medical informatics is limited.

The section also discusses the findings concerning the predominant factors that influence the adoption or use of NIT, which is the second question that the study aimed to answer. Figure 1 illustrates this finding and reveals that performance expectancy is the most influencing factor, closely followed by effort expectancy.

| Table 2. Health/Medical/Nursing Informatics and UTAUT from 2014-2019 |                       |                   |
|----------------------------------------------------------------------|-----------------------|-------------------|
| Database                                                             | No. of articles found | Relevant articles |
| Google Scholar                                                       | 129                   | 23                |
| Ebscohost Discovery                                                  | 76                    | 8                 |
| Total                                                                | 205                   | 31                |

| Table 3: Publications that applied UTAUT in healthcare informatics studies from 2014 to 2019 |         |      |        |                                             |
|----------------------------------------------------------------------------------------------|---------|------|--------|---------------------------------------------|
| S/N                                                                                          | Author  | Year | Focus  | Factors, in the order of significance.      |
| 1                                                                                            | Ibrahim | 2019 | Nurses | Performance expectancy<br>Effort expectancy |

| Table 3: Publications that applied UTAUT in healthcare informatics studies from 2014 to 2019 |                               |      |                    |                                                                                           |
|----------------------------------------------------------------------------------------------|-------------------------------|------|--------------------|-------------------------------------------------------------------------------------------|
| S/N                                                                                          | Author                        | Year | Focus              | Factors, in the order of significance.                                                    |
| 2                                                                                            | Kalavani, Kazerani, Shekofteh | 2018 | Resident Physician | Performance expectancy<br>Effort expectancy<br>Social influence<br>Facilitating condition |
| 3                                                                                            | Ehrlera, <i>et al.</i>        | 2018 | Nurses             | Effort expectancy                                                                         |
| 4                                                                                            | Aljarullah et al              | 2018 | Physicians         | Social influence                                                                          |
| 5                                                                                            | Jamie Vargo-Warran            | 2017 | Nurses             | Performance expectancy                                                                    |
| 6                                                                                            | Owolabi, Neil and Ocholla     | 2017 | Medical doctors    | Performance expectancy<br>Effort expectancy<br>Social influence<br>Facilitating condition |
| 7                                                                                            | Ju-Ling Hsiao and Rai-Fu Chen | 2016 | Physician          | Social influence                                                                          |
| 8                                                                                            | Waleed and Mhamed Al-Hadban   | 2016 |                    | Effort expectancy                                                                         |
| 9                                                                                            | Owolabi, Mhlono & Evans       | 2017 | Medical Doctors    | Performance expectancy                                                                    |
| 10                                                                                           | Owolabi, Evans and Ocholla    | 2016 | Medical Doctors    | Performance expectancy<br>Social influence                                                |

| Table 3: Publications that applied UTAUT in healthcare informatics studies from 2014 to 2019 |                                       |      |            |                                                                       |
|----------------------------------------------------------------------------------------------|---------------------------------------|------|------------|-----------------------------------------------------------------------|
| S/N                                                                                          | Author                                | Year | Focus      | Factors, in the order of significance.                                |
| 11                                                                                           | Vollmera, <i>et al.</i>               | 2016 | Nurses     | Performance expectancy<br>Effort Expectancy                           |
| 12                                                                                           | Nguyen, <i>et al.</i>                 | 2015 | Nurses     | Effort expectancy                                                     |
| 13                                                                                           | Ahmed Samed Al-Adwan<br>Hilary Berger | 2015 | Physicians | Social influence                                                      |
| 14                                                                                           | Sharifian, <i>et al.</i>              | 2014 | Nurses     | Performance expectancy<br>Social influence<br>Facilitating condition. |
| 15                                                                                           | Maillet, Mathieu and Sicotte          | 2014 | Nurses     | Performance expectancy<br>Effort expectancy                           |

| Table 4: Publications that applied UTAUT in Nursing informatics studies from 2014 to 2019 |                        |      |                                             |  |
|-------------------------------------------------------------------------------------------|------------------------|------|---------------------------------------------|--|
| S/N                                                                                       | Author                 | Year | Factors, in the order of significance.      |  |
| 1                                                                                         | Ibrahim                | 2019 | Performance expectancy<br>Effort expectancy |  |
| 2                                                                                         | Ehrlera, <i>et al.</i> | 2018 | Effort expectancy                           |  |
| 3                                                                                         | Vargo-Warran           | 2017 | Performance expectancy                      |  |

|   |                              |      |                                                                       |
|---|------------------------------|------|-----------------------------------------------------------------------|
| 4 | Vollmera, <i>et al.</i>      | 2016 | Performance expectancy<br>Effort expectancy                           |
| 5 | Nguyen, <i>et al.</i>        | 2015 | Effort expectancy                                                     |
| 6 | Sharifian, <i>et al.</i>     | 2014 | Performance expectancy<br>Social influence<br>Facilitating condition. |
| 7 | Maillet, Mathieu and Sicotte | 2014 | Performance expectancy<br>Effort expectancy                           |

The 7 eligible articles were then critically explored to identify the reported factors that influence the adoption or use of nursing informatics. Figure 1 presents a summary of the findings.

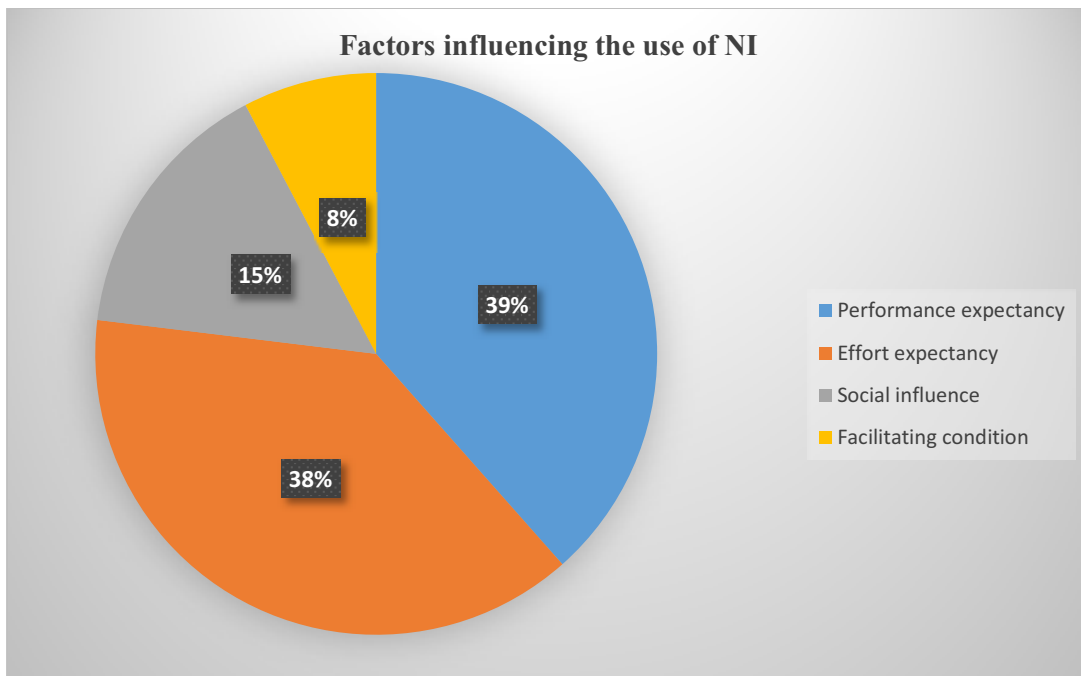


Figure 1: Factors influencing the use of NIT from the reviewed study

## **Discussion**

The findings from Google Scholar and Ebscohost revealed that, between 2014 and 2019, a total number of 205 publications were identified with UTAUT in healthcare informatics studies, but after the exclusion exercise, only 7 of the 205 publications actually used the original UTAUT to explore NI. This is less than 4% of the total, which shows the inadequacy of research work on the subject of NI. In other words, research activities on nursing informatics with UTAUT are very limited when compared with healthcare informatics in general.

The study further revealed that the application of UTAUT to nursing informatics research has focused mostly on the adoption of nursing informatics that relates to hospital information systems, electronic health records, etc. This shows the dearth of literature on the actual use of NIT. On the factors that influence either the intention to use or the adoption of NI, performance expectancy (39%) was the leading determinant, followed closely by effort expectancy (38%). The factor that appears to be the least inconsequential is facilitating conditions (8%). This suggests that the nurses would consider the use of NIT if it would give them the expected outcome of task performance and if there was less rigour/stress required to get the task done using the technologies. The low reference to facilitating conditions that refers to infrastructures (material, training, policies and support) is worth exploring because of its importance in NI provision and support.

## **Conclusion & recommendations**

The paper revealed that very few studies focus on nursing informatics research, particularly from the viewpoint of developing countries. Secondly, to the best of my knowledge, no study has so far focused on the factors that influence the use of NIT by nurses applying the UTAUT. The study examined the factors that would promote the use of nursing informatics technologies among nurses in healthcare sectors, guided by the theory of UTAUT. The extant literature review confirmed that nursing informatics' acceptance/adoption/use can be incited by all the constructs of UTAUT, but significantly by performance expectancy, closely followed by effort expectancy. The study recommends that more studies be carried out on the use of nursing informatics, and that nursing informatics system designers should develop NITs

bearing in mind the effectiveness and ease of use. Given that facilitating conditions appears to be the least mentioned factor, policy-makers and other stakeholders are called upon to provide the enabling infrastructure to enhance the use of nursing informatics technologies.

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# **Involvement of district traditional heads (DTH) in information provision for community development in Kano South Senatorial Zone, Nigeria**

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## **Abstract**

*This study assessed the involvement in information provision for community development of district traditional heads in Kano South Senatorial Zone, Nigeria. The study was structured along five (5) specific objectives to which answers were provided. The design for the study is a descriptive survey research. A questionnaire was the instrument used in collecting data for the study. Twelve (12) respondents filled and returned the questionnaires out of a total of sixteen (16) District Traditional Heads available in Kano South Senatorial Zone, Kano State in the northern region of Nigeria. The instrument for this study contained 47 items and each item sought to determine the level of perception using 4 Likert scale options. Data collected were analyzed using frequency counts and simple percentages. The mean response of each item and the frequency of options for each section were collated and compared. Twelve (12) questionnaires that were filled in and returned were used in the data analysis. The reliability test of the instrument confirmed that the instrument was fit for use in the study. The analysis shows that the nature/pattern of involvement of District*

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*Traditional Heads' (DTH) provision of information to their subjects (or rural dwellers) for community development in Kano South Senatorial Zone is at a very high level. Also, the level of involvement of District Traditional Heads (DTH) in providing information to their subjects (or rural dwellers) for community development in Kano South Senatorial Zone is quite high. The DTH equally provide different kinds of information to their subjects (or rural dwellers) for community development in Kano South Senatorial Zone, particularly socio-cultural, economic and agriculture-related information. It was recommended that each district in Kano South Senatorial Zone should be provided with an information centre for easier dissemination of information by DTH. The remuneration of DTH should be increased in order to facilitate an effective information flow. NGOs should work more closely with DTH and more funds should be made available to them for the provision of information to rural dwellers. DTH should have more say in decision-making processes, especially with regard to development/security issues in their communities. There should be regular meetings among government officials, DTH and rural dwellers in order to fill any communication/information gaps. Districts should have functional community radio stations where information is transmitted in local dialects. Town criers and messengers working in the office of the District Traditional Head should be remunerated better.*

**Keywords:** Districts Traditional Heads (DTH), information, information provision, community, community development.

## **Introduction**

Information has become a basic necessity of human development, as it helps to address other relevant needs such as food, shelter and clothing necessary for survival and growth. Without information, human survival and development face serious threats. At the rural community level especially, the availability of relevant information can make a significant difference. This is because information plays a key role in improving the livelihood of farming households and small-scale rural entrepreneurs. Farmers and produce buyers, for instance, require timely information on farming input and produce markets, government policies and regulations, as well

as community-related decisions taken by local government councils. Relevant information can also accelerate the decision-making process with regard to critical issues such as epidemics, flood, drought, and rural development (Uhegbu, 2010).

The provision of relevant information, without doubt, helps accelerate the pace of development of both the rural community and the nation. The actual act of providing information needed by people in a community is referred to as community information service (CIS). Typically, community information services are offered by governments as well as non-governmental and voluntary organizations in the course of their operations in different communities. According to Majumder (2016), community information is a combination of two terms, i.e. community and information. It is the type of information needed by members of a community in addressing their day-to-day challenges. Susan (2013) considers community information to be information that is required by members of the public (or those acting on their behalf) to make effective use of the resources potentially available to them in the communities in which they live. Such information may be needed to help solve problems involving housing, disability-related issues, household finance, marriage, unemployment and many more. The common information needs of rural people range from information on agriculture and other related issues such as education, employment opportunities, health, self-employment, financial assistance, and government programmes on rural development.

As a concept, rural development arose from problems associated with the neglect of rural areas, especially in developing countries such as Nigeria. The neglect is closely related to the notion that rural inhabitants are reactionary and antagonistic to modern ideas, they are unresponsive to modern economic innovations, and that they believe nothing can be done to prevent certain negative phenomena from occurring. This notion is not unconnected with the view that rural inhabitants are unwilling to transform the social and political conditions that they inherited. This idea has for many decades led to the relegation and neglect of rural areas by various governments, thus making rural areas remain under-developed (Nwobi, 2007). Rural development, or more specifically community development, as Ajayi (1995) puts it, is a social process

by which human beings can become more competent to live with and gain some control over local conditions and the changing world. According to Ajayi and Otuya (2006), sustainable community development cannot take place through force or order, but it is most likely to happen when all actors participate and share ideas, visions and responsibilities equally and democratically in steering and implementing their community or village development projects. To Orapin (1996) one approach in creating sustainable rural development is giving the main actors (villagers) an equal opportunity to think and plan their own future. Usually, community development programmes aim at creating an awareness of rural possibilities by providing information on available resources; deploying technical assistance for skills acquisition and development; increasing the literacy level; improving productivity and productive systems; adopting appropriate technology in agriculture as well as sensitizing potential volunteers and donors, among other things. Ideally, most community development programmes in developing nations focus on peoples' felt needs and basic amenities such as good roads, electricity, health clinics, markets, school buildings, and farm settlements. These goals can only be achieved through the combined and collective efforts of all who share the conviction that rural community development must be accorded a high priority, especially in the drive for poverty alleviation and national self-sufficiency (Orapin, 1996).

## **Historical background of Kano South Senatorial Zone, Kano State**

Kano State is the second most populated state in Nigeria, after Lagos. It is the centre of commerce in the northern region of Nigeria and the second most industrialized in the country. It is also the most politically active in the north, and arguably the most homogeneous in the Nigerian federation. It is a state where people have tremendous respect for tradition; traditional leaders are highly esteemed and the government recognizes this. As such, the general administrative machinery across the state is a combination of both the modern and the traditional. There are the Executive, Legislative and Judicial branches of government, Local Government Councils, as well as the Traditional/Customary administrative structures. The state government is

headed by an elected governor with elected lawmakers. Local Government Councils have elected chairmen and councilors. But at the traditional level, there is the Ward/ Neighborhood Head (Mai Unguwa), the Village Head (Dagaci), the District Head (Hakimi), while the Emir is at the top of the hierarchy. District Heads are appointed by the Emir after consultation with the local governments, and with approval from the State Governor. There is the Emirate (traditional) Council with the Emir as president; other members of this Council are the traditional kingmakers, chairmen of Local Government Councils and nominated persons who are capable of making useful inputs in the decision-making process (Memorandum for creation of Tiga State, 2009).

There are three senatorial zones in the state and Kano South Senatorial Zone is one of them. These zones are political arrangements meant basically to elect the three senators that are required by the constitution to represent Kano State in the nation's Senate. According to the National Population Commission (2006), Kano South Senatorial zone has 3,028,177 people (1,544,488 males representing 51.0% and 1,483,689 females representing 48.9%). Agriculture is the mainstay of the economy of the area, employing between 60-80% of the populace. The preponderance of rivers, Fadama lands (marshlands), man-made lakes and the favorable climatic condition make farming a year-round affair (Memorandum for creation of Tiga State, 2009).

### **Historical overview of traditional leadership in community development**

According to Rugege (2009), traditional leadership has been the basis of local administration on the African continent throughout history. Freddie (2011) argued that African people knew no other form of government except the institution of traditional leadership. He also explains that the African traditional style of government is different from the Western forms. Freddie (2011) pinpoints some errors prevalent in the literature of European colonialists about the African style of administration. One is the assertion that traditional leaders have absolute power. However, their power was never absolute. Khunou (2011) notes that customary law is regarded by members of



the African traditional community as binding on both the leaders and the followers alike. It was within this context that the traditional authority was vested with powers to enforce compliance with the values and customs of a traditional community. The traditional leader passed laws, judged with the consent of his traditional council and took action through the members of the community. Traditional leaders who were dictatorial actually faced revolt or secession by their people (Khunou, 2011). If people were dissatisfied with the leader they could desert him for another, arrange for his death or overthrow him through a civil war (Rugege, 2009). Rugege further notes that the traditional institution was a form of democracy where, in some cases, the decision-making process was participatory through the general assembly of all adult men on important matters affecting the community. This is similar to Locke's (1632-1704) view in his work, *The Second Treatise of Government*. Locke argues that sovereignty resides in the people and he explains the nature of government in terms of natural rights and a social contract. According to Khunou (2011), in the pre-colonial era traditional leaders were a very important institution in traditional life and they played an essential role in the day-to-day administration of their areas and people. However, it has been observed over the years that the institution of African traditional leadership has the potential of developing and changing with the times, especially in terms of its usefulness. This is a relevant issue in the current study.

## **Objectives of the study**

The main objective of this study is to investigate the extent of involvement of District Traditional Heads (DTH) in information provision for community development in Kano South Senatorial Zone. Specific objectives of the study are to:

Ascertain the nature/pattern of involvement of District Traditional Heads (DTH) in information provision to their subjects (or rural dwellers) for community development in Kano South Senatorial Zone.

Determine the kinds of information provided by DTH to their subjects (or rural dwellers) for community development.

Determine the communication channels used by DTH in disseminating information to their subjects (or rural dwellers) for community development.

Highlight challenges confronting DTH in providing information to their subjects (or rural dwellers) for community development.

Determine the solutions to the challenges affecting DTH in providing information to their subjects.

## **Theory and literature review**

The review highlights theoretical premise and provides a brief LR focusing on themes on the study's point of focus.

The current study has therefore adopted the two theories – modernization and structural functionalism (Ega, 2005). Modernization theory is a theory used to explain the process of modernization that a nation goes through as it transitions from a traditional society to a modern one, while structural functionalism is a framework for building theory that sees society as a complex system whose parts work together to promote solidarity and stability (Yol, 2010). It is believed that both theories serve the study well because both deal with social structure involving traditional rulers, people, their behaviour as well as attitudes towards community development and information provision. This is a prerequisite for any meaningful community development. Without the provision of information, no meaningful project can take place in rural communities.

The two theories, i.e. modernization and structural functionalism, are based on the assumption that deals with the sociological behavioural pattern of changing from the traditional mode to the modern era format, especially with regard to the administration of either a community or a nation (Brohman, 2005). This includes how a community behaves in a social order, changes in attitude of community members from the traditional form to modern forms, as well as the relationship that exists in the social institutions which make up the social system rather than as unrelated units. To this end the two theories are better used together, as they closely explain vital aspects of

the current study. It is believed that both theories serve the study well because both deal with social structure involving traditional rulers, people, their behaviour as well as attitude towards community development and information provision. This is a prerequisite for any meaningful community development. Without information, no meaningful projects can exist in rural communities.

### **Nature of involvement of district traditional heads in information provision for community development**

Venson (1995) observes that by preserving their own cultural traditions, traditional rulers are automatically involved in the mobilization for peace and order among their people. There are traditional judicial arrangement and system of accountability. Crime rates are low as these traditional rulers oversee the mechanisms for maintaining law and order. In some places, youth are effectively mobilized to police the communities and are also called upon to provide communal labour. Traditional leadership in its former form, before foreign interference occurred, operated on the principle of community participation, consultation, consensus, and an acceptable level of transparency through the village council or open tribal consultative meetings. These traditional principles are not too different from the ones that modern political thinkers prescribe as essential for democracy. It might prove useful, therefore, if countries that are striving for good governance in Africa were to look with renewed interest at traditional forms of governance and imbibe some of their valuable principles.

Donkoh (2002) states that traditional District Heads visit their subjects (rural inhabitants) in their various houses or kindred in the community, mostly to share information. They link up with agencies of Local and State Governments for vital information that will be useful to rural dwellers. Moreover, traditional rulers contact media houses like radio and TV stations for relevant and up-to-date information that would benefit rural communities. Leaders at the local level are also in constant touch with traditional the rulers' council (Emirate Council) in order to get essential community-based information. Kolawole and Igwe (2016) highlight traditional rulers' involvement in the following areas. They liaise with NGOs and community-based organizations on community development issues. They organize town hall meetings

with all categories of people in the community for the purpose of sharing information. They meet with opinion leaders and other key stakeholders who subsequently transmit information to rural dwellers. They hold periodic meetings with associations in the community (e.g. women's group, men's group, farmers, etc.) in order to share information. Other studies also show how traditional rulers are involved in information provision in the areas of health and agriculture. Such studies to a degree show the level of involvement of traditional rulers in the overall development of their communities (Kolawole & Igwe, 2016).

### **The kinds of information provided by DTH to their subjects (Rural dwellers)**

Kolawole and Igwe (2016) acknowledge that a broad categorization of information needs shows that individuals in a community have various information needs which may cut across some, or possibly all, the outlined needs. For instance, farmers, agricultural experts and other practitioners in the field of agriculture would have *agricultural information needs* in the areas of production, post-planting, marketing, improved seedlings, methods of fertilizer application, credit facilities for agriculture, etc. Students and other stakeholders in the educational system have *academic information needs* like admission systems in tertiary institutions, tuition fees, types of academic programmes in various institutions, how to prepare assignments and term papers, strategies of answering examination questions, and so on. *Business information needs* centre on business opportunities in a given environment, how to prepare a business plan, planning cash flow and profits, products and services most demanded by customers, etc. As for *economic information needs* there is the issue of business information on a given economy with regard to costs, prices, rates of productivity, profit levels, production capacity and trade statistics, etc. *Political information needs* include political systems and forms of government in a nation, responsibilities of tiers of government, how to mobilize and support candidates contesting elections, and how to assess and analyse policies and programmes of government, among others. *Socio-cultural information needs* have to do with festivals, carnivals, religious practices and worshiping systems. Other needs are

environmental, geographical and health information needs, that may be of relevance to health professionals, patients, caregivers and consumers.

### **Communication channels used in disseminating information for community development**

Ogidi (2014) highlights channels of information used as follows:

**Inter-personal channels of information communication:** This is referred to as face-to-face communication, involving an exchange of ideas and information between sender and receiver. The mode of interaction is usually of a conversational nature and involves the exchange of either verbal or non-verbal information. Interpersonal communication dominates activities at home, in an office, a market and elsewhere. Contrary to what obtains in formal relationships, it tends to be informal and generates warmth as well as creating harmony necessary for socio-economic development. One major advantage in this personal contact is immediate response; this gives an opportunity to those concerned to immediately decode and modify subsequent messages in order to achieve a determined objective. This is why contact between DTH and their subjects or representatives for information dissemination purposes is significant. Aderibigbe (1990) believes that interpersonal communication is important in linking up with rural farmers, since a majority of them are illiterate.

**Town Crier:** Traditional mass media serve both utilitarian and aesthetic purposes. They form the vehicle for acquiring and disseminating information to rural people. Ngwaimbi (1995) notes that town criers, the market place and word of mouth are popular among African rural people in terms of longevity of use and effectiveness in transmitting messages. He explains that in rural areas, town criers are village messengers who go from street to street delivering messages. Occasionally, striking a bell or drum, they report the news to villagers.

**Market places and worship centres:** Rural people are known to acquire and disseminate a huge amount of information at market places and worship centres such as churches and mosques. Awa (1988) observes that many issues or events are discussed in market places more than elsewhere. He reports that markets in Africa

have been successfully used for advertising new food products and drugs. Moreover, information on better nutrition and inter-village relationships has been spread by local agents trained by Afro-centric technicians. Bame (1990) notes that this mode of communication is development-oriented and messages are self-evident. Opeke and Ifukor (2000) point out that socio-political information often comes from preachers in churches and mosques. Some government agencies also pass on vital information on immunization, registration of children in school, etc. through these same channels.

**Role play, song, dance and drama:** Songs, poems and drama pieces are useful channels for information acquisition and dissemination among people. Fayose (1998) opines that among rural dwellers singing is usually associated with work, hunting, warfare, funeral, title-taking, birth and nursing, moonlight plays and other ceremonies. Songs address all types of social issues in the community. Some songs ridicule undutiful fathers, lazy mothers, wayward children, etc., while others encourage the well-behaved to keep it up. Fiofori (2005) states that there are also speech surrogates such as talking drums, gongs, oral narratives, etc. used in rural settings. Festivals are integral parts of life in rural communities where drama and role-play are used not only as a means of entertainment but also as a means of imparting socially accepted norms and values. Fayose and Dike (2002) identify poetry as another channel for the dissemination of information. Role-play is an impromptu dramatization and is often used to pass information on health and other issues to people. The World Health Organization and the United Nations International Children Education Fund (1989) report that role-play is a good teaching and learning method for children. They emphasize that it is very useful in influencing people's healthcare habits and agricultural practices. Equally, Aboyade (1990) observes that on clinic days health instructors use group singing to express essential health precautions to their audience.

**Radio:** With its flexibility and adaptability radio informs, educates and entertains audiences. Hiebert (cited in Edward, 2017) says that radio has become more individualized and personalized. Individualization of the radio is in keeping with some megatrends identified by Naisbitt and Aburdene (n.d., cited in Edward, 2017).

**Television:** Television appeals to more than one of the five senses and has thus become a dominant leisure activity. Television "is society's mass entertainer, mass informer, mass persuader, and mass educator" (Edward, 2017). To reach the most people with general information, television is the logical though more expensive choice.

### **Challenges confronting traditional rulers (DTH) in providing information for community development**

Access to information in rural communities in Africa faces a number of barriers such as basic infrastructure (electricity, telecommunication, utilities, roads and transportation), a low level of literacy, lack of proper information services, etc. A non-passable road especially means a lack of access to remote communities. This affects DTH in their effort to provide information to rural dwellers. Kolawole and Igwe (2016) state other challenges that constitute impediments. These are a poor attitude of government towards supporting Districts Heads in information provision, inadequate support from NGOs to District Heads in providing information to rural dwellers as well as communal conflicts and activities of vandals/criminals in the districts. Literature shows that traditional rulers generally have serious challenges wherever they operate. In Nigeria, the situation of traditionalism is further complicated by the fact that many of them are civil servants, farmers, and businessmen. In Namibia, the work that a traditional title holder does is part time. Keulder (2016) and Yol (2010) concur that there are challenges to the information dissemination process in rural areas. These include a poor attitude on the part of government towards supporting District Heads, inadequate support from NGOs, financial constraints, bad road networks among communities, communal conflicts, etc.

### **Methodology**

This study adopted a descriptive survey design using frequency counts and percentages. The population comprises all District Traditional Heads in Kano South Senatorial Zone in Kano State, Nigeria, which has sixteen (16) District Traditional Heads, such as (Ajingi, Albasu, Bebeji, Bunkure, Doguwa, Garko, Gaya, Karaye, Kibiya, Kiru, Rano, Rogo, Sumaila, Takai, Tudun Wada, Wudil). All were used as

primary population for the study. A structured questionnaire was used for data collection and a four-point Likert scale type of questionnaire was designed and divided into five parts. Sixteen (16) copies of the questionnaire were administered to all sixteen (16) District Traditional Heads. The reason for using the instrument was that it is not easy to meet with the district heads due to the nature of their work, therefore the Secretary to the council advised us to have something for them to fill at their convenience. This was our reason to administer the questionnaire as an instrument for data collection to allow the DTH to fill the instrument in at their convenience, as all efforts to meet them had failed. All the portions of the instrument were thoroughly filled in by the respondents. Since the number of instruments was not too high (and in line with the advice of Kerlinger, 1991), we used all sixteen (16) Districts Traditional Heads in all sixteen (16) districts of Kano South Senatorial Zone as primary population for the study; thus there was no sampling. Of the sixteen (16) copies of questionnaires administered, twelve (12) were returned and analyzed in line with the objectives of the study. The administration of the questionnaire was carried out by the co-researchers and assisted by a research assistant. Data collected were analyzed using descriptive statistics that are commonly used in social science and educational research, that is frequency counts and simple percentages.

George and Mallery (2003) provide the rules for the acceptance of the reliability of the instrument using Cronbach's Alpha Value as follows: any value greater than .9 indicates Excellent Reliability; a value greater than .8 indicates Good Reliability, a value greater than .7 indicates Acceptable Reliability, a value greater than .6 indicates Questionable Status, a value greater than .5 indicates Poor, while less than .5 indicates Unacceptable Reliability. The reliability values of the current study were between .887 and .975. This is an indication that there is a positive correlation and strong consistency between the items of the instruments; hence, they were reliable and suitable for the study.

## **4.1 Results**

This section is organized by research questions aligned to the research objectives as represented on Tables 1 to 5 below.



**Table 1: What is the nature/pattern of involvement of District Traditional Heads (DTH) in information provision to their subjects (or rural dwellers) for community development in Kano South Senatorial Zone?**

| S/N | Items                                                                                                                                      | Response categories |         |         |         |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------|---------------------|---------|---------|---------|
|     |                                                                                                                                            | SA                  | A       | D       | S       |
| 1.  | They link up with agencies of local and state governments for vital information that will be beneficial to rural dwellers                  | 5 (42%)             | 3 (25%) | 2 (17%) | 2 (17%) |
| 2.  | They contact media houses like radio and TV stations for relevant and up-to-date information that will benefit rural dwellers              | 2 (17%)             | 6 (50%) | 3 (25%) | 1 (8%)  |
| 3.  | They are always in touch with the traditional rulers' council (Emirate Council) for essential community-based information                  | 2 (17%)             | 6 (50%) | 2 (17%) | 2 (17%) |
| 4.  | They liaise with non-governmental organisations (NGOs) and community-based organisations (CBOs) on community development issues            | 6 (50%)             | 3 (25%) | 2 (17%) | 1 (8%)  |
| 5.  | They organize town hall meetings with all categories of rural dwellers in their communities to share information                           | 5 (42%)             | 2 (17%) | 3(25%)  | 2 (17%) |
| 6.  | They share information with opinion leaders and other key stakeholders in their communities for onward transmission to rural dwellers      | 3 (25%)             | 5 (42%) | 3 (25%) | 1 (8%)  |
| 7.  | They hold periodic meetings with associations in their communities (e.g. women's groups, men's groups, farmers, etc.) to share information | 3 (25%)             | 5 (42%) | 3(25%)  | 1 (8.%) |
| 8.  | They visit subjects (rural inhabitants) or kin in their various houses in the community, mostly to share information                       | 7 (58%)             | 3 (25%) | 1 (8%)  | 1 (8%)  |

The table above shows that the nature/pattern of involvement of District Traditional Heads (DTH) in information provision to their subjects (or rural dwellers) for community development is at a high level, especially the visits made to subjects (rural inhabitants) or kin for the purpose of sharing information. This is because the item has the highest agreement level of 11 (92%), while 1 (8%) was in disagreement. Liaising with NGOs and CBOs on community development issues is also high. It has the highest agreement level of 9 (75%), while 3 (25%) were in disagreement. As such, the nature/pattern of involvement of District Traditional Heads (DTH) in information provision to their subjects (or rural dwellers) for community development in Kano

South Senatorial Zone is very high. This is especially the case regarding visits made to subjects (rural inhabitants) or kin. The same applies to liaising with NGOs and CBOs. This finding is in line with the finding of Kolawole and Igwe (2016), and Donkoh (2002) who point out that District Traditional Heads liaise with NGOs and CBOs on community development issues. Equally, DTH organize town hall meetings with all categories of rural dwellers, opinion leaders and other key stakeholders. They also hold periodic meetings with associations, as well as visit subjects (rural inhabitants) or kindred, mostly to share information. They contact media houses like radio and TV stations for relevant and up-to-date information, and they are in constant touch with the traditional rulers' council (Emirate Council) for essential community-based information. Moreover, they link up with agencies of local and state governments for information that will be beneficial to rural dwellers.

**Table 2: What are the kinds of information provided by DTH to their subjects (or rural dwellers) for community development in Kano South Senatorial Districts?**

| S/N | Items                                                                                                                                                        | Response categories |           |           |        |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-----------|-----------|--------|
|     |                                                                                                                                                              | SA                  | A         | D         | SD     |
| 1.  | Health information (e.g. fight against HIV/AIDS, immunization practices against polio, infectious diseases, hygienic practices and environmental sanitation) | 6(50%)              | 3(25%)    | 2 (16.7%) | 1 (8%) |
| 2.  | Agriculture-related information (e.g. new farming techniques, high yielding crops, fertilizer accessibility and application, livestock production, etc.)     | 8(66.7%)            | 3 (25%)   | 1 (8%)    | -      |
| 3.  | Educational information (e.g. educational opportunities, admission slots, literacy programmes, scholarships, etc.)                                           | 8 (66.7%)           | 3 (25%)   | 1(8%)     | -      |
| 4.  | Economic information (e.g. job opportunities, business ventures, funding, credit facilities, government programmes, skills acquisition centres, etc.)        | 5 (41.7%)           | 6 (50%)   | 1(8%)     | -      |
| 5.  | Political information (party politics, political sensitizations and mobilizations, voter registration, voting during elections, etc.)                        | 8 (66.7%)           | 2 (16.7%) | 1(8%)     | 1(8%)  |
| 6.  | Socio-cultural information (acceptable social practices, values and norms, culture and traditions, etc.)                                                     | 4 (33%)             | 5(41.7%)  | 2 (16.7%) | 1(8%)  |
| 7.  | Security information (neighbourhood watch system, security practices, vigilante services, etc.)                                                              | 7 (58%)             | 4 (33%)   | -         | 1(8%)  |

|   |                                                                                                                                   |         |          |           |       |
|---|-----------------------------------------------------------------------------------------------------------------------------------|---------|----------|-----------|-------|
| 8 | Legal information (human rights protection, maintenance of law and order, settlement of disputes – farmlands or boundaries, etc.) | 4 (33%) | 5(41.7%) | 2 (16.7%) | 1(8%) |
|---|-----------------------------------------------------------------------------------------------------------------------------------|---------|----------|-----------|-------|

It is obvious from the table above that the kinds of information provided by DTH to their subjects (or rural dwellers) for community development in Kano South Senatorial Zone are various. Information provided most by DTH includes security information, economic information, education information, as well as agriculture-related information, which has the highest total of 11(92%) in agreement, while 1(8%) is in disagreement. Other notable information provided by DTH is political information which attracts the second highest agreement level of 11 (83%), while 2(17%) disagree. Consequently, DTH provide high and notable kinds of information to their subjects (or rural dwellers) for community development in Kano South Senatorial Zone, especially information on security, economy, education, agriculture and politics. This finding is in line with Majumder's (2016) view that various types of community information services can be provided, including information on health, drinking water, transport, emergency services, government activities, self-help programmes, rights and duties, environmental pollution, legal aid, etc.

**Table 3: What are the communication channels used by DTH in disseminating information to their subjects (or rural dwellers) for community development in Kano South Senatorial Districts?**

| S/N | Items                                                                          | Response categories |        |          |       |
|-----|--------------------------------------------------------------------------------|---------------------|--------|----------|-------|
|     |                                                                                | SA                  | A      | D        | SD    |
| 1.  | Town criers and palace messengers                                              | 7(58%)              | 4(33%) | -        | 1(8%) |
| 2.  | Town hall meetings (e.g. for lectures, exhibitions and demonstrations).        | 8(66.7%)            | 3(25%) | 1(8%)    | -     |
| 3.  | Market places                                                                  | 8(66.7%)            | 3(25%) | -        | 1(8%) |
| 4.  | Traditional Festivals (songs, dances, etc.)                                    | 7(58%)              | 3(25%) | 1(8%)    | 1(8%) |
| 5.  | Telephones (e.g. handsets)                                                     | 5(41.7)             | 4(3%)  | 2(16.7%) | 1(8%) |
| 6.  | State, local governments and their agencies                                    | 5(41.7)             | 4(3%)  | 2(16.7%) | 1(8%) |
| 7.  | Non-Governmental Organizations (NGOs) and Community-Based Organizations (CBOs) | 6(50%)              | 4(3%)  | 1(8%)    | 1(8%) |
| 8   | Associations in the community (e.g. women groups, men groups, farmers, etc.)   | 4(3%)               | 6(50%) | 1(8%)    | 1(8%) |
| 9   | Radio stations                                                                 | 7(58%)              | 3(25%) | 1(8%)    | 1(8%) |

|    |                                                         |          |          |          |          |
|----|---------------------------------------------------------|----------|----------|----------|----------|
| 10 | Television (TV) stations                                | 3(25%)   | 8(66.7%) | 1(8%)    | -        |
| 11 | Newspapers and magazines                                | 5(41.7)  | 4(3%)    | 1(8%)    | 2(16.7%) |
| 12 | Internet and social media platforms                     | 6(50%)   | 4(3%)    | 1(8%)    | 1(8%)    |
| 13 | Traditional rulers' council (Emirate Council)           | 7(58%)   | 3(25%)   | 2(16.7%) | -        |
| 14 | Liaising with outsiders on community development issues | 8(66.7%) | 3(25%)   | 1(8%)    | -        |
| 15 | Inter-personal channels (e.g. opinion leaders)          | 6(50%)   | 4(3%)    | 1(8%)    | 2(16.7%) |

The number of communication channels used by DTH in disseminating information to their subjects (or rural dwellers) for community development in Kano South Senatorial Zone is quite vast. The most used communication channels are town criers and palace messengers, town hall meetings, market places, radio and television (TV) stations. DTH also liaise with outsiders on community development issues. This item attracted the highest agreement level, 11(92%) among the respondents, while only 1 (8%) was in disagreement. The next most used communication channels by DTH are traditional festivals, non-government organizations (NGOs) and community-based organizations (CBOs), associations in the community, Internet and social media platforms and traditional rulers' council (Emirate Council). These attracted the second highest agreement level of 10 (83%), while only 2 (17%) disagreed. The third most used channels of communication by DTH are telephones, state and local governments and their agencies, as well as newspapers and magazines. These attracted the third highest mean response, 3.408 with details showing that a total of 9 (75%) agreed, while the rest 3 (25%) did not. Consequently, the number of communication channels used by DTH in disseminating information to their subjects (or rural dwellers) for community development in Kano South Senatorial Zone is vast, good and robust. In particular, most of them subscribe to the use of town criers and palace messengers, market places, traditional festivals associations in their communities, the Internet, as well as newspapers and magazines. This finding is in line with the findings of Ogidi (2014), Bame (1990), Ngwaimbi (1995)&Fayose (1998). All of them emphasized the use of town criers and palace messengers, market places, traditional festivals, associations in their communities, the Internet, as well as newspapers and magazines, etc.

**Table 4: What are the challenges confronting DTH in providing information to their subjects (or rural dwellers) for community development in Kano South Senatorial Districts?**

| S/N | Items                                                                                          | Response categories |          |          |          |
|-----|------------------------------------------------------------------------------------------------|---------------------|----------|----------|----------|
|     |                                                                                                | SA                  | A        | D        | SD       |
| 1.  | Absence of community information centres for rural dwellers                                    | 5(41.7%)            | 4(33%)   | 2(16.7%) | 1(8%)    |
| 2.  | Problem of communication gaps between rural dwellers and their traditional rulers              | 3(25%)              | 5(41.7%) | 2(16.7%) | 2(16.7%) |
| 3.  | Inadequate cooperation from rural dwellers                                                     | 6(50%)              | 3(25%)   | 2(16.7%) | 1(8%)    |
| 4.  | Inadequate capacity in terms of finance for accessing and disseminating information            | 7(58%)              | 4(33%)   | 1(8%)    | -        |
| 5   | Poor attitude of governments towards supporting District Heads in information provision        | 3(25%)              | 8(16.7%) | 1(8%)    | -        |
| 6   | Problem of basic infrastructure for information generation and dissemination to rural dwellers | 4(33%)              | 6(50%)   | 1(8%)    | 1(8%)    |
| 7   | Inadequate support from NGOs to District Heads in providing information to rural dwellers      | 7(58%)              | 3(25%)   | 1(8%)    | 1(8%)    |
| 8   | Communal conflicts and activities of vandals cum criminals in the districts                    | 4(33%)              | 5(41.7%) | 2(16.7%) | 1(8%)    |

The above are the perception of respondents on challenges confronting DTH in providing information to their subjects (or rural dwellers) for community development. These challenges are enormous. Specifically, the greatest challenge is inadequate capacity in terms of finance for accessing and disseminating information as well as the poor attitude on the part of government towards supporting district heads in information provision. Regarding this, 11 (92%) were in agreement while 1 (8%) disagreed. Another challenge is inadequate support from NGOs to District Heads, along with problems of basic infrastructure for information generation and dissemination. This attracted the second highest agreement level, 10 (83%), while 2 (17%) disagreed. Inadequate cooperation from rural dwellers and the absence of community information centres are other challenges, with 9 (75%) being in agreement, while 3 (25%) disagreed.

The challenges confronting DTH in providing information to their subjects are enormous. This finding affirms the view held by Keulder (2016), Yol (2010) that there are challenges to the information dissemination process in rural areas. These include a poor attitude on the part of government towards supporting District Heads,

inadequate support from NGOs, financial constraints, bad road networks among communities, communal conflicts, etc.

**Table 5: What do you think can be done to tackle the identified challenges?**

| S/N | Items                                                                                                            | Response categories |        |        |       |
|-----|------------------------------------------------------------------------------------------------------------------|---------------------|--------|--------|-------|
|     |                                                                                                                  | SA                  | A      | D      | SD    |
| 1.  | Provide community radio and TV stations to serve rural inhabitants.                                              | 5(42%)              | 4(33%) | 2(17%) | 1(8%) |
| 2.  | Provision of community information centres for rural dwellers.                                                   | 5(42%)              | 5(42%) | 1(8%)  | 1(8%) |
| 3.  | Adequate funding for information provision                                                                       | 6(50%)              | 4(33%) | 1(8%)  | 1(8%) |
| 4.  | Provision of basic infrastructures for information generation and dissemination to rural dwellers.               | 6(58%)              | 4(33%) | 2(17%) | -     |
| 5   | Government and NGOs should provide adequate funding for dissemination of information to rural dwellers           | 3(25%)              | 7(58%) | 1(8%)  | 1(8%) |
| 6   | Adequate support from NGOs to District Heads in providing information to rural dwellers.                         | 6(50%)              | 3(25%) | 2(17%) | 1(8%) |
| 7   | Regular sensitization, training and funding for District Heads to provide needed information for rural dwellers. | 4(33%)              | 5(42%) | 2(17%) | 1(8%) |

Solutions to the challenges are the provision of community information centres, adequate funding for information provision, and provision of basic infrastructures for information generation and dissemination to rural dwellers. Ten (10 or 83%) of DTH agreed that government and NGOs should provide adequate funding for information dissemination, while 2 (17%) disagreed. The second most suggested solution includes the provision of community radio and TV stations, adequate support from NGOs to District Heads and regular sensitization. This has an agreement level of 9 (75%), while 3 (25%) disagree.

## **Discussions and conclusions**

The following are the major findings of the study:

1. The nature/pattern of involvement of District Traditional Heads (DTH) in information provision for their subjects (or rural dwellers) for community development in Kano South Senatorial Zone is very high, especially as they regularly visit subjects

(rural inhabitants) or kindred to share information as well as liaise with NGOs and CBOs on community development issues.

2. DTH provide high frequency and notable kinds of information for their subjects (or rural dwellers) for community development in Kano South Senatorial Zone. This includes socio-cultural, economic, educational and agriculture-related information that rural inhabitants need.

3. The number of communication channels used by DTH in disseminating information to their subjects (or rural dwellers) for community development in Kano South Senatorial Zone is quite vast, reliable and robust, especially as most of them use town criers and palace messengers, radio stations, market places, etc.

4. The challenges confronting DTH in providing information for their subjects (or rural dwellers) for community development in Kano South Senatorial Zone are enormous. The most notable challenges include inadequate capacity in the area of finance for accessing and disseminating information, inadequate support for District Heads from NGOs, inadequate cooperation from rural dwellers, etc. in providing information for their subjects (or rural dwellers) in that order, among others.

Solutions to identified challenges include the provision of community radio and TV stations, provision of community information centres, adequate funding as well as provision of basic infrastructures for information generation and dissemination to rural dwellers.

There are many measures to be taken to address the challenges confronting the obstacles facing DTH in discharging their responsibility.

Based on the findings of the study, it is concluded that the nature/pattern of involvement of District Traditional Heads (DTH) in information provision to their subjects (or rural dwellers) for community development in Kano South Senatorial Zone is very high. DTH provide important and notable kinds of information and the number of communication channels that they use is vast, reliable and robust. DTH are confronted with many challenges, the most notable of which are inadequate funding, inadequate support from NGOs and inadequate cooperation from the rural

dwellers. Adequate funding, provision of basic infrastructures for information generation and dissemination, adequate support from NGO are a few of the possible solutions.

The following recommendations are made based on the outcome of this study:

1. Each district in Kano South Senatorial Zone should be provided with an information centre for easier dissemination of information by DTH.
2. The remuneration of DTH should be increased in order to facilitate effective information flow.
3. NGOs should work more closely with DTH and more funds should be made available to them for the provision of information to rural dwellers.
4. DTH should have more say in decision-making processes, especially with regard to development/security issues in their communities.
5. There should be regular meetings among government officials, DTH and rural dwellers in order to fill any communication/information gaps.
6. Districts should have functional community radio stations where information is transmitted in local dialects.
7. Town criers and messengers working in the office of the District Traditional Head should be remunerated better.
8. Further studies could be carried out on the factors militating against the effective development of grassroots communication between subjects and District Traditional Heads in other parts of the northern region of Nigeria.

The outcome of this study will be relevant to various stakeholders in the area of community development. One reason is that both the relevance and adequacy of information provided in a community impact on the extent of its usage. For instance, good quality information can engender good quality healthcare (Gould & Gomez, 2010). The current study covers a relatively scarcely researched area regarding information provision by District Traditional Heads in this part of Nigeria where there are identified challenges to community development. As such the study will contribute



to the body of knowledge on this area as well as providing insights needed by governments and traditional rulers who are major stakeholders in community development issues. This research work will help members of the public be better informed about the roles of District Traditional Heads in information provision as well as the problems they encounter in Kano South Senatorial Zone in particular. This work may also help people be constructive in their criticisms. The outcomes will equally assist subsequent researchers to engage in even more detailed studies in this area or other parts of the country. The current study will reveal the relevance of DTH in information provision to government, information practitioners, District Traditional Heads themselves and other stakeholders. Traditional leaders will benefit more from this study if their capacity gaps are identified and they use the suggested means of overcoming them. The study would, hopefully, be indispensable to Librarians, Library and Information Science students and all those who want to know about the involvement of District Traditional Heads in information provision. The findings of the study will not only add to existing knowledge in this area, but they will serve as reference materials for future research.

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