EDUCATION AND TRAINING OF LIBRARY AND INFORMATION SCIENCE PROFESSIONALS IN DIGITAL SCHOLARSHIP IN SOUTH AFRICA

by

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ABSTRACT

Dynamics in the library and information science (LIS) job market brought about by the fourth industrial revolution, including digital scholarship, calls for LIS schools to reconsider their curricula in line with the job market. This study explored the education and training of LIS professionals on digital scholarship in South Africa. Concepts from two frameworks on curriculum development and the Gap Service Quality Model were used as conceptual underpinnings for this study.

This study used the qualitative research approach through the adoption of a multiple case study method. Content analysis was used in examining the course outlines in the LIS school's course outlines and semi-structured interviews were used to collect data from the five LIS schools' Heads of Departments (HoDs) and five lecturers teaching digital scholarship. Five directors in academic and research council libraries were interviewed to find the perceptions of LIS employers of digital scholarship. Additionally, five digital scholarship librarians were interviewed. The data collected were analysed thematically following the methods by Braun and Clarke (2012) using ATLAS.ti 9.

The study showed that most LIS schools were not offering content on digital scholarship due to a lack of relevant 4IR infrastructure and the available workforce to offer such education. The study revealed that the LIS schools that were teaching digital scholarship lacked the practical component. Academics indicated that a shortage of literature on digital scholarship led to a poor infusion of the concept in the curriculum. It was discovered that the LIS school failed to consult with relevant stakeholders when developing the curriculum.

This study recommended that LIS schools should develop a curriculum that accommodates the current trends in digital scholarship. The study recommended that the LIS schools should procure the 4IR infrastructure relevant to digital scholarship. Capacity-building workshops should be offered to academics to develop knowledge and skills in this area. Consultation-relevant stakeholders such as LIS practitioners, interdisciplinary fields, and the Department of Higher Education and Technology on digital scholarship were identified as the strategy that can help improve the LIS curriculum. A framework that could be used when developing an LIS curriculum, inclusive of digital scholarship, was proposed.

DECLARATION

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Education and Training of Library and Information Science professionals in Digital Scholarship in South Africa

I, Philangani Thembinkosi Sibiya, declare that the above thesis is my own work and that all the sources I have used or cited have been acknowledged both in text and in the reference list.

_____   28 February 2022
                                                        _____

Philangani Thembinkosi Sibiya

DEDICATION

This thesis is predominantly dedicated to my family members, both those who are alive and those who are in a better place (may their souls rest in eternal peace). I dedicate this work to my late father, Mr **Magcekeni Sibiya.** Without his guidance and protection where I could not see, I would not have made it this far. I also dedicate this work to my mother, **Mrs Nomshado Sibiya (MaShenge).** I am grateful to her for being a cheerleader and a shining armour during the daunting PhD journey. I equally dedicate this work to my daughter, **Nkosisizwile Siphosethu Sibiya,** for being an inspiration to me to push at my studies hard, most of all, for the encouragement she provided. I further dedicate this work to my siblings **Philemon, Sifiso, Thembi, Thuleleni, Lethiwe, Manesi, Mandla and Sandile Sibiya,** for understanding and supporting my ultimate dream.

Chiefly, I dedicate this work to my Lord, my Saviour,
uShembe (uNyazilwezulu) for the
strength, faith, protection, and spiritual
support that I have received throughout this journey.

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LIST OF ACRONYMS AND ABBREVIATIONS

4IR	Fourth Industrial Revolution
AI	Artificial Intelligence
ALA	American Library Association
BA	Bachelor of Arts
BIS	Bachelor of Information Science
BLIS	Bachelor of Library and Information Science
BLISH	Bachelor of Library and Information Studies Honours
CAS	National Science Library of Chinese Academy of Science
CHE	Council on Higher Education
CHED	Centre for Higher Education Development
CHELSA	Committee of Higher Education Libraries of South Africa
CLIR	Council on Library and Information Resources
COIL	Collaborative Online Learning
Covid-19	Coronavirus
CSIR	Council for Scientific and Industrial Research
CSV	Comma Separate Values
DCC	Digital Curation Centre
DHET	Department of Higher Education and Training
DLF	Digital Library Federation
DLIS	Diploma in Library and Information Science
DS	Digital Scholarship
DUT	Durban University of Technology
GIS	Geographic Information System
HoD	Head of Department
HTML	HyperText Markup Language
HTR	Handwriting Text Recognition
ICA	International Council in Archives
ICTs	Information Communication Technologies
ID	Identity
IFLA	International Federation of Library Associations and Institutions
IoT	Internet of Things
IR	Institutional Repository

IS	Information Systems
IT	Information Technology
JISC	Joint Information Systems Committee
LAN	Local Area Network
LIASA	Library and Information Associations of South Africa
LIS	Library and Information Science
LMS	Learning Management Systems
M.IT	Master of Information Technology
MARC21	Machine-Readable Cataloguing
MLIS	Master of Library and Information Science
MOOCs	Massive Open Online Courses
MRC	Medical Research Council
MS	Microsoft
NCRE	National Committee for Research Ethics
NLSA	National Library of South Africa
NQF	National Qualifications Framework
NRF	Nation Research Foundation
OA	Open Access
OCR	Optical Character Recognition
OERs	Open Educational Resources
ORCID	Open Researcher and Contributor Identification
PAIA	Promotion of Access to Information Act
PDPs	Personal Development Plans
PGDLIS	Postgraduate Diploma in Library and Information Science
PhD	Doctor of Philosophy
POPI	Protection of Personal Information Act
QA	Quality Assurance
RDA	Resource Description and Access
RDM	Research Data Management
SAILIS	South African Institute for Librarianship and Information Science
SALA	South African Library Association
SANLiC	South African National Library and information Consortium
SAQA	South African Qualifications Authority
SPU	Sol Plaatje University

SRC	Students' Representative Council
SSPS	Statistical Package for the Social Sciences
STEM	Science, Technology, Engineering, and Mathematics
T & L	Teaching and Learning
UCT	University of Cape Town
UFH	University of Fort Hare
UJ	University of Johannesburg
UK	United Kingdom
UKZN	University of KwaZulu-Natal
UL	University of Limpopo
UNISA	University of South Africa
UP	University of Pretoria
US	United States
UWC	University of Western Cape
UZ	University of Zululand
VR	Virtual Reality
WITS	University of Witwatersrand

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CHAPTER ONE
INTRODUCTION AND BACKGROUND

1.1   INTRODUCTION

At the dawn of the Fourth Industrial Revolution (4IR), libraries have a significant role to play in developing and sustaining effective practices through digital scholarship (Ogburn 2012; Raju 2013; Miller 2017; Wood & Evans 2018; Ayinde & Kirkwood 2020). The nature of scholarly communication and other information-related functions have changed mostly as a result of the introduction of digital scholarship in library and information services. Sinclair (2014), Wexelbaum (2016) and Raffaghelli (2017) make the point that digital scholarship is an emerging trend in various disciplines that include, but are not limited to, the humanities, the social sciences, and the science, technology, engineering and mathematics (STEM). Wexelbaum (2016) further indicates that academics are teaching students new forms of research, rhetoric, expression and visualisation of data using imaging media. In line with developments on the academic side, libraries are expected to have spaces to accommodate new emerging community needs of this kind (Ogburn 2012; Sinclair 2014; Wexelbaum 2016; Raffaghelli 2017). In support of these views, Ogburn (2012) points out that technological advancements and evolving scholarly practices have encouraged librarians to dedicate resources to the curation of the digital assets, data management, publishing and intellectual property assistance that form part of digital scholarship.

Digital scholarship is referred to as the use of digital evidence and methods, authoring, electronic publishing, computational curation and preservation, and digital use and reuse of scholarship (Rumsey 2011; Weller 2011; Kinash, Knight & McLean 2015; Wexelbaum 2016; Raffaghelli 2017; Scanlon 2018; Iqbal & Yadav 2021). Along the same lines, digital scholarship is perceived as a scholarship that started with the emergence of the internet and Web 2.0 technologies and has been influenced by the fast technologies brought about by the 4IR, also known as the industrial revolution 4.0 (Rumsey 2011; Wexelbaum 2016; Marr 2018). Wexelbaum (2016) and Ayinde and Kirkwood (2020) note that institutions of higher education seeking to promote interdisciplinary study and research and to defend the relevance of the humanities and the social sciences, encourage the integration of STEM (computer science in particular) and the humanities (Wexelbaum 2016; Iqbal & Yadav 2021). This aids in discovering new ways of communicating information to people through media and

technologies. Iqbal and Yadav (2021) indicate that human beings must persistently improve their skills set to remain relevant in terms of knowledge during this revolution.

Mardiana (2019) posits that with the Fourth Industrial Revolution (4IR) in progress, education has to match the demands of the job market. The market needs graduates with competitive technological skills relevant to the 4IR. Technology has a significant impact on higher education, as it has become the core differentiator attracting students and corporate partners (Economist Intelligence Unit 2008). Penprase (2018) points out that, globally, education has been influenced by all the industrial revolutions. Each time a new industrial revolution presents itself, the education curriculum changes, thus illustrating that revolutions carry economic power (Penprase 2018). As a result, the failure of universities to channel their education to be in line with the job market could result in poorly skilled graduates who are not fit for the job market. The implication is that, with the introduction of fast technologies such as the Internet of Things (IoT), as illustrated in Figure 1 on page 4, education in general has to change to suit the needs of the job market (Mardiana 2019). These technologies are at the epicentre of digital scholarship, as indicated by Rumsey (2011).

Rumsey (2011) mentions that the crucial part of digital scholarship is the effort to enforce digital media and social media as credible, professional, and legitimate approaches to research and communication among scholarly communities. The huge volumes of information consisting of born-digital and digitised information are accessible through web platforms to provide scholars with an opportunity to connect more deeply and broadly across time and geography without significant barriers (Ogburn 2012; Wood & Evans 2018; Ayinde & Kirkwood 2020). Rumsey (2011) suggests that education and training based on the new skills, including conventional literacies, should be incorporated into graduate and post-graduate education programmes to provide for the life-long learning needs of the library and information science (LIS) profession based on digital scholarship. However, the question asked in the United State of America (USA) by Harris-Pierce and Liu (2012) of whether LIS schools are adequately addressing the growing need to educate future librarians on digital scholarship in the 4IR still stands for LIS schools in South Africa. Raju (2017b) suggests that LIS schools should embark on teaching contents on a digital scholarship to prepare their information specialist to be competitive and to survive in a dynamic digital library environment.

Chisita (2009) highlights the need to invest in LIS education that is more market driven, techno-perineural in approach, and competency-based. According to Chisita (2009), investments in LIS education will enable institutions to produce graduates who are adequately equipped with the relevant knowledge and skills to tackle job-related problems as well as other socio-economic and technological challenges. Additionally, this implies that LIS schools should always be well informed about the changing nature of scholarship across the globe to ensure that they offer proper curricula in line with technological developments in the information landscape. Rumsey (2011) indicates that libraries, archives and museums are adapting additional digital scholarship responsibilities and publishing content on the web, which implies that LIS schools should take the initiative to ensure that the skills, knowledge and competencies acquired by graduates empower them and give them a competitive advantage in the job market. Scholarly communication in the 21st century changed because of the proliferation of digital technologies scholarship; hence, scholarly communication can hardly occur without digital scholarship tools (Rumsey 2011; Wexelbaum 2016).

Digital scholarship tools are ubiquitous and they are affecting all facets of society, resulting in a power shift. Furthermore, this implies a shift in the paradigm that term the 4IR (Schwab 2016; Xing & Marwala 2017; Schwab 2018). The 4IR is characterised by the revolution of fast-changing technologies, including physical (intelligent robots, autonomous drones, driverless cars, 3D printing, and smart sensors) and digital (the IoT, services, data, and people) that brought about changes in the way people work and learn things (Xing & Marwala 2017; Marr 2018; Du Preez 2019; Ayinde & Kirkwood 2020). Ayinde and Kirkwood (2020) affirm that for people to survive and embrace the 4IR, they will have to skill and re-skill themselves. They further indicate that continuous education and training on technology would ensure that employees are not replaced by smart technologies (Marr 2018; Schwab 2018; Lekhanya 2019; Tsekeris 2019; Ayinde & Kirkwood 2020). Re-skilling will ensure that employees are capacitated to take over when machines are defective. The major features of the 4IR are illustrated in Figure 1 on page 4:
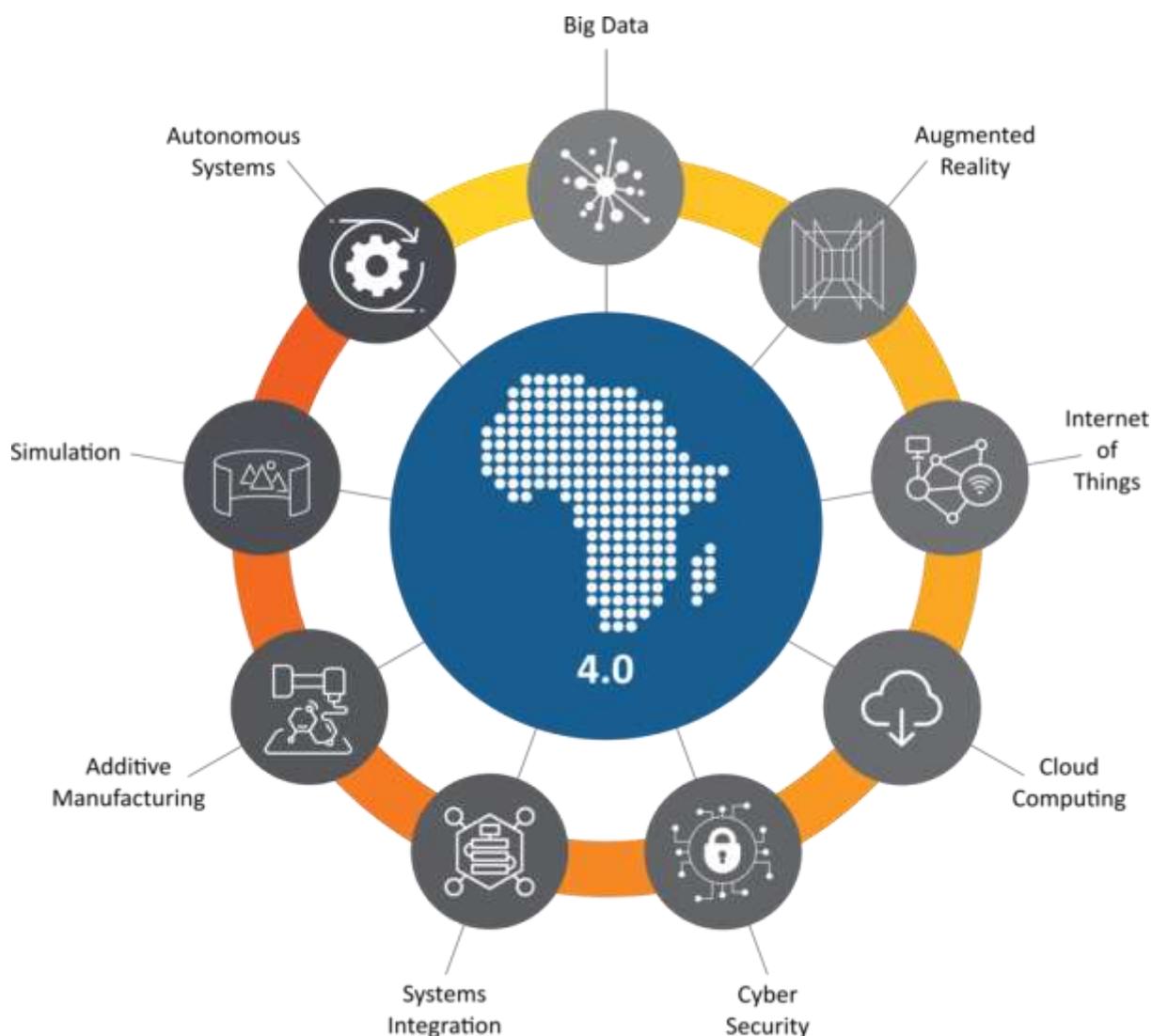
Figure 1: Features of the 4.0 (Data Courtesy: LCR4.0, 2019 in Du Preez 2019)

Libraries are continuously embracing the 4IR through practising digital scholarship duties (Sinclair 2014). As outlined by Raju (2015) such duties include metadata handling, digitation, managing institutional repositories, research data management and scholarly communication. Most college faculties lack digital scholarship expertise brought by the 4IR such as web design, computer programming, text coding, geographic systems and mapping, data analysis and storage, app development, online gaming, and 3D animation (Wexelbaum 2016). It also compels digital scholarship librarians to acquire skills from computer science disciplines.

Xu, David and Kim (2018) criticise the 4IR for yielding great inequality, particularly in its potential to disrupt labour markets. Hence, most candidates for employment may not have the required skills. Partridge and Yates (2012) affirm that building a dynamic curriculum that accommodates the dynamic demands of a snowballing comprehensive and diverse employment

landscape is required. They further remark that this change will help meet the current and future requirements for the dynamic LIS profession. It is also stated by Raju (2017a) that it is worth knowing and understanding the current trends, best practices, and models for the creation, publication, dissemination, and preservation of research writings and other scholarly output for future use. LIS schools may contribute to the understanding of such content in the provision of the curriculum. Raju (2015) suggests that LIS schools should offer content on creating and providing access to digital documents and data, metadata handling, managing institutional repositories (IRs), digital curation, and research data management (RDM).

On the other hand, Finlay, Tsou and Sugimoto (2015) note that jobs requiring digital scholarship skills, knowledge, and competencies are increasing, thus creating demand for skilled human expertise. Furthermore, this reflects the dire need for LIS schools in general and in South Africa in particular to incorporate digital scholarship as an emerging trend in scholarly communication.

LIS schools should provide comprehensive education which is aligned with the job market and improve the quality of information services across the spectrum. The Department of Arts and Culture (2014) in the LIS transformation charter highlights the importance of vibrant South African LIS schools in improving the educational systems in the country. This implies that LIS schools need to ensure that their curricula are in line with the changing job market. Generally, LIS education has changed over time because of the emergence of information communication technologies (ICTs) in African countries and globally, as demonstrated by Raju (2003), Onyancha and Minishi-Majanja (2009), Raju (2013) and Munyoro (2014). Munyoro (2014) notes that, in Zimbabwe, LIS education has changed due to the ICT revolution. Munyoro (2014) further opines that the technological revolution has affected the quality of training offered by LIS schools to the information professionals. The impact of ICTs in the education and training of librarians is critical because technology permeates every aspect of professional growth in the LIS field.

Munyoro (2014) and Raju (2015) caution that the rival disciplines such as business management, computer science, and information systems (IS) may invade LIS education and training from its established cognitive domain. Digital scholarship is more visible in the labour market, mostly in academic and special research libraries that are technologically endowed and

serve a globally competitive academic community. Therefore, this study focuses on skills and knowledge relevant to digital scholarship librarians.

The study targeted all LIS schools in South Africa, purposively selected academic libraries, and selected special research council libraries in South Africa. There is no agreement on the actual number of LIS schools in South Africa. Ocholla and Bothma (2007) point out that there was a reduction in the number of LIS schools in South Africa, from 18 to 12. However, Raju (2014), Maluleka and Onyancha (2016) and Ngulube and Ukwoma (2019) state that the actual number is ten. Raju (2014) and Maluleka and Onyancha (2016) list these as University of Cape Town (UCT), University of the Western Cape (UWC), University of Limpopo (UL), University of KwaZulu-Natal (UKZN), University of South Africa (UNISA), University of Fort Hare (UFH), Durban University of Technology (DUT), Walter Sisulu University, University of Zululand (UZ), University of Pretoria (UP) and University of Johannsburg (UJ).

The study also targeted academic and special research council libraries to gain an insight into the employers and employees regarding LIS education based on digital scholarship. The study purposively selected academic libraries within the universities where LIS schools were based. The national research council libraries included the Nation Research Foundation (NRF) Library, Medical Research Council (MRC) Library, and the Council for Scientific and Industrial Research (CSIR) Library.

The rest of the chapter is illustrated in Figure 2.
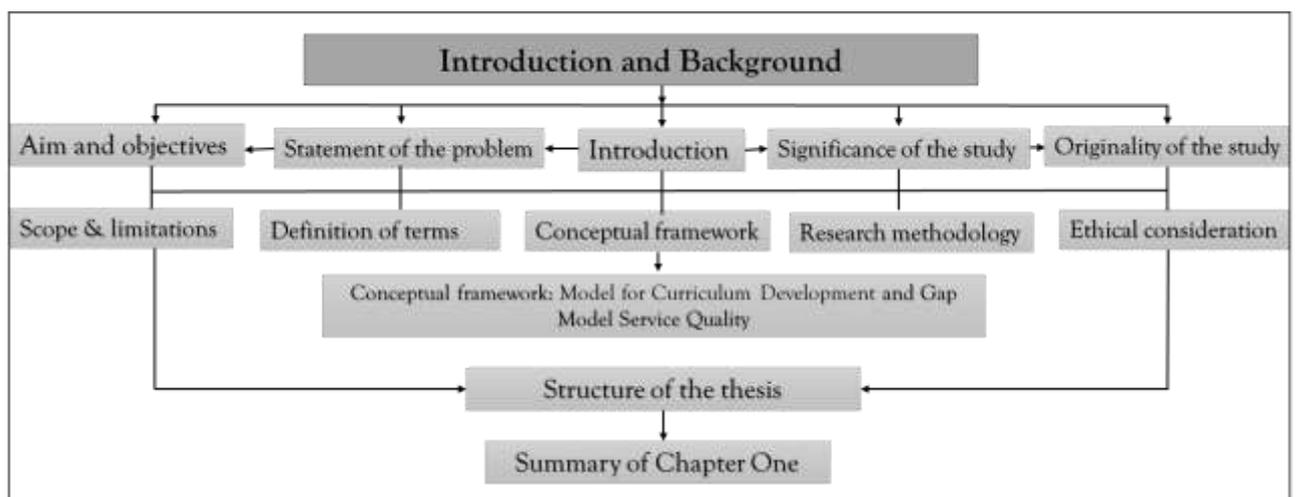
Figure 2: Mapping Chapter 1

1.2   STATEMENT OF THE PROBLEM

Organisations are operating in the 4IR, which places a premium on digital data (Sinclair 2014; Schwab 2016; Tzoc 2017; Du Preez 2019). Information professionals must be equipped with digital skills to enable them to effectively organise information and provide access to digital information. This implies that educational providers such as LIS schools must be aware of these technological imperatives when providing their services. Due to the expectations of the job market and changing highly digitised information environment, LIS schools in the digital age are expected to offer an education that includes digital scholarship skills and knowledge. Digital scholarship skills and knowledge directly affect the quality and competitiveness of LIS education in South Africa (Munyoro 2014; Raju 2015).

Given the aforementioned arguments, the problem at hand is that the LIS schools in South Africa provide inadequate education in digital scholarship skills, knowledge and methodological competencies needed by students or librarians to perform their various duties in libraries and adapt to the changing environment. In support of this statement, Raju (2015), and Wood and Evans (2018) underscore that South African LIS schools are struggling to offer digital scholarship skills and knowledge needed in the digital environment. Evidently, the majority of LIS schools in South Africa remain behind in offering digital scholarship programmes and courses (Raju 2017b; Wood & Evans 2018). Consequently, a lack of provision of digital scholarship programmes and courses could negatively impact on job opportunities for LIS graduates. The literature reviewed highlighted that the failure to provide the necessary courses that offer competencies, skills and knowledge to support digital scholarship could lead to computer or ICT specialists and software engineers showcasing in the job market and displacing LIS professionals (Mathews & Pardue 2009; Harris-Pierce & Liu 2012; Raju 2015; Ayinde & Kirkwood 2020). Furthermore, this can also result in poor provision of library services due to a lack of digital scholarship core skills, knowledge and competencies required in the digital library environment.

Given this context, there is an urgent and critical need for LIS schools to offer digital scholarship courses to meet the dynamic needs of the job market. The survival of the library profession in South Africa is under threat because fewer LIS schools have incorporated content

on digital scholarship into their curricula (Wood & Evans 2018). LIS schools' curricula are a demand-driven process that should be responsive to the needs of the job market; hence, there is an urgent call for curriculum review and development to incorporate digital scholarship. In South Africa, numerous efforts have been made and solutions given by the LIS schools to align their programmes and courses to the digital scholarship and job market. This includes curriculum revision, re-development and revised curriculum frameworks. However, despite these diverse solutions, aligning programmes and courses to the digital scholarship and the job market remains a challenge in South African LIS schools. Although, many studies have proposed different frameworks and models for digital scholarships, none of these frameworks and models are applicable to enhance the curricula and courses offered by LIS schools in South Africa as they are about infusing digital scholarship in libraries or digital humanities centres and not in the LIS curricula. Therefore, the researcher recognised the gap in South African LIS education and training in digital scholarship as discovered during the analysis of the literature, which has spurred the need to analyse LIS education concerning digital scholarship content and develop a framework. The proposed framework serves a frame of reference to nudge South African LIS schools to reshape their curricula and programmes to be in line with the current digital dynamics and the job market, and to assist policy developers. Lastly, it will assist employers of graduates from LIS schools in deciding on the potential candidate(s) as the study also provides LIS schools that are offering proper digital scholarship education.

1.3   PURPOSE OF THE STUDY

The purpose of this study was to explore education and training of library and information science professionals in digital scholarship in South Africa with the view to recommending a context-specific framework.

1.4   OBJECTIVES OF THE STUDY

More specifically, the objectives of this study were to:

i.   Analyse the LIS school's curricula in South African LIS schools for digital scholarship content

ii.   Map the LIS curricula for digital scholarship content in South African LIS schools

iii.   Establish the perceptions of employers on the competencies of digital skills and knowledge among the LIS graduates

iv.   Examine the knowledge, competencies, and skills of the LIS graduates in digital scholarship

v.   Recommend a framework for re-/development of the programme structure with the inclusion of digital scholarship in South African LIS schools

1.5   RESEARCH QUESTIONS

The study sought to answer the following research questions:

i.   What is included in the LIS schools' curricula relating to digital scholarship?

ii.   What procedures do they follow in incorporating digital scholarship in the curricula?

iii.   What are the perceptions of the employers on the competencies of digital skills and knowledge among the LIS graduates?

iv.   What are the ideal knowledge, competencies and skills of LIS graduates?

v.   What framework can be proposed for the inclusion of digital scholarship content in LIS schools' curricula?

The research objectives and research questions are summarised and linked to the constructs in the conceptual framework and data collection methods in Table 1.

Table 1: Research dashboard

Research objectives	Research questions	Conceptual framework constructs	Data collection method
Analyse the LIS school's curricula in South African LIS schools for digital scholarship	• What is included in the LIS school's curricula relating to digital scholarship?	Curriculum assessment (Wolf's 2007 model)	Semi-structured interviews with: • HoDs • Lecturers • Academic/ special research council library directors

			• Digital scholarship librarians Content analysis: • Course outlines
Map the LIS curricula for digital scholarship content in South African LIS schools	• Do LIS schools incorporate contents on digital scholarship in South Africa? • What procedure do they follow in incorporating digital scholarship in the curricula?	Curriculum mapping (Wolf's 2007 model)	Semi-structured interviews with: • HoDs • Lecturers • Academic/special library directors • Digital scholarship librarians
Establish the perceptions of employers on the competencies of digital skills and knowledge among the LIS graduates	• What are the perceptions of the employers on the competencies of digital skills and knowledge among the LIS graduates?	Zeithaml, Berry and Parasuraman (1993) – Antecedents of both desired and predicted service	Interviews with directors of academic and special research council libraries
Scrutinise the knowledge, competencies and skills of the LIS schools' graduates for digital scholarship	• What are the ideal knowledge, competencies and skills of LIS schools' graduates? • Are these ideal knowledge, competencies and skills accommodative of digital scholarship functions?	Articulate attributes of the ideal graduate (Wolf's 2007 model)	Semi-structured interviews with: • Librarians • Directors of academic and special research council libraries

Recommend a framework for development or redevelopment of the programme structure with the inclusion of digital scholarship in South African LIS schools	• What is the framework in place for the inclusion of digital scholarship contents in LIS schools' curricula?	Curriculum development and re-/develop programme structure	Semi-structured interviews with: • HoDs • Lecturers • Academic/ special research council library directors • Digital scholarship librarians Content analysis: • Course outlines

1.6   JUSTIFICATION OF THE STUDY

Ballinger (2008) defines justification of the study as a rationale for conducting a study that includes the explanation on the design and methods employed in the study. The rationale is constructed and may illustrate how the research endeavour informs gaps in the existing knowledge base, adds new dimensions or views, or otherwise generates theory about a phenomenon that has never been explored before. There are three kinds of problems that lead to social research, namely policy problems, problems of social philosophy, and problems paramount to developing scientific disciplines (Chadwick, Bahr & Albrecht 1984; Ngoepe 2012).

The LIS profession is experiencing a paradigm shift, which means that LIS education must be in line with the trends in the job market. As outlined by Chadwick, Bahr and Albrecht (1984), this study addressed the problem essential to the development of LIS education as a scientific discipline. This study contributed to curriculum assessment and informed to what extent recurriculation should happen in LIS schools. Fundamentally, in the South African context, mostly in academic libraries, the daily functions of a librarian are digital scholarship driven (Raju 2014; Xing & Marwala 2017). On the other hand, little evidence is available on whether LIS schools provide content on digital scholarship, which is attributed to a shift in the paradigm. Munyoro (2014) and Raju (2015) note that new LIS graduates apply for jobs that they do not qualify for, which implies that LIS education lacks requisite competencies for the

job market. Raju (2015) proposes that LIS education must be aware of the new diverse trends of the profession. These trends include the creation and provision of access to digital documents and data, metadata handling, managing IRs, digital curatorship and RDM. This study explored whether LIS schools have incorporated such content in their curriculum since there was no comprehensive study that explored such a phenomenon in the LIS curricula. The question can also be asked whether they have resources for teaching digital scholarships, such as competent lecturers and equipment. Besides, the study sought to identify the digital scholarship skills, knowledge and competencies among the lecturers.

In a broader sense, the outcomes of this study will benefit LIS schools in South Africa by adding to the existing body of knowledge based on LIS education, more specifically, on digital scholarship and scholarly communication. Through the framework developed by the researcher, this study provided insights into how important digital scholarship is to the content of the LIS curriculum. Moreover, this study enlightens employers about LIS schools' graduates and academic libraries about the quality of the graduates with regard to skills and knowledge. This will help employers to make informed decisions when employing e-research or digital scholarship librarians.

1.7   ORIGINALITY OF THE STUDY

The University of Melbourne (2017) states that the major requirement in the assessment of postgraduate scholarly work at postgraduate level is the extent of originality and contributions to the existing body of knowledge. On the same note, Blaxter, Hughes and Tight (2001) indicate that most research conducted for a university degree should reflect some form of originality. Creswell (1994), Ngoepe (2012), Clarke and Lunt (2014), and Mhlongo (2018) emphasise that the originality of the study is determined by its potential to add value to the existing scholarly research and new literature in the field of study, improvement of policies and practice in the particular field of speciality. Finn (2005) and Mhlongo (2018) are in consensus that the originality of the study has to be identified through analysing the nature of the research question, the effectiveness of the methodology employed, and the evidence of critical evaluation. Tinkler and Jackson (2004), and Clarke and Lunt (2014) posit that although the significance of the study is not part of originality, it is crucial to note that original research at doctoral level must provide knowledge of significance to the field of study.

Some studies have been conducted in the South African context on the change of the labour market with a specific focus on academic or research libraries amidst digital scholarship (Raju 2014; Raju 2017a). The current study supplements the survey papers of Raju (2015) and Raju (2017b) that target heads of departments (HoDs) of LIS schools based in South Africa. Raju's (2015) study examined ICTs inclusion in the LIS curriculum. Besides the study by Raju (2015), not much has been done in studying whether LIS schools provide inclusive education on digital scholarship content, as it directly enforces processes involved in scholarly communication in the 4IR. The approach employed to conduct this study distinguished it from any previous studies since the researcher used in-depth data collection methods to collect data from LIS schools in South Africa. Despite these studies having been conducted, since 2015 there have so much change in the information landscape occasioned by rapid technological changes that require LIS schools to periodically review their curricula.

Raju (2015) and Raju (2017b) used a survey research design through questionnaires to collect data from HoDs of LIS schools on the incorporation of the emerging trends in the LIS curriculum. Although this study seems to be a replication of the study done by Raju (2017b), it was different in the approach used and the focus of the study. The current study used semi-structured interviews with HoDs and lecturers at the LIS schools, and the researcher triangulated that data with interviews from academic and special research council libraries' directors and digital scholarship librarians. Therefore, the researcher believed that this study would bridge the gap in the literature on the LIS curriculum concerning digital scholarship amidst the paradigm shift. In addition to that, the recommendations from Raju (2015) on the content of digital scholarship should be added by LIS schools.

1.8 SCOPE AND LIMITATIONS OF THE STUDY

Creswell (2003) states that limitations are evident in qualitative, quantitative and mixed method research, which implies that all studies have limitations. The focus of this study was on the LIS schools in South Africa. HoDs from the LIS schools in South Africa were interviewed as they assisted in identifying lecturers teaching courses relating to digital scholarship content. Lecturers teaching content on digital scholarship were interviewed. Content analysis of course material, for instance course outlines of LIS schools, was used to check whether content on digital scholarship was evident. However, to gain insightful data, the job market was included in this study. Directors of academic and special research libraries and digital scholarship

librarians formed part of the scope of this study. These digital scholarship skills, knowledge and competencies are also evident mostly in special research council libraries; therefore, e-content or digital scholarship librarians were interviewed. Specifically, the CSIR, NRF and MRC e-content or digital librarians were used for this study. Wolf (2007) states that all the key stakeholders affected by the curriculum have to be involved when assessing the LIS schools' curricula.

LIS professionals consist of librarians and archivists; however, their activities or job descriptions are different. As a result, the researcher limited the study to librarians in the academic and special research council since most LIS schools' programmes focus on training librarians as archivists in South Africa (SAQA 2009a). The context of this study was librarianship. The researcher initially aimed to use face-to-face interviews but, due to the novel coronavirus (Covid-19) regulations, the researcher had to change to virtual platforms. Zoom and Microsoft (MS) Teams were used to collect data, resulting in limited exposure to gestures and probes that were supposed to be captured during face-to-face interviews.

1.9   DEFINITION OF TERMS

The concepts or key terms described above are part of digital scholarship, as identified by Raju (2015). These concepts were used in this study and were defined in order to generate a common understanding and meaning in the context of this study. After they were defined in this section, they were used throughout the study and for content analysis when analysing data.

1.9.1   Digital scholarship

Lewis, Spiro, Wang and Cawthorne (2015) perceive digital scholarship as the process in which the creation, production, analysis, or publishing and dissemination (research processes) of the new scholarship takes place by using computerised tools. Mutula (2011), and Lewis et al. (2015) characterise digital scholarship as the research and tuition process whereby every step occurs online or electronically. In the context of this study the definition by Rumsey (2011) coupled with the ones provided here will be used to refer to digital scholarship.

1.9.2   Scholarly communication

Many scholars regard scholarly communication as the system through which research and other scholarly writings are created, evaluated for quality, disseminated to the scholarly population and preserved for future use (Steele 2014; Gullbekk 2016; Raju 2017a; Tella & Onyancha 2020). These activities have been digitised in the 4IR. Therefore, this forms part of digital scholarship components as it requires digital scholarship skills, knowledge and competencies.

1.9.3   Research data management

University of Pretoria (2017) data management policy describes RDM as the planning, organisation and preservation of the evidence that underpins all research conclusions. This college further indicates that effective and efficient data management ensures safe and reliable storage, retrieval and use to reproduce findings.

1.9.4   Digital curatorship

Digital curatorship embraces digital preservation, data curation and the management of assets over their lifecycle (Poole 2017). Poole (2017) further states that digital curatorship is also the design of a new digital approach for extracting meaning from traditional sources. Digital curatorship is part of the skills and knowledge required in the LIS field brought about by digital scholarship.

1.9.5   Digitisation

Namande (2012) refers to digitisation as the process of converting paper and other media in an existing collection to digital format to ensure multiple accesses to information, remote access for users, and effective information retrieval for users and sustainable preservation.

1.9.6   Metadata handling

Metadata is usually referred to as "data about the data" (Getty Research Institute 2008). Tech terms (2018) states that metadata for an article is information concerning the article, for example, bibliographic data such as authorship, article title, copyright year, and publication

date; descriptive material such as abstract and keywords; or any article identifying numbers. The article on metadata does not form part of the body text or graphics of the article but serves to identify or describe the article.

1.9.7 Institutional repository

Crow (2002) defines an institutional repository (IR) as the digital collections capturing and preserving the intellectual output of a single or multi-university community. This collection is a critical component in reforming the system of scholarly communication, extending access to research and ensuring that quality is ensured in scientific scholarship (Tella & Okunloye 2020).

1.9.8 Digital librarianship

Digital librarianship is an emerging concept for librarians who have skills and knowledge of creating and managing digital collections and services. Choi and Rasmussen (2009) define a digital librarian as the one that encompasses knowledge of imaging technologies, optical character recognition, mark-up language and metadata handling.

1.9.9 Digital ecosystem

It is about the connection of data sets with algorithms and analysis in order to create insights. In order for digital ecosystem to occur a well-designed infrastructure to facilitate data exchange, processing and visualisation (King 2018).

1.10 CONCEPTUAL FRAMEWORK

This study generated a conceptual framework, as the nature of the study could not be covered by one model or theory. Ngulube (2018) indicates that when more than one theory or model is used, the product is a conceptual framework and when one theory is used in a study, it can be called a theoretical framework. The conceptual framework is one of the crucial aspects of the research process; however, most doctoral students experience challenges to infuse it into their doctoral studies (Grant & Osanloo 2014). Ngulube (2018) defines the conceptual framework as the holder or glue that keeps the components of social research together because, without it, the research design disintegrates. Ngulube (2018) further states that the conceptual framework

provides focus and direction to empirical research. This implies that the success of empirical social research is grounded in the conceptual framework.

The researcher identified two frameworks for this study. However, frameworks seem to present many uncertainties that can hinder the interpretations of the research at hand. These frameworks are only concerned about digital scholarship and its development, and they do not reflect how the phenomenon is included in the LIS curriculum. These frameworks include the 5S theoretical framework by Suleman and Fox (2001) and a theoretical framework for researching the sustainability of digital scholarship curation by Rieger (2010).

These frameworks are rigid since they are devoid of constructs that address the needs of the research at hand. These frameworks are about digital scholarship; however, they are not about integrating digital scholarship into the education system. For instance, Rieger (2010) has three constructs, which are: ICTs use and assessment embedded in academic and social practices and norms of humanists; ICTs exhibit duality enabling and constraining effects; and ICTs are dynamic and adaptive and the ability to be interpreted and used in multiple configurations. These constructs are ICT based but they fail to accommodate the curriculum perspective of the study. Suleman and Foxs' (2001) model is about building digital libraries to enhance digital scholarship, but not teaching it to aspiring librarians or information professionals.

As indicated above, this study used constructs from two models to achieve its purpose. It used part of the constructs from Wolf's (2007) model (addressing LIS education) and a construct from Zeithaml, Berry and Parasuraman (1993) relating to perceptions of employers; therefore, a conceptual framework was employed to address the research questions of this study. The detailed discussion of the conceptual framework can be found in Chapter Two of this study

1.11 RESEARCH METHODOLOGY

Different research approaches in scientific research are used such include quantitative, qualitative and mixed methods research (Bryman 2012; Creswell 2014; Ngulube 2015b; Creswell & Creswell 2018). Goulding (2002) expresses that the choice of research methodology is a difficult one and it should be based on the researcher's convictions, beliefs and interests. Furthermore, Buchanan and Bryman (2007), and Bryman (2012) reveal that the choice of the research methodology is informed by the aim of the research, epistemological

concerns and norms of the practice of the researcher, as well as previous work conducted on the topical area. The study This research used a qualitative research approach as it sought to understand the perceptions, opportunities and challenges of the LIS community regarding digital scholarship education in South Africa. The study adopted a multiple case study design and semi structured interviews with the participants and content analysis of the course outlines were used as data collection tools. Participants were selected purposively and data was analysed thematically. The detailed discussion of the research methodology is provided in Chapter Three of the study, which discusses the philosophical assumptions, research approach, research design and data collection procedure, data collection methods and data analysis methods that were used by the researcher in this study.

1.12   ETHICAL CONSIDERATIONS

Flick (2009) defines ethics as norms or standards of behaviour that control moral choices and interaction with others in research. The National Committee for Research Ethics (NCRE) in Norway (2006) defines research ethics as a complex set of values, institutional schemes and standards that help constitute and regulate scientific activities.

UNISA provides guidelines and policy documents that show what ethical considerations the researcher should follow (University of South Africa 2013). These documents ensure that the researcher avoids plagiarising and malevolent acts that harm participants and non-participants physically or emotionally. For this research, participants were respected in terms of confidentiality. The researcher ensured that a letter from UNISA was submitted to those who were interviewed. All documents or materials used were cited or acknowledged correctly.

More specifically, an ethical clearance certificate (see appendix E) was issued by the University Ethics Committee, which approved that the study could be conducted. The ethical clearance certificate, the interview schedules (see appendices A, B, C & D), the short proposal, informed consent (see appendix I) and the letter of introduction (see appendix F) were sent to all LIS schools in South Africa. Permission letters were received from the institutions in question (see Appendix G with sub-appendices from A to H & appendix H with sub-appendices from A to B) and are appended to this study. This section is comprehensively discussed in Chapter Three of the study.

1.13 ORGANISATION OF THE THESIS

This study is organised into six chapters. The chapters include the introduction and background; literature review chapter inclusive of the conceptual framework; research methodology; data analysis and presentation of findings; discussion of the findings; and summary, conclusions, and recommendations of the study. Each chapter contains all three components of what makes up a chapter, which are an introduction, a body and conclusions.

Chapter One: Introduction and background

This chapter presents the introduction to the study; statement of the problem; aim, objectives and research questions of the study; limitations and delimitations of the study; the significance of the study; originality of the study; summary of the methodology used; definition of important terms; ethical consideration and the structure of the study.

Chapter Two: A literature review on digital scholarship and conceptual framework

This chapter comprises two sections: the conceptual framework and the literature review. The conceptual framework is composed of a model by Wolf (2007) which deals with curriculum re-/development in higher education and the Gap Service Quality Model. These frameworks present all the constructs the researcher investigated. However, the researcher only used certain constructs of the models to develop the conceptual framework used in this study. The section that follows provides a comprehensive review of existing empirical literature concerning digital scholarship education worldwide, continental and national. The researcher reviewed literature from books, book chapters, journal articles, conference proceedings, and other available information sources used for the study at hand. This chapter identifies gaps presented by the current literature on LIS schools based on digital scholarship.

Chapter Three: Research methodology

This chapter details the methodology and methods used for this research. The chapter consists of the section on philosophical perspective (interpretivism paradigm); research strategies (inductive); research approach (qualitative research); research design (multiple case studies); population and sampling technique; data collection instruments (interviews and document

analysis); trustworthiness of the findings; data analysis; ethical considerations and evaluation of the study.

Chapter Four: Presentation of findings

This chapter presents the findings of the study collected through content analysis and semi-structured interviews. Data were analysed using thematical analysis through the aid of the ATLAS.ti 9 software. This chapter is organised in accordance with the research objectives. Data from LIS schools were analysed first while data from the job market followed.

Chapter Five: Interpretation and discussion of findings

The findings of the study are analysed and presented in Chapter Five. Theories and relevant literature are used to discuss the findings of the study. The chapter is organised according to research objectives or themes used to present data in Chapter Four.

Chapter Six: Summary, conclusions and recommendations

This chapter provides a summary of the findings, conclusion of the study and recommendations. Furthermore, a proposed framework on the infusion of digital scholarship in the LIS curriculum is provided. This chapter is based on the objectives and the summary of the study. It also gives general conclusions and, lastly, the recommendations of the study. The chapter is wrapped up by providing the implications of the study findings and the suggestions for future research.

1.14   SUMMARY OF CHAPTER ONE

Providing background on the burning issue being investigated is very important for the reader. Therefore, Chapter One introduced the study and provided a conceptual and contextual background of the study regarding digital scholarship education in South Africa. The chapter further provided the statement of the problem, aim and specific objectives of the study. The justification, originality, scope and limitation of the study were discussed. The conceptual frameworks and research methodology were outlined in this chapter to be later discussed in Chapters Two and Three, respectively. The procedures for conducting ethical research were

also provided in this chapter. The next chapter presents the literature review, together with the conceptual framework of the study.

CHAPTER TWO
LITERATURE REVIEW ON DIGITAL SCHOLARSHIP
AND CONCEPTUAL FRAMEWORK

2.1   INTRODUCTION

The preceding Chapter One set the scene by providing the background for the aim of the study, which was to explore education and training of the LIS professionals in digital scholarship in the LIS curriculum in South Africa. Chapter Two of this study presents a detailed review of existing empirical and conceptual literature on education and training of the LIS professionals on digital scholarship. Several scholars outlined the purpose of a literature review from different perspectives. Among others is that the purpose of the literature review is to locate the research project to form its context or background and to provide insights into previous work (Blaxter, Hughes & Tight 2001; Bryman 2012; Flick 2014; Snyder 2019). Another purpose of the literature review, as indicated by Flick (2015) is to select available documents (both published and unpublished) on the topic of interest, gather information, ideas and evidence written from a particular standpoint, and effectively evaluate these documents in relation to the proposed theme. Blankenship (2010) avows that the purpose of literature review in research is to gather scholarly information about the research topic so that the researcher can build the foundation knowledge related to the study.

Grant and Booth (2009) and Snyder (2019) perceive a literature review as "published materials which offer an examination of recent or current literature. Literature review covers a wide range of subject matter at various levels of completeness and comprehensiveness based on analyses of literature that may include research findings". In the same vein, Ridley (2012) echoes that literature reviews are comprehensive studies and interpretation of literature relating to a particular topic under investigation. The literature review connects the ideas of the researcher with other researchers' ideas.

The literature for this study focuses on LIS schools' education in the wake of digital scholarship skills, knowledge and competencies brought about by the 4IR in the LIS sector. The literature review is based on the objectives of the study derived from the conceptual framework based on Wolf (2007) and the Gap Service Quality Model by Zeithaml, Parasuraman and Berry

(1991). The literature review begins with the discussion of a conceptual framework and then provides literature based on the research objectives.

2.2   MAPPING LITERATURE REVIEW

Creswell (2014) states that step number five of conducting a literature review is designing a literature map. Creswell (2014) describes literature mapping as "the process whereby the researcher draws a visual picture of the literature by assembling the literature being searched on the topic". The ultimate goal of literature mapping is to show the eventual contribution of the study to literature (Creswell 2014). Figure 3 represents the literature mapping for this study.
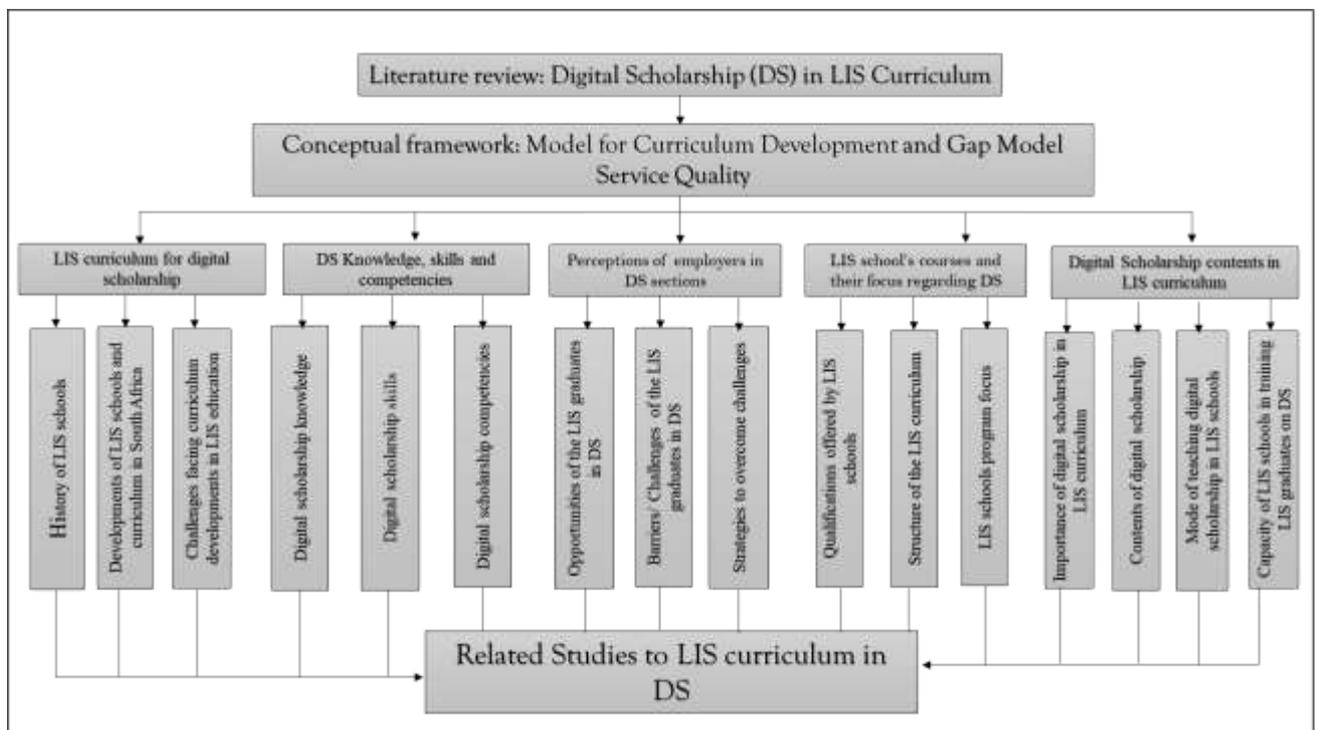
Figure 3: Mapping literature review

2.3   IMPORTANCE OF LITERATURE REVIEW

Literature reviews are the backbone of each and every academic piece of work. Seuring and Gold (2011) claim that condensed literature review permits the grounding of a researcher's work on the context of existing research and highlight certain scholarly contributions in the research field. Along the same lines, Rhoades (2011) affirms that good literature reviews are essential because they represent an important scientific contribution, strengthen advocacy and

capacity, and facilitate the direction of research by pointing out what needs to be done. In addition, literature reviews, whether in a paper, dissertation or thesis, provide a historical background for the research and offers an overview of the current status or context on which the research problem is based by referring to contemporary trends, issues and questions in the field of study (Ridley 2008). Ridley (2008) categorises the following purposes which indicate the importance of literature review in a thesis:

- Discusses relevant theories and concepts which underpin one's research
- Introduces the relevant terminology and offers definitions to clarify how terms are being used in the context of the researcher's work
- Discusses related research in the field and shows how the work extends or challenges this, or addresses a gap in work in the field
- Supports evidence for a practical problem or issue the research is addressing, thereby underlining its significance.

Scholars agree that when the existing literature in the topical area is critically reviewed, it places the researcher in an advantageous position to spot trends, challenges and activities, as well as empirical weakness and strengths in other researches (Pugh & Phillips 2005; Ridley 2008; Randolph 2009). Therefore, the literature reviewed by the researcher aided in identifying the constructs of the conceptual framework that informed the objectives of the study.

2.4   TYPOLOGIES OF LITERATURE REVIEW

Boot and Beile (2005) and Randolph (2009) emphasise the number of poorly developed literature reviews due to the lack of published literature on how to undertake this process. This claim is affirmed by the discrepancies available in literature about the types of literature review, as various types of literature review are evident in the literature. However, there are six types of literature review that appear to be dominant in the extant literature. These types of literature reviews include, but are not limited to, systematic literature review, critical literature review, meta-analysis, narrative literature review, state-of-arts review and scope literature review (Mouton 2001; Grant & Booth 2009; Randolph 2009; Rhoades 2011). Rhoades (2011) articulates that every type of literature review must have definite steps it adheres to. The steps adopted from Rhoades (2011) include:

- defining the topic or research question

- identifying the relevant information: inclusion or exclusion of criteria and keywords

- conducting the literature search

- screening all and excluding the irrelevant studies

- scrutinising the relevant studies

- extracting the data and developing graphic organisers

- synthesising the findings

- developing conclusions and recommendations.

Although many literature reviews were identified in the extant literature, one type of literature review was selected and utilised for the purpose of this study. Critical literature review was used in reviewing the literature embodied in the education and training of library and information science professionals. Grant and Booth (2009) perceive critical literature review as the type in which extensive research has been done on the literature and critical evaluation of quality searches has been conducted. Mouton (2001), and Grant and Booth (2009) observe that the function of a critical literature review is to present, analyse and synthesise material from diverse sources with an ultimate goal of manifesting a hypothesis or developing a model. The current study's ultimate goal was to recommend a framework for inclusion of digital scholarship content into LIS curricula in South Africa. Therefore, this type of literature review was regarded relevant for this study.

2.5   CONCEPTUAL FRAMEWORK

The conceptual framework underpinning this study was based on the models of Zeithaml, Berry and Parasuraman (1993) and Wolf (2007). The conceptual framework is one of the crucial aspects of the research process; however, most doctoral students have challenges in infusing it into their doctoral studies (Grant & Osanloo 2014). Ngulube (2018) defines a conceptual framework as the holder that keeps the components of social research together, in the sense that, if it is not there, the research design falls apart. On the same lines, Jabareen (2009) views conceptual framework as a network or a "plane" of interlinked concepts when combined provides a comprehensive understanding of a phenomenon or phenomena being explored. Sinclair (2007) exemplifies a conceptual framework as a map, or a travel plan, acquired from

the experiences of previous travellers that guides one to achieve the purpose of the research. In order to devise the suited conceptual framework for the study, literature must be widely consulted (Sinclair 2007; Green 2014). The conceptual framework provides focus and direction to empirical research (Ngulube 2018). This implies that the success of an empirical social research is grounded on the conceptual framework. Green (2014) further suggests that there is ongoing confusion because the terms conceptual and theoretical framework are used interchangeably among novice researchers. Although there are differences between conceptual frameworks, they still serve one sole purpose – are used to simplify thinking, structure work, clarify issues and provide a common reference point (Jacobs 2016; Poschin-Young, Haines-Young, Görg, Heink, Jax & Schleyer 2018). Therefore, it is a necessity to differentiate these terms in a study prior to using them.

A framework is generally considered to be a map for a study that provides a rationale for coming up with research objective or questions. Green (2014), Ngulube (2018) and Varpio, Paradis, Uijtdehaage and Young (2020) distinguish a conceptual framework from the theoretical framework by stating that when the researcher uses one theory in a study, it can be labelled a theoretical framework; however, when different models or frameworks are used in one study, it becomes a conceptual framework. Using concepts or constructs from different models or theories to guide a research project qualifies a conceptual framework (Parahoo 2006; Green 2014). Ngulube (2018) further indicates that when a researcher uses parts of a model or theory, it is a conceptual framework. This study followed this notion by Ngulube (2018). The conceptual framework justifies the need for the research through logically developed arguments and shapes the study design (Varpio et al. 2020) which, in this case, motivated for a multiple case study. Hence, multiple LIS schools, and academic and special research council libraries were explored to achieve the purpose of the study.

More specifically, this study used part of the constructs from Wolf's (2007) curriculum development model to inform the conceptual framework of the study. Nonetheless, the Wolf (2007) model alone was deemed insufficient, as it does not address the perceptions of the employer of LIS graduates. In the same vein, the Gap Service Quality Model, also known as the generic model of customer expectations, by Zeithaml, Berry and Parasuraman (1993) accomplished the conceptual framework of this study. Specifically, a construct of the Gap Service Quality Model on customers experiencing different services from what they have expected or antecedents of both desired and predicted service was used to examine the

perceptions of the employer of LIS graduates (Zeithaml, Parasuraman & Berry 1990; Zeithaml, Berry & Parasuraman 1993).

Based on the reasons mentioned above, the researcher identified the two models: the model by Zeithaml, Berry and Parasuraman (1993) and the model by Wolf (2007). The Wolf (2007) model formed the basis of the conceptual framework that informed this study, while the Gap Service Quality Model assisted in extracting concepts that were used to assess the perceptions of employers of LIS graduates. LIS graduates are considered to be customers of LIS schools who are employed by information centers. Therefore, it was pertinent to seek perceptions of employers of LIS graduates on the relevance towards digital scholarship jobs.

The model by Wolf (2007) facilitates the curriculum development in higher education and consists of constructs that permit the researcher to identify, analyse data and gather the desired results. This approach is faculty driven, data informed and educational developer supported. The framework by Wolf (2007) consists of three major processes, namely curriculum visioning, curriculum development and alignment, coordination and development, which are presented in Figure 4.

As indicated above, Wolf's (2007) model could not address all the objectives of this study. As a result, certain constructs of the Gap Service Quality Model by Zeithaml, Berry and Parasuraman (1993) bridged the gap in formulating a complete conceptual framework for this study. The Gap Service Quality Model articulates the nature and determinants of customer expectations of services (Zeithaml, Berry & Parasuraman 1993). In the context of this study, the customers of LIS schools are employers of librarians, specifically for digital scholarship librarians. This model assisted in mining perceptions of customers as far as the service of the company in question is concerned. Zeithaml, Parasuraman and Berry (1990) list the following four major constructs of this model in the form of gaps:

- Gap 1: not knowing what customers expect
- Gap 2: the wrong service-quality journey
- Gap 3: the service performance gap
- Gap 4: when promises do not match delivery

These authors later came up with revised constructs for the model, the functions of which are similar to those mentioned above. The revised model includes: the expected service component, antecedents of desired service, antecedents of adequate service and antecedents of both desired and predicted service (Zeithaml, Berry & Parasuraman 1993). Specifically, construct number four was used for this study, as it is more relevant in mining employers' perceptions of their experiences with LIS schools' graduates regarding digital scholarship. Zeithaml Berry and Parasuraman (1993) indicate that antecedents of the desired and the predicted service encompass explicit service promises, implicit service promises, word-of-mouth communication and past experiences. These antecedents assisted in mining the perceptions of employers of librarians.

Curriculum Visioning

Curriculum Assessment → Develop SWOT Analysis → Stakeholders: faculty, staff, students alumni, employers, graduate programs, community, and so on

Data collection: focus groups, surveys, interviews, and so on, with stakeholders

Program Objectives Re/Development → Articulate attributes of the 'Ideal Graduate' → Domains: cognitive, affective, psychomotor

Program Focus → Identify foundational content

Identify desirable educational experiences → Pedagogies: service learning, co-ops, placements, international, distance ed., hybridized, labs, seminars, tutorials, research-based, case-based, problem-based, and so on

Curriculum Development

Curriculum Mapping → Match foundational content to current and future courses → Levels of sophistication: indroduce, reinforce, master

Match program objectives to current and future courses → Instructional methods: methods for teaching, practice, and evaluation

Re/Develop Program Structure → Review gaps, redundancies, opportunities → Structure options: co/prerequisites, course sequence, electives, service, and so on

Alignment, Coordination, and Development

Align Program and Course Objectives

Align Foundational and Course Content → Prioritize short- and long-term development plan → Coordination: Approaches, resources, rubrics, exemplars, and so on

Further develop specific pedogogical knowledge and expertise

Align Program and Course Learning Experiences

Figure 4: Model for curriculum development adopted from Wolf (2007)

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2.5.1 Constructs informing the objectives of the study

According to Wolf (2007), curriculum visioning is the process through which the research analyses the curriculum to identify gaps and strengths. Wolf (2007) describes this process as gathering data from key stakeholders such as HoDs, lecturers, employed graduates (alumni) and employers of graduates (directors of academic and special research council libraries).

The construct on the curriculum assessment was used to inform objective number one of this study namely to analyse the LIS school's curricula in South African LIS schools for digital scholarship content. According to Wolf (2007), this construct stipulates that the researcher must involve stakeholders; for this study, HoDs, lecturers, directors of academic libraries and special research council libraries, and LIS schools' alumni working in academic and special research council libraries were the key participants. Wolf (2007) states that interviews, questionnaires and document analysis are used for data collection from stakeholders. Therefore, the researcher used interviews as data collection instrument from the afore-mentioned stakeholders to assess the LIS curriculum. The researcher further conducted content analysis on the available documents (course outlines). This was done to gain insight on the current offerings of LIS schools in South Africa with regard to digital scholarship content, as Raju (2017b) indicates that most research-intense institutions demand these skills.

This construct in Wolf's (2007) model also focuses on the programme of the course. While assessing the curriculum, the researcher should also identify foundational content and educational experiences of courses (Wolf 2007). Wolf (2007) indicates that the researcher must evaluate the pedagogies and the availability of infrastructure as well as the learning and teaching milieu. The researcher gathered data on the factors that this construct entails by means of interviews.

The construct on curriculum mapping informed the formulation of the second objective of this study which is to map the LIS curricula for digital scholarship content in South African LIS schools. Wolf (2007) cites this construct as the one in which the researcher matches the foundational contents to current and future courses, and further matches the programme objectives with current and future courses. Wolf (2007) justifies that this is done by looking at the level of sophistication that includes introduction, reinforcement and mastering. Furthermore, to gather more insight into this construct, instructional methods which include

teaching methods, practices and monitoring must be investigated. Through semi-structured interviews with stakeholders and document analysis of LIS schools' course outlines, more insight was gained into the factors enclosed in this construct as they have a direct impact on the final product of the LIS graduates.

The Gap Service Quality Model was used to address objective number three of this study, which was about mining the perceptions of employers of LIS graduates regarding digital scholarship positions. Zeithaml, Berry and Parasuraman (1993) contend that the researcher should mine the perceptions of employers to ensure customer satisfaction or dissatisfaction; in this case, customers are employers of LIS schools' graduates. Expectations, as indicated by Zeithaml, Berry and Parasuraman (1993), barriers or challenges, opportunities and strategies to overcoming barriers were sought from the directors of digital scholarship sections in both academic and special research council libraries.

The construct on the attributes of the ideal graduate for this study was used to construct objective number four of the study which is about examining the knowledge, competencies, and skills of the LIS graduates in digital scholarship. Wolf (2007) cautions that the researcher must look at ideal graduates' attributes by identifying the cognitive, effective and psychomotor domains that the ideal graduates possess upon graduation. All these attributes are about the knowledge, skills and competencies that an LIS graduate must have after graduation. Therefore, this construct assisted in identifying whether LIS schools infuse digital scholarship-oriented content in their graduate.

The last objective of the study was informed by two constructs from the Wolf (2007) model. One of the constructs focuses on curriculum development, whereas another construct deals with re-/development of the programme structure (Wolf 2007). Wolf (2007) states that in this construct, the researcher has to look at the gaps, redundancies and opportunities presented by the curriculum. This could be done by assessing the structure option which includes co-/prerequisites, course sequence, electives, services, and so on. Data that were gathered have been used to achieve this objective of the study. This construct assisted in recommending or proposing a framework for re-/development of the LIS curriculum to include digital scholarship content.

The last part of the Wolf's (2007) framework formed part of the last objective of this study, although it is suitable for action research, this section assisted in recommending the alignment, coordination and development of the LIS curriculum based on the emerging trends. Wolf (2007) points out that this is the stage where action occurs, and the proposed curriculum is implemented; however, this study only suggests the process and does not enforce implementation. This could be the recommendation for a further study on participation-based research. Figure 5 illustrates the constructs that were used to generate a conceptual framework for this study:

- Teaching digital scholarship
- Infrastructure used for teaching DS
- Focus of DS content
- Importance of DS
- Skills development training interventions for lecturers

- Infusion of digital scholarship
- Alignment of the course objectives
- DS contents to be incorporated
- Stakeholders consulted

Curriculum assessment

Curriculum mapping

Digital scholarship curriculum development

Ideal graduate

Perceptions of employers

Cognitive, Affective & Psychomotor domains:
- DS knowledge
- DS skills
- DS competences

Gap Model Service Quality:
- Expectations
- Challenges
- Opportunities
- Strategies to overcome

Figure 5: Conceptual framework underpinning the study

Section 2.5 delineated on the conceptual framework that informed the study. Specific constructs that were utilised to inform the objectives were provided in this section. Visualisation of the constructs was provided in a form of Figure 5 above. The next section provides a literature review of the study based on the objectives of the study and as guided by Figure 3 on page 22. The themes emerging from the objectives include library and information science schools' curricula for digital scholarship, digital scholarship, skills and competencies, perceptions of employers in digital scholarship sections, LIS school's courses and their focus regarding digital scholarship and digital scholarship contents in LIS curricula.

2.6   LIBRARY AND INFORMATION SCIENCE SCHOOLS' CURRICULA

Ocholla (2000) asserts that LIS curricula functions as a blueprint that offers basic guidelines for an LIS department on: what is studied, why, when, where and how it is to be studied, who should study and how the course of study should be evaluated and trainees assessed. Therefore, the status of libraries and information services in the community can be advanced by putting much effort into the academic and professional preparation of librarians. Luce (2008) proposes that LIS schools provide a curricula that prepare practictioners to respond to the needs of students, academics, researchers and scientists in these eScience and eResearch areas. LIS schools in South Africa include ICTs in their curricula, which is not the case in LIS schools on the rest of the African continent (Minishi-Majanja 2007). Raju (2015) stipulates that most graduates from LIS schools fail to perfom well in their first jobs, which presents a disjuncture in the LIS profession practices. Shongwe (2014) and Raju (2017b) indicate that most jobs in academic or research libraries need skills in and knowledge of digital scholarship. Shongwe (2014) further recommends that due to the number of job descriptions in South Africa that requires information technology (IT) skills, LIS schools should intensify their curricula by including these IT or digital scholarship skills to be in line with the job market.

Raju (2015) proposes that LIS education must take the new, diverse trends in the profession into consideration. Such trends include creating and providing access to digital documents and data, metadata handling, managing IRs, digital curatorship, Geographic Information System (GIS) and mapping, licencing issues and RDM (Vinopal & McCormick 2013; Craft 2018). These trends are considered to be the new knowledge and skills required by a librarian to work in an academic or special research council library in this century.

2.7   HISTORY OF LIS SCHOOLS' CURRICULA

In order to understand the current situation of the LIS profession and identify future trends of LIS schools and their curricula, it is paramount to understand the history of LIS schools and their evolution overtime. Therefore, grounding the historical developments of LIS schools is pertinent for this study since this could provide proper guidance and grounding regarding the direction that the profession is from, currently stationed and embarking on. Kumar and Sharma (2010) declare that history draws a picture of the growth and development of the LIS profession. Richardson (2010) affirms that formal LIS education origins are mainly rooted in

Germany, noticeably, as *bibliothekswissenschaft* was offered in the early 19th century. Richardson (2010) underscores that most Americans before World War I studied in Germany, which may justify the influence of Germany's perspective in the LIS education globally.

The turnaround in LIS education was brought by the Williamson report in 1923. Williamson Charles Clarence was appointed to investigate LIS education and based the Williamson report, it was decided that LIS schools should be housed in universities globally to ensure the quality of education obtained by LIS professionals.

Land, Henderson and Weihs (2004) opine that while LIS schools, mostly those liaising with the American Library Association (ALA), are trying to retain their core areas as library schools; however, way has been given to iSchool due to the automation of library services. Education in the USA has remained the basis of librarianship until the tremendous birth of iShools in the crack of the 21st century in 2001 starting with the University of Michigan, followed by School of Information at the University of Texas (Richardson 2010). Hirsh, Simmons, Christensen, Sellar, Stenström, Hagar, Bernier, Faires, Fisher and Alman (2015) and IFLA (2015) listed the following trends that characterise these iSchools:

- Access to information with new technologies
- Online education for global learning
- Hyper-connected communities
- Global information environment

These afore-mentioned trends impacted directly on the paradigm shift from traditional librarianship to the iSchool phenomenon, which resulted in many LIS schools introducing ICTs into their curricula. This has been the trend until late in the 21st century and has affected the core areas of the LIS profession, as most of the core areas are even changing their traditional names. In the 4IR, iSchools are replaced by another trendy information and knowledge paradigm shift characterised by digital technologies with artificial intelligence (AI) mainly functioning through high-speed technologies. This is buttressed by Raju (2015) when stating that cataloguing and classification are termed metadata and data schemas, for instance, Dublin Core are taught parts of MARC21. Along the same lines, Tu and Xu (2018) affirm that spaces known as Digital Scholarship Commons or LABS and Center for Data Scholarship have been

established in many academic libraries. These spaces provide digital scholarship-related activities. Librarians in such spaces are assigned duties of being data analysis librarians, metadata librarians, online publishing designers and application engineers (Tu & Xu 2018). The implication is that librarians trained by LIS schools should have diverse disciplinary backgrounds, combined with various digital skills and knowledge. These skills are mainly digital scholarship motivated.

The history of LIS education in Africa, especially in the English-speaking part of the African continent (Anglophone) before independence, was more concerned with librarianship training (Ocholla 2000; Otike 2012), because the different libraries (public, academic, private) (Ocholla 2000) were being established. Otike (2012) indicates that LIS education in Africa is aimed at producing competent librarians to manage libraries in different African countries. Palmer (1959), and Gupta and Gupta (1997) claim that LIS education in Africa began in Ghana by the Achimota Teacher's Training College in 1944, yet it was not formal. The LIS school in Ghana lasted only a year because the authorities felt that graduates were would not be able to secure jobs since new libraries were not likely to be established in the near future (Palmer 1959; Gupta & Gupta 1997). Furthermore, Gupta and Gupta (1997) postulate that formal education in LIS was initiated in Ibadan, Nigeria, in 1959 by John Dean, but they did not include South Africa in their discourse about LIS education history. Hence, LIS education began in the 1930s in South Africa (Ocholla 2000; Raju 2003; Chisita 2009), which implies that LIS education was established in different periods across Africa.

As part of the influence that the global trend of iSchools had on the technology in the LIS profession, Africa introduced ICTs into their LIS schools to respond to the global challenge (Ocholla 2000; Minishi-Majaja 2007). However, in some parts of Africa, adopting these trends has been the challenge due to the lack of infrastructure to support teaching and learning (Minishi-Majanja & Ocholla 2004). This section covers the history of Africa as a whole, excluding South Africa, as developments in South Africa have been faster than in other African countries. Minishi-Majanja and Onyancha (2009) buttress this by affirming that most of the South African LIS schools incorporated ICTs into their education, as against their African counterparts that did not. South African LIS education is detailed in the section below.

2.8 DEVELOPMENTS OF LIS SCHOOLS AND CURRICULUM IN SOUTH AFRICA

It is worth indicating that South African LIS education, like other African countries, has been influenced by British and American trends (Raju 2003). Therefore, most of the developments in earlier LIS education in South Africa and other African countries were brought by colonisers.

LIS education in South Africa began in 1933 when the LIS professional body known as the South African Library Association (SALA) introduced the training of librarians (Musiker 1986; Ocholla 2000; Chisita 2009). LIS education was introduced as a response to recommendations made by Septimus Albert Pitt and Milton James Ferguson, the Carnegie Corporation Commissioners in South Africa (Musiker 1986; Raju 2003). Ocholla and Bothma (2007) are of the view that the development of LIS education was shaped by the quantitative growth of LIS schools from the year 1938 to the year 2000, increasing from one school to 18. Another noticeable period was 1988 with a dramatic decline from 18 to 12 schools. This was discovered from the results of the investigation done by the Academic Planning Committee of the Committee of the University Principals. This committee revealed that LIS programmes were not cost-effective at the time. Ocholla and Bothma (2007) indicated above what led to this decline of LIS schools in the country. However, Raju (2014) and Maluleka and Onyancha (2016) noticed another decrease in LIS schools, from 12 to 10 which means in South Africa, there are currently 10 LIS schools.

According to Raju (2003), the UP was the first university to offer a degree in librarianship in 1938, which was followed by UCT a year later. During the introduction of LIS education, UNISA joined the other two universities and offered a correspondence programme in librarianship from the year 1955 and other universities followed later.

Raju (2003) asserts that in 1979, the SALA committee for education and research developed standards for library and information services that were used to guide curriculum development. This implies that the services offered by information centres were the main focus of the curriculum in order to meet the demands of the information society. In 1987, the South African Institute for Librarianship and Information Science (SAILIS) felt that the education for LIS should be advanced for both paraprofessionals and professionals. Based on the guidelines

developed by SAILIS, it was clear that LIS professional education should be offered by universities to ensure quality education.

Gorman (2002) notes that due to the introduction of information science in the field of librarianship, globally, most schools have abandoned core areas of the profession such as cataloguing. This trend marks a shift from the traditional librarianship profession to the trendy information science profession. South Africa is not innocent in this shift as Ocholla, Ocholla, Olson, Glover, & Guimarães (2015) advocate that these schools call themselves iSchools and they believe that new trends related to the i-word must be infused toin the profession. Furthermore, these schools consider themselves to be information and knowledge oriented rather than focused on traditional LIS (Ocholla et al. 2015).

Along the same lines, Miwa (2006), Ocholla and Bothma (2007), and Onyancha and Minishi-Majanja (2009) note that some LIS schools have dropped the term 'library' and started using the term 'information' instead. This implies that the name of the department has to do with the specialisation of the LIS schools. Ocholla and Ocholla (2014) concur that these schools changed their names to 'information science' and that their specialisation is no longer purely librarianship; rather, they have added information and knowledge disciplines (Onyancha & Minishi-Majanja 2009; Raju 2015). This indicates the paradigm shift in the LIS education, which has been happening in the industrial revolution perceived by Schwab (2016) as the third industrial revolution characterised by the use of ITs and electronics. More recently, Raju (2017b) called for a review and revision of the LIS curriculum. Raju (2017b) suggests that LIS schools have to embark on this journey in order to investigate whether they prepare their information specialists properly to be competitive and survive in a dynamic digital library environment. This initiative indicates the shift in the paradigm that Schwab (2016) and Xing and Marwala (2017) call the 4IR.

Schwab (2016) informs that the first industrial revolution used water and steam to machanise the production, while the second one used electric power to create mass production. Furthermore, Schwab (2016) suggests that the third industrial revolution used eletronics and IT to automate production. Schwab (2016), Keywell (2017) and Peters (2017) attest that the 4IR is building on the third industrial revolution and this digital revolution has been occurring since the middle of the last century.

The 4IR (or industrial 4.0) is characterised by a fusion of technologies that is distorting the lines between the physical, digital and biological spheres. In the same breath, Xing and Marwala (2017) opine that the changing domains are influenced by the intelligent technology that is powered by the AI. Such a wave of technology led the world into the Industrial 4.0. Such revolutions are characterised by the fast changes as indicated before, including physical (intelligent robots, autonomous drones, driverless cars, 3D printing and smart sensors) and digital (the IoT, services, data and people) technologies that have brought changes in the way people work and learn things (Xing & Marwala 2017).

Scanlon (2017), and Xing and Marwala (2017) posit that these changes are witnessed across all domains, and they influence the economic and social well-being of the society. Furthermore, they stipulate that there is a strong link between higher education institutions and these changes. Concisely, improving the quality of education in higher institutions through providing education on the changing scholarship brings about a significant improvement in the society. The 4IR has a direct impact on digital scholarship since all the digital scholarship activities are digitally driven. As alluded by Sinclair (2014) that libraries are continuously embracing the 4IR changes through practising digital scholarship duties. Such activities practised by libraries include RPM, metadata handling, digitisation, digital curatorship, 3D modelling, gaming, cloud computing, use of autonomous systems and many more which are 4IR driven (Xing & Marwala 2017).

2.9   CHALLENGES FACING LIS CURRICULUM DEVELOPMENT IN LIS SCHOOLS

Ocholla (2000) and Sharma (2005) articulate that for LIS schools to attract more students, they must have a good curriculum supported by facilities, curriculum updates, awarding of degrees to successful students, hiring of qualified full-time staff, research facilities and available computer laboratories. However, the major challenge is that these developments are evident in developed countries while developing countries are left in the dark. Si, Zhuang, Xing and Guo (2013) affirm that institutes, including research organisations, that focus on scientific data curation, library consortiums and universities, are mostly located in North America and Europe, especially the USA and the United Kingdom. This implies that countries in the third world are continuing at a snail's pace in catching up with the developments, for reasons that include a lack of infrastructure and the relevant workforce. Ocholla (2000) concurs that the shortage of

staff is another limitation that hinders the development of LIS curriculum as expertise assists in the infusion of emerging trends into the curriculum. Ocholla (2000) and Ocholla (2005) further state that, in some cases, the qualifying staff members may be available; however, the shortage of funds in the institution to attract the staff is another challenge in most institutions. The implication is that a lack of necessary equipment, which may include, but is not limited to, computer laboratories, required software, recording devices, audio-visual devices and digitisation equipment acts as barrier to a will-marketed, suitable curriculum.

Curry (2000) states that another challenge facing the development of LIS schools is the repositioning of LIS schools into different faculties in the universities for survival purposes. Raju (2017b) further concurs that LIS schools' curricula have no clear boundaries as they borrow contents from computer science, engineering and it, business management and IS. Therefore, there is a discrepancy in the positioning of LIS schools since most of them are located in the faculty of humanities in most universities. Additionally, Munyoro (2014) and Raju (2015) caution that these rival disciplines may invade LIS education and training from its established cognitive domain. This indicates that LIS schools should indeed establish strong grounds and protect their boundaries relating to their curricula.

In consensus with the above scholars, Ocholla and Bothma (2007) list career opportunities, funding of LIS schools and technology infrastructure as challenges facing LIS curricula. Regarding career opportunities, Ocholla (2005) and Ocholla and Bothma (2007) maintain that with several opportunities emerging and relating to LIS, the boundaries of LIS education are blurred. Therefore, the emerging LIS market is forcing LIS schools to re-orient their curricula to meet the new market needs for survival purposes. Ocholla and Bothma (2007) express that graduates from broad LIS programmes can work in any information-related field. Scholars like Gorman (2004) share the sentiments indicated above; however, they are threatened because most core contents of LIS schools' courses such as information organisation and retrieval, knowledge management, and information-seeking behaviour are lost when borrowing contents from related disciplines.

Another common noticeable challenge that is affecting developments in LIS education is collaboration, as indicated by Virkus (2012). Kajberg (2002) illustrates that collaboration is beneficial to, among other things, the quality of teaching and learning, research, the socio-economic development of the region, the competencies of the graduates, the reputation of the

university, the enrolment of students and the university's access to funding. However, Virkus (2012) is correct in arguing that partners need to be complementary in their resource bases and need compatible backgrounds. This presents a challenge because it is found that one part to the collaboration is in a developing country with limited resources, while the counterpart is in a developed country with many resources. Therefore, as noted by Kajberg (2002), LIS schools lacking financial resources end up moderating their international aspiration, or even stopping certain initiatives. However, LIS schools in developed countries can always lead the way in assisting LIS schools in developing countries in implementing current trends, since they have more expertise and proper infrastructure.

These challenges are affecting the LIS curriculum in general as well as digital scholarship incorporation into the entire LIS curriculum. Mahapatra (2006) affirms that ICTs and the computer science have presented metamorphic changes in information products, information-seeking behaviour and the overall information organisation. These changes witnessed in the LIS education are due to the convergence of a variety of technologies (Mahapatra 2006; Ali & Bakhshi 2013). Muthu, Sivaraman and Singh (2015) posit that as the changes occur at a fast pace in the information profession leading to the library environment giving way to the digital environment. In addition, LIS schools' lecturers must acquire skills to operate in the digital environment.

Muthu, Sivaraman and Singh (2015) note that, due to a lack of capacity from the lecturers' side, LIS schools' major challenge is that they train librarians with inappropriate skills that do not meet the needs of the society. This can be seen in the attitude of librarians despising their duties. Muthu, Sivaraman and Singh (2015) blame this on lecturers who lack expertise and who fail to interact with colleges like Computer Science and Communication Sciences. In consensus with Muthu, Sivaraman and Singh (2015), Kaur (2015) laments that the emerging information environment and developments in IT call for a progressive update of the LIS curriculum. This will assist in the development of the manpower, the challenges and the complexity of the emerging job market. However, this is not the case in many countries, especially in Africa, as African countries are lagging in the use of emerging ICTs in teaching digital scholarship education. This was revealed by Burnett (2013) when noting that LIS schools are not keeping abreast of rapid changes of the digital environment.

Kaur (2015) further comments that the leading factor in poor confidence and failure of LIS schools to meet the requirements of the current job market is that much of the course content is not sophisticated, it is too basic. This is supported by Lippincott (2017) in a report of Harvard University Libraries that the major contributing factor of LIS schools to meet the requirements of the employer is that it is unclear to staff what is digital scholarship and what it encompasses. Further to that, other faculty members are lazy to learn new tools of digital scholarship or there are no resources (necessary tools, hardware, software, facilities, funding) for them to familiarise themselves with digital scholarship activities (Lippincott 2017). Malhan (2011) realises that it is always difficult for LIS schools to meet the demands of the job market, because whenever LIS schools attempt to update their programmes, another need arises to align the programmes again with new, emerging trends coming from the corporate world. Consequently, as the digital or information environment stays fluid, LIS education will always be fluid, demanding constant change and adaptation to new developments, technologies and desired service level (Malhan 2011; Khan & Bhatti 2012).

2.10 PERCEPTIONS OF EMPLOYERS IN DIGITAL SCHOLARSHIP SECTIONS

Perceptions of employers in digital scholarship differ from one individual institution to the next (Soundararajan, Ravikumar & Aro-Gordon 2020). The experience of the perspectives is shaped by the experience of the individual librarians in their respective institutions. Parts of the framework by Zeithaml, Berry and Parasuraman (1993) as conceptual basis structured this section. This section is organised according to opportunities of digital scholarship, challenges or barriers to digital scholarship and strategies to overcome the challenges or barriers to digital scholarship in the library environment. Sections are detailed below:

2.10.1 Opportunities of digital scholarship

The digital scholarship brings opportunities to the LIS profession, as the expertise evident at the centre permits researchers to deepen their knowledge, refine their work and collaborate with other disciplines (Longmereier & Murphy 2021). Sinclair (2014), and Wolski and Richardson (2014) elaborate that in an era of visualisation, analytics, big data and new forms of online publishing, central spaces can facilitate knowledge creation and transfer by connecting people, data, and technology in a shared collaborative space. The implication is that librarians should not be threatened by the fast-growing technologies brought about by the 4IR.

Rather, they should embrace them and view them as tools to facilitate their responsibilities. Along the same lines, King (2018) sustains that in the wake of the 5IR, a partnership between digital humanities and digital libraries has been forged calling for an increase in digital humanities or scholarship centres in academic libraries. This resulted in a dire need to employ digital scholarship librarians. Nevertheless, it is not so clear what the relevant skills are that these librarians need to fulfil their roles (King 2018), as this field is contested by IT specialists and computer science specialists (Mathews & Pardue 2009; Harris-Pierce & Liu 2012; Raju 2015; Cox 2016; Ayinde & Kirkwood 2020; Longmeier & Murphy 2021).

Scholars answered that the role of a digital scholarship librarian lies between digital humanities and digital librarianship as broader areas (Nowviskie 2013; Erway & Schaffner 2014; King 2018). Furthermore, King (2018) postulates that librarians have acquired digital skills; therefore, they should not support digital humanities, instead, they should play a collaborative role in the process and be viewed as equal partners. Although this assertion is factual, for librarians to match this challenge, it is paramount to include lifelong learning training of digital scholarship librarians. This training, in the form of a module, equips librarians with tools and competences in digital scholarship methods that will equip them with the knowledge of drafting questions and leading a digital humanities project rather than being supporters (Wolski & Richardson 2014; Longmeier & Murphy 2021).

Various scholars indicated that the following new jobs invade the library space in the dawn of the 4IR, which are duties performed by both digital scholarship librarians and digital humanist (Buchanan 2013; Heimburger & Ruiz 2012; Poole 2017; Wolski & Richardson 2014; King 2018; Uzwyshyn 2020). King (2018) indicates that the opportunities brought to the LIS profession, specifically the digital scholarship librarianship, are mainly drawn from both digital humanities and digital librarianship. Therefore, the responsibilities listed in the table below are important, as they are the new opportunities available for digital scholarship librarians; however, the list is not exhaustive (see Table 2).

Table 2: Digital scholarship jobs

New roles (opportunities for digital librarian)					
Digital eco-system (open access	Digital curation	Digital humanities data	Website management	Dissemination through social media	Publishing

platforms, digital archives, databases), digital repository space services					
Big data	Interface knowledge	Coding	Database construction	Outreach	Collaborative work
Copyright issues	Metadata enhancement and classification schemas	Institutional repository	Preservation and sustainability	Digital resource creation	Content creation

Wolski and Richardson (2014) appreciate the beauty of digital scholarship as it is highlighted that electronic networks permit different scholars to communicate and collaborate. Collaboration between scholars ensures that, globally, perspectives and problems are tackled by relevant stakeholders on time. Agreeing to the idea, Ridge (2018) groups the digital scholarship opportunities for librarians according to how it equips or improves their day-to-day activities. Scale, perspective and speed are listed as the three most important opportunities brought by the 4IR into the digital scholarship field. These groups by Ridge (2018) are listed and explained below:

- **Scale**: permits the exploration of a bigger body of material computationally – numerous volumes of text, images or media files, while retaining the ability to individually examine individual items as research questions arise from that distant reading
- **Perspective**: permits for the analysis of data to perceive trends, patterns and relationships not apparent from close reading individual items, or gain a broad overview of a topic
- **Speed**: allows the testing of an idea or hypothesis on a large dataset; prototype new interfaces; generate classification data about people, places, concepts; transcribe content

These factors are evident in the duties listed in Table 2 and they include the digital humanities and digital librarianship, as indicated by King (2018). Most university libraries have established digital scholarship centres to merge the digital humanities and digital librarianship activities. Hensley and Bell (2017) cite that digital scholarship centres present an opportunity to build or improve current skills through other expertise of librarians who are knowledgeable in this area. It is expected of digital scholarship librarians to push their own expertise past the traditional boundaries to survive the digital wave brought about by the 4IR. Therefore, the digital scholarship centre in the library acts as hotspot for experts and novices joining forces to learn from each other, hence the role of a librarian is to provide tools and education to ignite the process of learning (Hensley & Bell 2017). Although this is the case, King (2018) argues that the role of a librarian is not only to provide tools, but rather to play a collaborative role in conducting or leading digital scholarship projects.

Furthermore, the technology in the digital scholarship centres offers librarians an opportunity to build on their expertise; such technologies include laser cutters, Virtual Reality (VR) headsets, high-end scanners, visualisation and video walls (Hensley & Bell 2017; Uzwyshyn 2020). It is expected of a digital scholarship centre to have a hub for digital humanities, experts to respond to questions about data management and data curation services. However, this may not always be the case, as what works for one centre, may not work for another depending on the centre's requirements (Hensley & Bell 2017; Uzwyshyn 2020). In most cases, digital scholarship centres particularly require skills in web development, project management, metadata schemas, GIS specialisation, digitisation specialisation, RDM, intellectual property and open access (OA) textual and numeric data, and data specialisation (Craft 2018; Uzwyshyn 2020). In an essence, Craft (2018) stresses that the potential opportunities are different in every digital scholarship centre, as each centre defines its functions differently depending on the needs of the parent organisation.

Uzwyshyn (2020) indicates that the application of structured metadata for textual academic research opens discoverability, which enables access to multiple points of subject access, resulting in high citation index. This implies that the visibility of the researcher and the institution will increase; therefore, digital scholarship opportunities are beneficial to the institution. Furthermore, scholars are in consensus that digital scholarship enhances the consortium model, which allows for collaboration discovery and comparison of data results (Hensley & Bell 2017; Ridge 2018).

2.10.2 Challenges/ barriers of digitals scholarship

Digital scholarship brings many opportunities in the library space; however, certain challenges in the fraternity of librarianship were brought about by the emerging skills as introduced in the 4IR. Most of these challenges concern resources, as indicated by several scholars in the literature. Mutula (2009) summarises these challenges in the African context as a shortage of computers, a lack of clarity of online content, poor internet connectivity, struggles in locating information online, too heavy workload and poor formats of presenting online content. These challenges are still relevant, and they affect both LIS schools and libraries. Scanlon (2017) indicates that it is a challenge for academics to learn digital scholarship practices within a particular network. This could result in adequate skills transfer to librarians, as academics are trainers of practitioners; therefore, a lack of knowledge in academics results in poorly trained graduates. Wolski and Richardson (2014) note that most institutions fail to provide relevant infrastructure for the new environment, especially those involved in digital scholarship, as most stakeholders only think of infrastructure as physical things. However, this is not the case with digital scholarship, as it concerns the sharing of information, collaboration and knowledge creation beyond the physical enterprise (Weller 2011; Wolski & Richardson 2014). It could be that there is a lack of awareness by senior management in the university as far as digital scholarship is concerned (O'Brien 2010).

Specifically, in the library environment, Ridge (2018) shares the following challenges evident in the digital scholarship arena:

- Digitisation and cataloguing backlog – material not available as it is not digitised at that moment.
- Providing access to assets for individual items – between copyright and technology, scholars have no permission to download the optical character recognition (OCR) or handwriting text recognition (HTR) text, or download all digitised media about an item.
- Providing access to collections as datasets – moving more material into the more accessible spot of material that is properly digitised in suitable formats, usable sizes and with open licences allowing for re-use is an ongoing, expensive and time-consuming process.

- Cleaning historical data and dealing with gaps in both tools provision and source collections – with none of these processes are straightforward.
- Providing access to platforms or suites of tools – how much should the library take on for researchers, and how much should other institutions or individuals provide?
- Skills – digital scholarship training courses for researchers are lacking, making it hard for scholars to grasp the skills.
- Peer review – lack of digital scholarship-skilled peers that could result in poor quality; hence, there are no reviewers. This raises questions such as "How can peers judge a website or database if they have only had experience with monographs or articles?" and "How can scholars overcome prejudice about the 'digital'?" Versioning datasets as annotations or classifications change, software tools improve over time and transcriptions are corrected. Some of these changes may affect the daily functions of the librarians.

These challenges are presented by a lack of training in LIS schools, as most librarians are trained in working in a traditional library, as indicated in section 2.8 of this chapter. Failure of institutions to account for these challenges may be fatal or may distort new development processes brought by the digital environment. Wolski and Richardson (2014) support that empowering scholarship and the creation of new knowledge, approaches and technologies is a work in progress.

2.10.3 Strategies to overcome digital scholarship challenges/ barriers

The awareness among the stakeholders of digital scholarship seems to be problematic. Craft (2018) indicates that training sessions in the form of workshops, on-the-job training, conferences, and informal and formal courses for digital scholarship could assist in awareness and training of digital scholarship librarians. Furthermore, Craft (2018) echoes that funding must be provided to support learning in this area for both librarians and graduate students. Upon return from any funded training, the group that attended can workshop others for the purpose of knowledge transfer. Partnerships with different digital scholarship constituents by librarians could be beneficiary. Muthu, Sivaraman and Singh (2015) and Craft (2018) strongly commend the idea of education as the need for staff, faculty, students and the university management who are not aware that the concept of digital scholarship must be in place.

Hensley and Bell (2017) emphasise that one of the most important strategies to overcome barriers or challenges in digital scholarship is education on the concept. Wolski and Richardson (2014) highlight that higher education institutions have to provide relevant infrastructure and education on digital scholarship, and they have to validate the digital scholarship as valued scholarship. It is not feasibly for information centres to entirely take on the responsibility of digital scholarship education; however, constructing a network of collaborators across a campus that have similar interests in leveraging new technologies and research methods to advance scholarship and learning at different institutions could ease the responsibilities (Wolski & Richardson 2014; Hensley & Bell 2017; Craft 2018).

Infrastructure is another challenge that most institutions experience, as scholars indicate that parent organisations must be willing to provide relevant infrastructure to support digital scholarship (Wolski & Richardson 2014; Craft 2018). A proper infrastructure would equip the digital scholarship services with the strength to be efficient and effective in attracting more users to the centre. Other organisations rely on the already existing infrastructure to support digital scholarship, but this is not optimal as new equipment should be developed for digital scholarship as it is an emerging trend with completely different needs (Uzwyshyn 2020). Attached to infrastructure is the issue of staffing, a proper model for staffing must be adopted to look into the digital scholarship competencies, skills and knowledge. Desired skills for these kinds of jobs are not easily identified as they vary across disciplines; nonetheless, with a proper staffing model it will be possible to identify the relevant candidates. Wolski and Richardson (2014) note that there are policies and legislation that are outdated as they were not targeted for the digital scholarship environment; therefore, institutions have to rethink these policies and acts to meet the needs of the current era.

2.11   DIGITAL SCHOLARSHIP KNOWLEDGE, SKILLS AND COMPETENCIES

Lewis et al. (2015) and Ayinde and Kirkwood (2020) posit that as scholarship changes, institutions should reshape the skills set of their workforce, thus enhancing digital scholarship. This workforce includes directors, research staff, faculty, librarians, graduate students and university administrators. King (2018) elaborates that the roles of the digital scholarship librarian include digital librarian skills, for instance, data life cycle management and metadata knowledge, as well as digital library soft skills, that manifest in a collaborative spirit. Raju (2014) conducted a study based on the knowledge and skills for the digital era academic library.

Orme (2008) and Raju (2014) categorise these knowledge and skills as disciplinary knowledge, generic skills, and personal competencies. Choi and Rasmussen (2009), and Raju (2014) indicate that disciplinary knowledge for the digitally oriented environment includes metadata knowledge and knowledge of digital content creation and management. Choi and Rasmussen (2009), and Nonthacumjane (2011) state generic skills for digital scholarship librarians as effective communication and interpersonal skills, critical thinking, problem solving and teamwork.

Furthermore, Nonthacumjane (2011) recognises the personal competencies as flexibility, adaptability and reflective thinking as highly recommended for candidates to work in a digital library environment. These skills have been noticed in the LIS field in the last leg of the 21st century (McCullough 2014; Sinclair 2014). Although this has been the case, on the African continent, there has been a setback regarding the adoption of these knowledge and skills.

Wexelbaum (2016) makes clear that embracing and promoting digital scholarship require a new set of skills and an ideological shift for librarians, from expert to participants in the learning process. When librarians act as experts, it creates anxiety for patrons and results in failure to explore possibilities of digital scholarship. Nevertheless, library employees should still adopt lifelong learning and share the joy and experience of learning among themselves to remain competent in creating a safe and exploratory digital space for the patrons (Wexelbaum 2016). Koehl, Green, Henley and Heidenwolf (2019) propose that academic librarians should be trained in digital scholarship, since knowledge of key skills, tools and strategies for digital scholarship is not widespread despite the growing demand for librarians in this area. That is why there is a call by Ayinde and Kirkwood (2020) for information professionals to learn, unlearn and relearn skills needed to survive in their respective workplaces.

Various knowledge disciplines for digital scholarship are provided by authors across the globe. As a suggestion, Miller (2017) assumes that the expertise of a digital scholarship librarian should include the creation of a new collection's home page that requires HyperText Markup Language (HTML), metadata and repository architecture knowledge. Moreover, all material that has been developed digitally or has been digitised must be organised through metadata schemas; therefore, knowledge of metadata schemas, codes and standards is important among librarian's capacity (Miller 2017). On the same note, Tu and Xu (2018) cite the required digital scholarship knowledge as physical space, tools, research data services, scholarly

communication and digital publishing, digital humanities, digital scholarship trainings and seminars, and digital technology support services as skills that are supposed to be offered by LIS schools for LIS professionals to be able to provide quality services for the communities. Furthermore, new librarian knowledge competencies such as big data mining, modelling, analysis, visualisation tools, interface design and programming language are listed by various authors (Drucker, Kim, Salehain & Bushong 2014; Collins 2017; Greene & Roberts 2018). Therefore, lifelong learning is essential for already practising librarians to gain these skills; for LIS schools, training of LIS professionals should include these in their education.

As highlighted by Raju (2014), generic skills are required from candidates opting for digital scholarship jobs. These skills are also referred to as transferable skills or graduate skills (Partridge & Hallam 2004). Ayinde and Kirkwood (2020) view skills as methods to perform a job in the best possible manner using sufficient or insufficient resources. Communication skills are voted to be highly required skills for one to work in a digital scholarship lab (Orme 2008; Raju 2014; Carter 2016; Ayinde & Kirkwood 2020). Computer literacy skills are considered to be generic skills; however, they are also considered as technological skills, which are a requirement for a digital environment (Koya & Gopakumar 2018; Mann 2019). More recently, Ayinde and Kirkwood (2020) listed customer needs skills, searching and retrieving skills, managerial and leadership skills, reference service skills and IT skills as indispensable in the dawn of the new library environment.

Bonn (2014) reveals that most of the competencies evident in most job advertisements for digital scholarship jobs range from flexibility, innovation and keeping abreast of the many changes in scholarly communication. More of these competencies are the aptitude for thinking creatively and developing products and services; evidence of leadership, entrepreneurship and initiative. It is also noted that the position holder encourages experimentation and risk-taking in digital scholarship projects (Nonthacumjane 2011; Bonn 2014). Other advertisements on digital scholarship-related jobs stipulate that candidates must have capacity to thrive in the fast-paced, future-oriented environment of a top research institution (Bonn 2014). Although these advertisements frequently display these requirements, Pinfield, Cox and Rutter (2017) argue that librarians are resistant to embrace these changes in the library environment. They further encourage library staff to familiarise themselves with these technological changes to do away with the resistance and start embracing these skills.

Academic libraries perceive digital scholarship as a dynamic and evolving area of work and look for staff members who operate comfortably in such an environment. Bonn (2014) and Wolski and Richardson (2014) further argue that to gain such skills, many strategies need to be considered; however, the wish list is long. Among the aspects identified as important are collaboration, exposing interested staff to digital scholarship, encouraging librarians already serving under digital scholarship portfolios to engage in continuing education were identified as important. Nonetheless, it is also clear that the library profession is in an era that requires an expansion of education and training to pay attention to the recent climate and the needs of the academic environment (Bonn 2014; Ayinde & Kirkwood 2020). This expansion can and should be undertaken by LIS schools and through professional development, locally sponsored and conducted by our professional organisations. Such collaboration among partners involved can also assist in LIS education and training for digital scholarship.

Wolski and Richardson (2014) recommend a framework that could be useful for institutional infrastructure to support digital scholarship. This model comprises four major components, which are people, built infrastructure, digital artefacts and organisational structure. As suggested by Bonn (2014) and Wolski and Richardson (2014), under the component about people, researchers, support staff and librarians should be re-skilled to meet the digital scholarship needs. The implication is that since digital scholarship is an emerging trend in the LIS profession and fast evolving, it is paramount that the work environment should prepare its employees to serve the community. LIS schools should begin to offer such education to prepare the future professionals for a digital-friendly environment (Raju 2015). Figure 6 illustrates the institutional model that should be adopted when preparing for a digital scholarship centre in libraries:
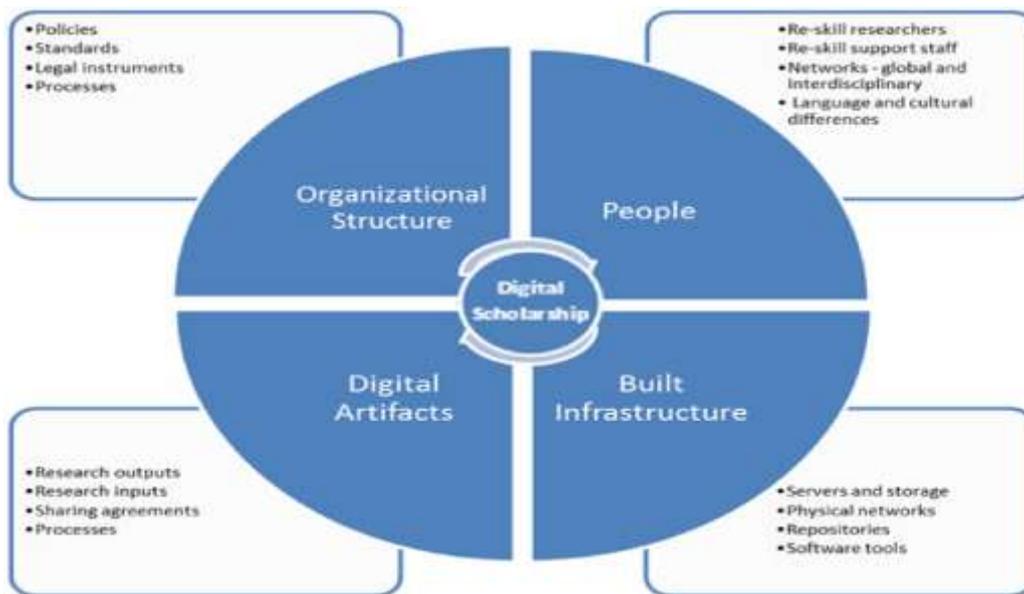
Figure 6: Institutional Infrastructure Model (Wolski and Richardson 2014)

The model indicates that libraries are no longer subscribing to the monopoly of offering information; therefore, values need to be emphasised that ensure that libraries provide values of unique digital content and are service providers rather than providing published information that may be available somewhere else (Wolski & Richardson 2014; Collins 2017; Yadav 2018). Consequently, skills, knowledge and competencies that librarians possess need to be reshaped and polished to meet the needs brought about by digital scholarship. Shem (2015) mentions that in the USA, libraries have changed and LIS schools were in the process of changing their programmes to support digital scholarship.

Lewis et al. (2015) note that there is not much literature on this form of scholarship globally; and the same was noted in South Africa. The extant literature notes that new LIS graduates apply for jobs that they do not qualify for, and further to that, that LIS education is not competent enough for the job market. Digital scholarship skills, knowledge and competencies include creating and providing access to digital documents and data, metadata handling, managing IRs, digital curatorship and RDM should be evident in then LIS curriculum (Raju 2015).

2.12   LIS SCHOOLS' DIFFERENT TERTIARY QUALIFICATIONS

Different LIS schools have different names for their courses; the name of the course is manifested by the focus of the LIS school (Gerolimos 2009; Ocholla & Ocholla 2014). Most schools followed the world trend to be iSchools and their courses are iSchool oriented (Ocholla & Bothma 2007). According to Mahapatra (2006), there are various LIS school qualifications available, such as the South African Qualification Authority (SAQA) (2009a). Muthu, Sivaraman and Singh (2015) state that such courses include the following:

- Diploma in Library and Information Science (DLIS)
- Bachelor of Library and Information Studies (BLIS)
- Bachelor of Information Science (BIS)
- Postgraduate Diploma in Library and Information Science (PGDLIS)
- Bachelor of Library and Information Studies Honours (BLISH)
- Postgraduate Diploma in Library and Information Studies
- Master of Art (Information Science)/ Master of Library and Information Science
- Doctor of Library and Information Science or Doctor of Philosophy in Library and Information Science

These qualifications are available at different academic institutions in South Africa. The universities offering LIS include UCT, UJ, UFH, UP, UWC, UNISA, UZ, UL and UKZN (SAQA, 2009a; Raju 2014; Maluleka & Onyancha 2016). These qualifications are aimed at different levels (undergraduate or postgraduate level). This study focused on the structured courses.

2.13   QUALIFICATIONS OFFERED BY LIS SCHOOLS

Due to the limited scholarly articles on the structure or elements of LIS schools' curricula, SAQA (2009a) documents on LIS or information science or studies in LIS schools formed part of the literature review. These SAQA (2009a) documents are categorised alphabetically from SAQA (2009a) – SAQA (2009l), as there were 12 documents from nine universities. SAQA (2019a) lists different qualifications on their website. Such qualifications range from certificate, diploma, bachelors' degree, post-graduate diploma, honours degree, master's degree and PhD degree. This study focuses on the coursework qualifications (diploma, bachelor's degree, post graduate diploma and the honours degree) offered by LIS schools from

the National Qualifications Framework (NQF) level 7 and level 8. Therefore, SAQA (2009a) documents that were extracted were among the afore-mentioned qualifications.

2.14   STRUCTURE OF THE LIS CURRICULA

The structure of the curriculum comprises purposes, objectives, study units, outcomes of the module and the assessment criteria. These elements of the curriculum are covered in the SAQA (2009a) active registered qualification documents. The documents assisted the researcher in discussing the components of the curriculum enclosed in the qualifications.

2.14.1 Aims/purpose

Muthu, Sivaraman and Singh (2015) state that the major aim of providing LIS education is to educate individuals for careers as librarians and information specialists and to undertake instruction, research and service programmes that meet recent and emerging library, information and technology needs. This implies that the LIS curriculum has to change as long as the needs of the community serves evolve. Extracting scholarly literature on the purpose of the LIS qualifications has been a daunting process. However, the researcher identified the SAQA (2009a) documents submitted by individual institutions as relevant to understand the structure of the LIS curriculum. SAQA (2009a) documents were deemed relevant due to the fact that they undergo a review process during recurriculation processes by individual universities. Ocholla and Bothma (2007) and Borrego (2015) posit that, in most cases, LIS schools are housed in universities in South Africa and globally within the humanities.

SAQA (2009f) posits that the major purpose of the LIS curriculum is to focus on the education and training of LIS personnel while maintaining well-recognised international standards in its curricula. Furthermore, SAQA (2009l) suggests that LIS schools strive to equip graduates with knowledge and skills to enter the labour market and serve both technologically advantaged and disadvantaged sectors.

One specific submission at SAQA (2009k) expresses that the aim of offering LIS education to information professionals is to ensure that they understand data communication, internet and multimedia technologies and applications. The SAQA (2009k) document further states that LIS

education aims to familiarise students with databases, risks, opportunities and management of information by individuals, groups and organisations.

These purposes from different universities indicate that the main goal is to offer a curriculum that meets the dynamic changes in the job markets as per different information sectors. The implication of the purposes in the SAQA (2009a) curriculum documents by individual LIS schools highlight the willingness of different institutions to ensure quality education or products to the public at large as far as technologies are concerned.

At PGDLIS level, SAQA (2009b), SAQA (2009c) and SAQA (2009e) documents clarify that the main purpose of this one-year qualification is to equip graduates from other fields who want to be LIS professionals with knowledge in LIS profession. SAQA (2009b) and (2009d) further posit that recognition of prior learning is usually considered when one wishes to enrol for the qualification. SAQA (2009b) places emphasis on the research component and library and information science component on this qualification, hence it is a postgraduate qualification.

These documents indicate that the LIS curriculum has to be renewed in most cases; hence, they all consist of terms like meeting the demands of the job market. This creates space for emerging trends like digital scholarship to be infused in the curriculum.

2.14.2 Objectives of the qualification

Most of the records retrieved from SAQA (2009a) from different institutions have no objectives, however, a few does. The following objectives are provided by SAQA (2009i) documents which are to:

- Enhance the quality of LIS education, training and skills development
- Facilitate access to, and mobility and progression within LIS education, training and career paths
- Contribute to the full personal development of each LIS professional and the social and economic development of the nation at large

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Muthu, Sivaraman and Singh (2015) provide the objectives of LIS education and courses, which are considered as milestones used to achieve the main mission of the LIS education. Muthu, Sivaraman and Singh (2015) list them as:

- To enable the students to understand and appreciate the function and purpose of the library in the changing social and academic environment
- To equip the products in the new specialised knowledge and capabilities to enable them to scan and design information systems, tools, products, services
- To equip them with appropriate research methodologies applicable to the area of information services, study in other subjects for information work and services
- To equip them with knowledge and skills of efficiently and effectively designing, developing, and working value added information products and servicing to meet identified needs
- To equip them with the required knowledge and skills for operating the tools of the IT, such as computer, telecommunications, reprographic technologies
- To equip them with the required knowledge of scientific management of library systems, information centres and so on
- To provide the students with an understanding of the basic principles and fundamental laws of LIS
- To provide the students with basic knowledge of quantitative techniques, including basic statistical methods (this implies that students should learn basic quantitative data analysis tool for instance SSPS)
- To provide students with basic knowledge of the application of ICTs to the information system and services.

These objectives elaborated on by Muthu, Sivaraman and Singh (2015) are in line with the digital scholarship knowledge and skills. They indicate that students should be trained for the present and the future. These objectives are not diverting from the SAQA (2009a) documents.

These objectives are general, which possibly permits LIS schools to infuse emerging changes into the curriculum to meet the demands of the job market. In this case, digital scholarship content can be infused as these objectives are generally flexible for removal and inclusion of the desired contents.

2.14.3 Study units

Most of the SAQA (2009a) documents have study units, but some do not; these study units are from different universities. They are detailed below from each SAQA (2009a) document. Only four SAQA (2009a) documents contained study units. The SAQA (2009k) only states that the qualification comprises compulsory modules at level 8, totalling to 120 credits.

The other three SAQA (2009a) documents consist of the following compulsory study units:

Table 3: Study units of LIS courses

SAQA (2009a) PGDLIS (Compulsory=120)	SAQA (2009c) PGDLIS (Compulsory=120)	SAQA (2009f) B. Information Science (Compulsory= 360)
NQF Level 8	NQF Level 8	NQF Level 5
• Organisation management, level 8 with 15 credits • Document description & subject analysis, 15 credits • Collection management, 10 credits • Information services, 15 Credits • User studies, 15 credits • ICT • Fieldwork, 10 credits	• ICT application in library & information service 1,24 credits • Management of knowledge & information services 1, 24 credits • Resource description & access 1, 12 credits • Using the internet as a reference tool (applied information science 104)	• Introducing applied information science • Introducing information records & sources • Fundamentals of communication • Language through an African lens • Introducing to information science • Developing information skills for lifelong learning • Basic text skills • English for academic purposes • Ethical ICT for development solutions

These study units were submitted in 2009, which means that they have existed for some years. A three-year bachelor's degree has contents from NQF level 5 to NQF level 7. In the PGDLIS, all the study units or modules are at level 8 and some institutions offer it one year full time and others two years part time (SAQA, 2009b; SAQA, 2009c). Much might have changed since 2009, as some universities update their contents based on the current trends internally. SAQA (2009b), SAQA (2009c) and SAQA (2009f) contents seem to be more based on the automation era than the 4IR because, when these submissions were done, it was when the automation period was under way in South Africa libraries. Although much has changed, these units permit the curriculum developers to include emerging trends. SAQA (2009a) from institutions A, B and E all have units that emphasise the inclusion ICTs in the LIS curriculum. Muthu, Sivaraman and Singh (2015) propose that LIS curriculum designers should consider including computer science components as the LIS profession have moved from traditional librarianship to computer science and IT disciplines. The authors use examples of web-based education that consists of committed faculty and learning services, digital library and instructional technology support. Nevertheless, the suggestion, most LIS schools seem to still have contents on traditional librarianship contents, as Raju (2017b) witnesses that very few LIS schools teach digital scholarship-related contents.

2.14.4 Outcomes of the LIS qualifications

Outcomes from LIS schools' documents submitted to SAQA (2009a) were also used as part of the literature review. These outcomes indicate a variety of factors from different LIS schools. Similarly, the outcomes are arranged according to qualifications submitted to SAQA (2009a), as in other sections above. The lowest qualification document retrieved is for the Diploma of Library and information Science (SAQA, 2009d). SAQA (2009d) stipulates that upon completion, their graduates should have met the following outcomes:

- Demonstrate skills of critical thinking and debate
- Demonstrate skills of reading and interpretation
- Demonstrate skills of writing and rhetoric
- Demonstrate information skills

These skills are in line with the ones provided by Nonthacumjune (2011) and McCullough (2014) and are considered to be relevant to be able to perform digital scholarship-related duties. Therefore, students must have these skills upon completion of the course.

SAQA (2009d) indicates that this qualification is at NQF level 6, which carries 360 credits. Upon completion of this qualification, graduates can enrol for a Bachelor in Library and Information Science (BLIS) qualification to be professionals as this qualification is targeting para-professionals of the LIS field (SAQA 2009d).

Documents on the Bachelor of Information Science qualifications were retrieved and the outcomes from these documents are presented in Table 4:

Table 4: Outcomes of Bachelor of Information Science courses

SAQA (2009f)	SAQA (2009g)	SAQA (2009h)
• Organise information effectively for retrieval purposes & for bibliographic control	• Analyse & synthesis information	• The skills of critical thinking & debate reading & interpretation
• Use ICT effectively for information retrieval & train users to effectively access information worldwide by using ICTs	• Provide effective & professional information service	• IT competencies required in the information society
• Investigate contemporary information ethics by learning about relevant issues of access, privacy & intellectual property within the South African legal frame	• Use research techniques to conduct information needs assessment	

The BLIS qualification is at NQF level 8 with 480 credits in four LIS schools, according to SAQA (2009a). However, other LIS schools have it at NQF level 7 since it is a three-year qualification, and it carries 360 credits (SAQA2009a).

LIS schools in South Africa also offer a PGDLIS, which are outcomes that each university expect their students to have (SAQA 2009a; Muthu, Sivaraman & Singh 2015). The SAQA (2009a) website has three documents of universities offering LIS education at PGDLIS level. Documents from SAQA (2009b), SAQA (2009c) and SAQA (2009e) are from the universities offering PGDLIS. The selected outcomes relate to the thriving of digital scholarship as this study focuses on digital scholarship. Mostly, technology-related outcomes are displayed in the Table 5:

Table 5: Outcomes of the PGDLIS courses

SAQA (2009b)	SAQA (2009c)	SAQA (2009e)
• Apply skills & knowledge of the structure of information domains to discipline based problems in locating information.	• Collect, process & organise different information resources within the scope of a LIS.	Equipped with proficiency in knowledge of the theory of library & information science sufficient
• Analyse & critique local policies with respect to the development of libraries & information services.	• Implement administrative routines for library & information support services.	Ability to organise a collection of information for efficient access, assess & respond to user needs
• Apply the ethical issues associated with the supply of information.	• Evaluate the role of people in knowledge generation, information exchange & dissemination.	• Conduct searches for manual, advanced literature searches & computerised information systems using advanced searching techniques.
• Appreciate the impacts of the	• Design, develop & implement collection	• Develop strategies & plan for the development of

development of information & communication technology.	development & management strategies within the LIS environment.	library & information science.

At the PGDLIS level, the outcomes of the qualifications indicate that LIS schools' graduates must be equipped with technological skills, as such skills are related to digital scholarship. The outcomes of these qualifications are in line with outcome outlined by Mbagwu, Okoye and Anyanwu (2018) that upon graduation, LIS schools' graduates must be intellectuals that are capable of searching, discovering and using the knowledge acquired effectively in the digital age. However, these outcomes are outdated, since they were published in 2009 when most institutions in South Africa focused on the automation process rather than the digital age. SAQA (2009e) indicates that upon completion of this qualification, students should be able to search computerised information. This indicates that LIS schools allow for the infusion of new skills in their curriculum; however, one cannot be adamant about such statement since Raju (2014), Ferguson, Barzilai, Ben-Zvi, Chinn, Herodotou, Hod, Kali, Kukulska-Hume, Kupermintz, McAndrew, Rienties, Sagy, Scanlon, Sharples, Weller, and Whitelock (2017) and Mbagwu, Okoye and Anyanwu (2018) caution that LIS schools produce graduates who are unfit or rather poorly trained for the job market.

2.15 DIGITAL SCHOLARSHIP CONTENTS IN THE LIS CURRICULUM

In 2015, in the USA, most digital scholarship programmes and centres have been discovered by private institutions (Wexelbaum 2016). Wexelbaum (2016) highlights that these institutions are in the forefront of the discovery of digital scholarship qualifications and certificate programmes for graduate students and professionals. Programmes offered by LIS schools in the USA have changed according to the results of the change in library services; therefore, programmes offered are more specialised in most LIS schools (Yadav 2018). RDM, user experience testing, assessment, digital library development, embedded librarianship, digital scholarship or humanities, web design and archives are considered as new focuses of LIS schools (Yadav 2018; Ayinde & Kirkwood 2020). Furthermore, Tu and Xu (2018) point out that, in China, in order to support digital scholarship, programmes have been identified by the National Science Library of Chinese Academy of Science (NSLCAS) on RDM. The emphasis on the importance of digital scholarship is indicated by the desire by most academic libraries

that have invited the facilitators to train their librarians and the individual librarians who have enrolled to acquire digital scholarship skills and knowledge. Table 6 displays units that appear in NSLCAS libraries:

Table 6: Training programmes toward Digital scholarship in libraries of CAS

Training Programmes	Topics and Descriptions
RDM & services	• Data science • Research data service management & services • Implementation of data management • Data analysis & tools • Research data release & dissemination
RDM in practices	• Introduction to research data & RDM • DMP (data management plan) & other agreements during research processes • Research data & copyright • Hands-on licences • Text & data mining • Repository
Data librarian training	• Big data: trends & policies • Data sharing: best practices • Data copyrights: laws & regulations • Data copyrights: contracts & licenses • Data use: data visualisation • Data normalisation: data set generation • Data analysis: supervised machine learning • Data analysis: unsupervised machine learning
Data visualisation methods & tools application	• Data source & processing • Time-varying data visualisation • Complex high-dimensional data visualisation • Geospatial data visualisation • Web data visualisation • Text visualisation

Long-term preservation of digital resources	• Main technologies & standards for long-term preservation of digital resources • National long-term preservation system for S&T digital resources • Practical exploration of long-term preservation of digital information • Mechanisms for participating in national long-term preservation system

This training is mainly on RDM, which is one part of digital scholarship; there are also other digital scholarship parts. This whole project was aimed at training librarians to systematically learn RDM issues and services, consisting of strategic planning, project planning, data repository, legal issues, user promotions and important components of RDM (Wise, Henninger & Kennan 2011; Tu & Xu 2018; Ayinde & Kirkwood 2020). It is evident that most of these contents have been migrated from the IT and computer science and are not originally from the library sciences. Therefore, as indicated by Blake, Gallimore and Radford (2018), and Ayinde and Kirkwood (2020), already practising librarians need to consider upgrading their skills or reskilling.

Other content evident in the literature that are digital scholarship-driven include 3D modelling and printing, database development, making digital collections, digital exhibits, digitisation of analogue material, GIS and mapping, textual mining, and modelling and analysis (Estlund 2013; Mulligan 2016; Lippincott 2017; Joseph 2019). Looking at these contents, it is evident that originated from in computer sciences and IT, or rather from STEM fields. Therefore, this means that for LIS schools to produce competitive graduates, they must collaborate with STEM fields.

Although, in other parts of the world, education on digital scholarship is reaching a stable position, it is not the case in South Africa, as Mahlatse, Pienaar and Van Deventer (2018) caution that even education on big data, which is part of digital scholarship, has been recently approved by the Department of Science and Technology and introduced in 2018. This education is approved in one university, but not in LIS schools, the name of the university offering qualifications in big data is Sol Plaatjie University (SPU) and the name of their formal qualification is Bachelor of Science in Big Data (Mahlatse, Pienaar & Van Deventer 2018).

Additionally, Mahlatse, Pienaar and Van Deventer (2018) claim that there are few LIS schools (Department of Knowledge and Information Stewardship previously known as Library and Information Study Center, UCT) that offer a digital scholarship-related course (Annual short course); UCT specialises in data curation and RDM. UCT also offers a coursework master's degree in digital curatorship over a period of two years (Kahn, Higgs, Davidson & Jones 2014; University of Cape Town 2016).

Furthermore, the UP also offers digital scholarship-related courses, as they introduced a Master's Degree in Information Technology and M.IT in Big Data Science Degree (University of Pretoria 2017). Mahlatse, Pienaar and Van Deventer (2018) state that in the former qualification, there is a module on RDM and in the latter module, they have introduced data curatorship. There is no existing evidence in other LIS schools in South Africa that indicates a keen offering of education and training in digital scholarship content. However, Raju (2017a) indicates that duties in academic libraries require digital scholarship skills, knowledge and competencies, which indicates a huge gap in the LIS schools regarding digital scholarship content in South Africa. Although this may be the case, these contents may be silently existing in individual courses in LIS schools, thus the urgency of this study to discover the statues of digital scholarship training and education in South Africa.

Based on the literature reviewed, there is no undergraduate qualification in South Africa that offers digital scholarship education. However, Mahlatse, Pienaar and Van Deventer (2018) mention that there are informal courses available in South Africa on digital scholarship. Briefly, Mahlatse, Pienaar and Van Deventer (2018) state that the Digital Curation Centre (DCC) and the Joint Information Systems Committee (JISC) in the United Kingdom have designed and piloted numerous programmes for training LIS professionals in the emerging trends. These programmes focused on the RDM mostly in South Africa, and the first training was presented in 2014 by the DCC (Mahlatse, Pienaar & Van Deventer 2018).

2.16   IMPORTANCE OF DIGITAL SCHOLARSHIP IN LIS CURRICULUM

Digital scholarship is important and brings about many opportunities in LIS schools. Scanlon (2018) claims that digital scholarship enhances interdisciplinary learning and research among students and researchers through the use of social media platforms. Digital scholarship among students or information specialist brings about the potential of new solutions to problems

through the new ways of thinking (Klein 2010; Scanlon 2018; Schwab 2018). Digital scholarship services are considered both highly practical and highly technical; therefore, LIS schools should offer education on digital scholarship. Therefore, an experienced eResearch librarian is of crucial importance to ensure the quality services in the work environment.

Swan and Brown (2008) and Si et al. (2013) caution that in the near future, the role of digital scholarship librarians who curate, preserve and archive digital data will become increasingly important. Masenya and Ngulube (2019) also emphasise the importance of digital preservation resources in academic libraries as a result of the digital revolution in South Africa. The lack of skills and training was identified as the one shortcoming that hinders the preservation of digital resources, which are part of digital scholarship (Masenya & Ngulube 2019). Librarians have to be trained by LIS schools before other competing professions, such as the IT and computer science fields, can dominate the job market. Therefore, this indicates the absolute importance of infusion of digital scholarship content in the LIS curricula. However, this is only evident in the developed countries.

Developed countries such as the United Kingdom and the USA demonstrate the importance of digital scholarship by providing programmes relating to this emerging scholarship. For instance, the Council on Library and Information Resources or Digital Library Federation (2013) (CLIR/DLF) Data Curation Fellowship Program is one of the great expansions of CLIR's Postdoctoral Fellowship Programme in Academic Libraries. Si et al. (2013) claim that this programme provides PhD students with professional development, education and training opportunities in data curation for the sciences and social sciences, as well as for medieval studies. Furthermore, Si et al. (2013) state that there are 25 out of 38 iSchools that teach digital scholarship contents in the ALA LIS schools. This indicates how essential digital scholarship in the LIS curriculum is.

The urgency of digital scholarship education in LIS schools is evident by the growing job positions that require digital scholarship skills, knowledge and competences in the job market. Klein (2010) posits that there has been a shift in traditional disciplines due to digital humanities and digital practices. King (2018) mentions that, more recently, a partnership is being forged between digital humanities and digital libraries, leading to the demand for digital humanities centres in academic libraries and an increase in the call for digital scholarship librarians. This is evident in scholars and other researchers conducting their research digitally (King 2018).

These scholars are served by librarians produced by LIS schools; therefore, librarians should always be well equipped with referral information and research skills to collaborate with their patrons. Therefore, without proper digital scholarship education, it is impossible to render quality services according to the needs of the patrons.

Digital scholarship education also allows for collaboration between librarians and patrons in discussing issues of the profession and sharing relevant information with researchers, faculty members and other library patrons. To emphasise the importance of digital scholarship, Malhan (2011), and Adams and Gunn (2013) suggest that librarians should be trained in digital scholarship since there is an emergence in the work environment of the cutting-edge knowledge, ingenuity and new ideas that make a big difference in advancement. However, Malhan (2011) notices that there is a constant searching for talent and employing individuals with agility, requisite skills and competencies, inclination for updating, penchant for learning and performing in an outstanding manner using innovative approaches, but LIS schools are failing to train individuals in digital scholarship (Mathews & Pardue 2009; Malhan 2011; Harris-Pierce & Liu 2012); yet, they expect their graduates to excel in the job market. Therefore, to thrive as LIS schools against the counterparts supplying the market with similar knowledge and skills in the 4IR, LIS schools should offer education relating to the demands of the market.

Digital scholarship education is important as everyone, whether a practising librarian or a student, needs to be trained in this emerging area. Altogether, Malhan (2011) and Wexelbaum (2016) sum it up by stating that LIS schools must expand their role to providing needs-based continuing education for working professionals in order for them to remain relevant in their jobs. Furthermore, Malhan (2011) proposes that LIS schools in developing countries should provide relevant LIS programmes of the times and supporting infrastructure for teaching and learning in order for students to understand the content on digital scholarship. Masenya and Ngulube (2019) suggest that librarians should go to workshops and conferences relating to the preservation of digital resources to establish or polish their skills in order to thrive in the revolving digital environment.

2.17 PEDAGOGIES FOR TEACHING DIGITAL SCHOLARSHIP IN LIS SCHOOLS

Ferguson et al. (2017) posit that pedagogies have four functions, which are training people for employment, developing civilised citizens, socialising people with the community and developing happy rounded individuals. These authors, however, emphasise that the main purpose is to move people from being a learner to being an earner. Therefore, such education traits must be evident in the teaching approaches. This is best achieved when the teaching pedagogies of the times are used in the teaching and training of LIS professionals. Kinash, Knight and McLean (2015) are of the view that as digital scholarship has taken over, digital content has the potential to be a disruptive pedagogy, accelerating an overall shift from didactic lecture to constructive learning. The motivation behind the adoption of such pedagogies is the adoption of Massive Open Online Courses (MOOCs) and Open Educational Resources (OERs) by most universities across the globe (Bayne & Ross 2014; Kinash, Knight & McLean 2015). Therefore, the use of digitally based teaching methods is recommended for teaching digital scholarship-related contents.

Mutula and Tsvakai (2002) note that methods used in South Africa for teaching in general are largely influenced by the methods used in the USA. Normore (2013) lists various pedagogies used in LIS schools for teaching and learning, such as face-to-face communication, distance learning and linking theory with practice as teaching methods. Face-to-face communication is defined as a traditional method in which a classroom or computer laboratory or a physical space is used to teach students. It has been used by most residential universities across Africa. Koehl et al. (2019) state that face-to-face communication is a method to teach digital scholarship. These authors articulate that the objective has to be refined to be in line with the pedagogy used. Thereafter, skills, knowledge and competencies available in the literature have to be used to formulate contents. The course material has to be consistent with the learning goals and objectives, and there should be a laboratory to train individuals on digital scholarship content (Koehl et al. 2019).

Cloete (2005), Duncan, Miller, and Jiang (2012) and Ali and Bakhshi (2013) perceive distance learning as the method in which students and lecturers utilise numerous technologies for teaching and learning LIS contents through the use of web-based training programmes and interactions. The drive behind this pedagogy is that technology and students can complete their activities anywhere, provided they have access to the internet. This teaching method is very effective where there is a proper technology infrastructure. Cloete (2005) and Mbagwu, Okoye

and Anyanwu (2018) argue that in developing countries, it is a problem because of the lack of technological skills and infrastructure.

Ferguson et al. (2017) list ten pedagogies that could be utilised to enhance distance learning for digital scholarship, which include spaced learning, learners making science, open textbooks, navigating post-truth societies, intergroup empathy, immersive learning, student led-analytics, big data inquiry: thinking with data, learning with internet values and humanistic knowledge-building communities. The authors highlight that these new forms of teaching and learning are already in use, but they have not yet had a profound influence in education. These innovative pedagogies include some that have an urgency about them, since they are addressing the needs of today's world. For instance, the open textbook pedagogy, which entails freely sharable and editable resources designed to operate in place of a specific textbook, forms part of OERs, which is a new development in universities (Ferguson et al. 2017). Scanlon (2018) points out that in the digital age, teaching and learning materials are created digitally, which allows for the easy sharing of materials and increases so much if OERs' movements. Furthermore, the intergroup empathy is all about the online environment where social media form global virtual spaces. It allows different individuals the opportunity to interact and solve global conflicts, regardless of their backgrounds or geographical location. Therefore, digital scholarship on its own has changed the scholarship of learning.

Normore (2013) and Mbagwu, Okoye and Anyanwu (2018) further assert the significance of ensuring that theory is linked with practice through the utilisation of internships, practicums and volunteering. Normore (2013) notes that exposure to the actual practices is an effective manner for students to acquire theoretical notions that constitute the core bases of the field. A practicum also assists to assess whether students understand the theory learnt in class. The engagement of LIS schools with practitioners helps to ensure that students keep up with the trends and hot issues occurring in the profession. Additionally, Ocholla and Ocholla (2014) claim that drill and practice, which is defined as the process in which multiple repetitions of the same activity are performed until the objectives of the session are achieved, is the best for teaching in the current era. This model states that the lecturer must give students sufficient time to do their practical work. Preferably, the number of students in the class should be limited. This strategy could work in enforcing the practical component of digital scholarship.

In this digital age, LIS schools need to improve in terms of methods of teaching. Ferguson et al. (2017) provide new ways of teaching and indicate that these are crucial in the digital age, or rather the 4IR. Along the same lines, Mbagwu, Okoye and Anyanwu (2018) state that the reason behind poorly trained graduates from LIS schools is partly the fact that LIS schools' management and educational administrators have not done much to implement new methods of instruction. The implication in the dawn of the new skills, knowledge and competencies brought by the 4IR, is that LIS schools must implement new methods of teaching and learning. Ali and Bakhshi (2013) also indicate that LIS schools must adopt these new teaching methods, as there has been a global shift in education that reflects the dynamics brought by the 4IR, which is called e-learning, where the use of the internet for teaching and conferencing is employed.

2.18 CAPACITY OF LIS SCHOOLS TO TRAIN LIS GRADUATES ON DIGITAL SCHOLARSHIP

The Report to the European Commission on new modes of learning and teaching in higher education in 2014 shows that higher education institution are supposed to offer quality education based on the technological innovations available in the 21st century (European Commission). However, this report indicates that many universities are not ready since there is less capacity among staff and there are not sufficient resources. This means that ensuring that all staff in LIS schools possess the skills and attributes necessary to successfully use these new technologies assists in ensuring that LIS schools offer proper education based on these new digital scholarship skills, knowledge and competencies. It is paramount for LIS schools to capacitate themselves with content on the emerging skills as cautioned that libraries are using the IoT to improve workflow and service, integrate existing resources and systems to achieve service innovation and connect library resources and services to more people than ever before (Connaway 2015; Liang 2018; Liang & Chen 2018). This calls for education that includes digital scholarship.

Laal, Laal and Aliramaei (2014) encourage continuing education; they stipulate that this kind of education provides skills and knowledge in a changing environment. Formal and informal education in the form of lifelong learning should be offered by LIS schools based on digital scholarship to equip academic staff to be in line with the trends in the LIS profession (Laal, Laal & Aliramaei 2014; Shongwe 2014). As part of training for lecturers, Ocholla and Ocholla

(2014) propose that lecturers should join groups available for practitioners and engage in the workshops or trainings to remain relevant in their teaching.

Ocholla and Ocholla (2014) point out that since the library environment is digitised, LIS schools should have the right equipment in place to teach those IT-based skills to the future information professionals. Scholars mentioned that in order for LIS schools to provide proper education with digital scholarship skills, knowledge and competencies, students must have access to hardware and software used for IT or ICT skills, knowledge and competencies (Manda 2006; Edegbo 2011). Munyoro (2014) indicates that most LIS schools in Zimbabwe have not bought infrastructure to offer proper education on ICT or IT-based skills. Researchers like Ocholla and Bothma (2007) and Liang and Chen (2018) reveal that LIS education has some disparities such as ICTs in the curricula due to the lack of infrastructure. This implies that infrastructure in LIS schools is very important. Fundamentally, to offer digital scholarship contents, it is important to have equipment that will reinforce the training of information professionals.

Along the same lines, Kaur (2015) notes that other LIS schools will have in their curricula contents on IT or ICTs but there would be no infrastructure supporting the teaching of such contents. Parts of this infrastructure include a computer laboratory with connected computers and software to facilitate teaching and learning in the digital space (Kaur 2015). Expertise among lecturers is another problem, since most lecturers lack digital scholarship skills, knowledge and competencies. King (2018) indicates that the already existing services in libraries and in digital humanities sections include consultation at the beginning of the digital project, infrastructure for repositories, project management and outreach, and grant writing. Furthermore, King (2018) notes that librarians trained in LIS schools feel overwhelmed by these duties and they need more training to be better trained to the these needs of digital humanities or scholarship. This implies that proper training for teaching staff in LIS schools to train librarians to meet the needs of the job market is a major part of the capacity required for digital scholarship education.

Scanlon (2018) indicates that digital scholarship plays an important role that is evident in the drastic changes that occurred in the landscape of scholarly communication in the past decade, and it has direct implications for the activities of academics. These changes brought about new ways of thinking among researchers as well as new kinds of academic output for lecturers to

incorporate into their teaching in universities based mostly in developed countries (Scanlon 2018).

2.19   SUMMARY OF CHAPTER TWO

This chapter reviewed the literature based on digital scholarship education and training for library professionals internationally, continentally and nationally. The chapter also presented the conceptual framework on which the entire study was based. The framework emphasised the education and training in LIS schools for digital scholarship. A model by Wolf (2007) on curriculum development and the Gap Service Quality Model by Zeithaml, Berry and Parasuraman (1993), which informed the study were also discussed. Curriculum analysis, curriculum mapping, ideal graduate attributes and re-/development of the curriculum were identified from Wolf's (2007) comprehensive model as construct for this study.

Thereafter, empirical literature on LIS curriculum; history of LIS curriculum; developments of LIS curriculum and challenges facing LIS curriculum was conducted to understand the evolution of the LIS education over different industrial revolutions to the last revolution. Employers' perceptions of digital scholarship in the form of opportunities, challenges and strategies to overcome challenges or barriers brought by digital scholarship were sought. In addition, skills, knowledge and competencies in digital scholarship were sought from the literature to understand the developments in the job market as they directly impact on the quality of education offered by LIS schools. The extant literature was reviewed to understand the inclusion of digital scholarship content in the LIS curriculum. In that regard, LIS schools' different qualifications, digital scholarship content, importance of digital scholarship in LIS curriculum, pedagogies of teaching digital scholarship and capacity of LIS schools to teach digital scholarship were explored from the literature. The following chapter (Chapter Three) addresses the research methodology used to carry out this study.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 INTRODUCTION

Research methodology expresses the understanding of the researcher of the entire research process, which includes the social-organisational context, philosophical assumptions, ethical principles and the political impact of new knowledge from the researchers' enterprise (Mouton 2001; Gall, Gall & Borg 2003; Neuman 2014; Leavy 2017; Creswell & Creswell 2018). This implies that the understanding of the methodology allows the researcher to select relevant methods to be used when conducting the study.

Various authors emphasise that when social research is conducted, persistence, personal integrity, tolerance for ambiguity, interacting with others and pride in conducting quality research are major keys to a successful research product (Mouton 2001; Perri & Bellamy 2012; Bryman 2012; Neuman 2014; Ahmed, Opoku & Aziz 2016). Mouton (2001) further supports this by stating that research methodology focuses on the processes and the kinds of research tools and procedures needed to gather the required data for the study. Goulding (2002) comments that choosing an appropriate methodology is difficult; therefore, it has to be based on the researcher's convictions, beliefs and interests. When deciding on the research approaches, the researcher is guided by the research problem and the aim of the research in terms of whether it should be intensive or extensive (Lowe 2001; Saunders, Lewis & Thornhill 2016). Lowe (2001) points out that intensive research is deeper in focus while the coverage is narrower, and extensive has a wider coverage, but it does not investigate concepts deeper. This research was an intensive research since its focus was deeper and the coverage was narrowed down to HoDs in LIS schools, lecturers teaching digital scholarship contents, directors of academic and special research council libraries and librarians practising digital scholarship in academic and special research council libraries.

Narrating on the research methodology is crucial; hence, it shows to the reader the understanding of the research undertaken by the researcher. The aim of the research methodology is to help the reader understand, in the broadest possible terms, not the product but the scientific process itself used to achieve the aim of the research (Cohen, Manion & Morrison 2000; Cohen, Manion & Morrison 2018). Rajasekar, Philominathan and

Chinnathambi (2013) concur that it is important for the researcher to know not only the research methods necessary for the research undertaken, but also the methodology. Knowing methodology means that one knows the procedures to be used to describe, explain and predict the phenomena (Rajasekar, Philominathan & Chinnathambi 2013).

The previous chapter articulated the literature review and the conceptual framework utilised by the researcher to achieve the purpose of this study. Mouton (2001) and Henning, Van Rensburg and Smit (2004) agree that the section on the research methodology discusses the methodology used by the researcher. Saunders, Lewis and Thornhill (2016) share these sentiments as they describe methodology as a section that deals with the entire theory of how research should be conducted. Likewise, the study aimed to explore education and training of LIS professionals in digital scholarship in South Africa; therefore, discusses the methodology aided the researcher to achieve the aim of the study. Henning, Van Rensburg and Smit (2004), Saunders, Lewis and Thornhill (2016) and Leavy (2017) contend that this chapter should discuss philosophical assumptions, perspectives or worldviews, research approach, research design, data collection procedures, data collection methods and data analysis methods to be used in the study. All the aspects listed by Henning, Van Rensburg and Smit (2004) are represented in Figure 7 and detailed in the subsections of the chapter.
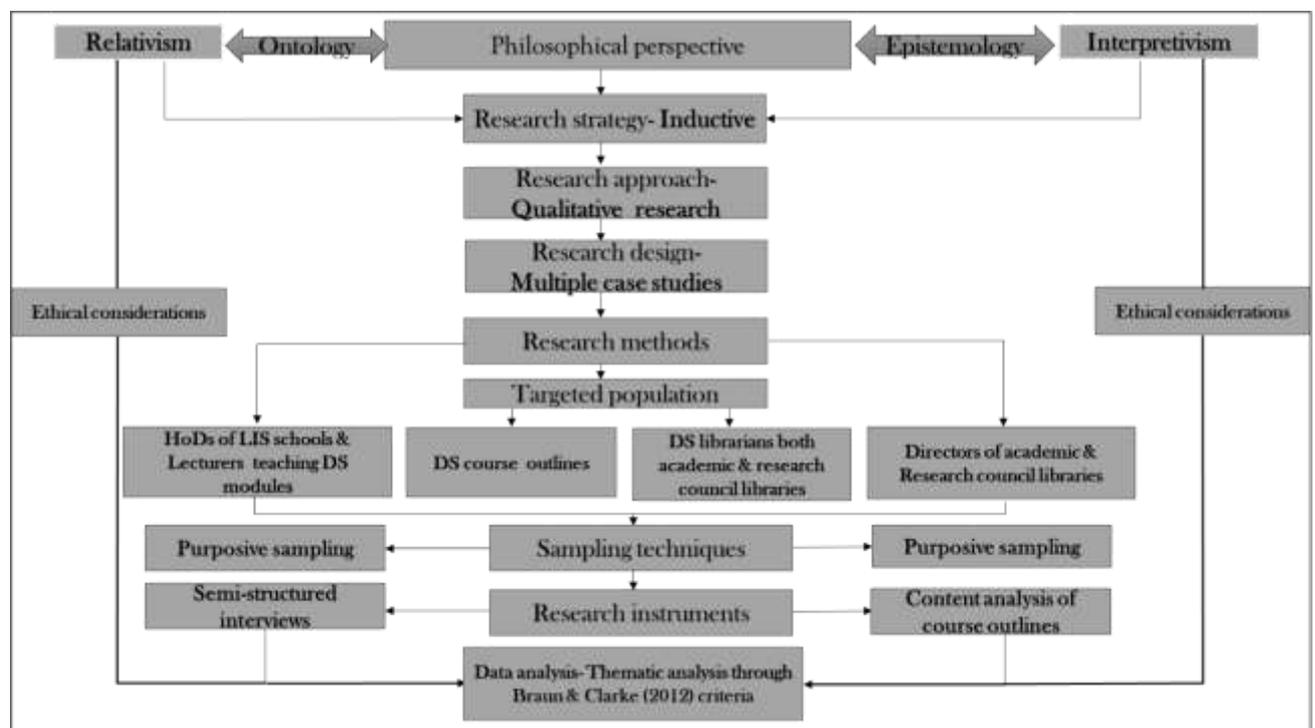
Figure 7: Methodology mapping

3.2 PHILOSOPHICAL ASSUMPTIONS

When a researcher understands philosophical assumptions and is explicit about them, they become a better researcher (Neuman 2014; Saunders, Lewis & Thornhill 2016; Creswell & Creswell 2018; Kaushik & Walsh 2019). Detailing the researcher's philosophical worldview assists the readers to establish the choice of the research approach and design (Creswell 2014; Neuman 2014; Creswell & Creswell 2018; Sehlapelo 2020). Rehman and Alharthi (2016) concur that researchers have to understand and articulate beliefs about the nature of reality, what is known about it and how one can attain this knowledge. Neuman (2014) explains that the researcher must learn and understand philosophical assumptions rather than adopting them without awareness. Furthermore, Neuman (2014) narrates that understanding assists the researcher to be flexible and think more clearly about the choice of the philosophical assumption. Collier (2005) claims that social sciences researchers are not innocent of philosophy; hence, many of them assume, from the outset, a certain philosophical position about what science should look like and attempt to imitate it.

Mack (2010), Lincoln, Lynham and Guba (2011) and Sehlapelo (2020) state that philosophical perspectives are paradigms, while Creswell and Creswell (2018) refer to them as philosophical worldviews. Creswell and Creswell's (2018) terminology is synonymous to that of Creswell (2014), as they refer to worldviews as philosophical perspectives. Philosophical perspectives are cited in the extant literature as the basic beliefs or ideas that direct action in the research project (Creswell 2014; Neuman 2014; Rehman & Alharthi 2016; Creswell & Creswell 2018). Rehman and Alharthi (2016) cite paradigms as basic belief systems and theoretical framework with assumptions about ontology, epistemology, methodology and axiology. Creswell and Creswell (2018) state that philosophical worldviews are the researcher's general philosophical orientation about the world and the nature of research brought to the study. This implies that when one decides on the ontological assumption, it should be consistent with the epistemological, axiological, methodological and methods assumptions to be used in the study. Grix (2004), Neuman (2014), Creswell (2014), Mack (2010), Ngulube (2015b) and Creswell and Creswell (2018) are of the view that there are two forms of philosophical perspective in the social sciences research, which include ontology and epistemology. Grix (2004) indicates that ontology and epistemology lays the foundation for the whole research process. However,

Denzin and Lincoln (2005), Mertens (2009), Saunders, Lewis & Thornhill (2016) and Sehlapelo (2020) oppose this by categorising paradigms as ontology, epistemology, methodology and axiology. Yet, the researcher opted for the understanding of Grix (2004), Mack (2010), Creswell (2014), Ngulube (2015b), and Creswell and Creswell (2018) of paradigms as it is clearly articulated and convenient to be followed by a novice researcher. In addition to that, once one has decided on the ontological and epistemological views automatically, methodologies (procedures used to conduct the study) and axiology (the study of ethics) are discussed in the study (Saunders, Lewis & Thornhill 2016).

This study concentrated on LIS education in South Africa and was aimed at exploring education and training of LIS professionals in digital scholarship in South Africa. Therefore, as suggested by Neuman (2014) and Rehman and Alharthi (2016), it is paramount to understand the different philosophical perspectives from the outset before acting upon one. Creswell (2014), and Creswell and Creswell (2018) elaborate that philosophical assumptions remain hidden in the research process; however, these authors concur with Neuman (2014) that the researcher has to be explicit about which broader philosophical assumption is adopted in the research. Creswell (2014) explains that being explicit about the philosophical assumption assists in making choices about the research approach among qualitative, quantitative and mixed methods research. Greener (2008) points out that paradigms are believed by researchers to be inconsistent with each other, for instance, should a researcher uses one paradigm for a certain project, they cannot also use another one. The ontological and epistemological positions of this study are detailed in the subsections below.

3.2.1 Ontology

Ontologies are claims and assumptions that are made about the nature of social reality, claims about existence, what it looks like, its components and how those components interact (Patton 2002; Richards 2003; Mack 2010; Yin 2016; Leavy 2017; Pope & Mays 2020). Patton (2002), Saunders, Lewis and Thornhill (2016) and (Leavy 2017) suggest that it is the ontological assumption that leads a researcher to inquire what kind of reality exists, whether it is singular, verifiable reality, or truth or otherwise, it has to be socially constructed reality. Mack (2010), Flick (2018) and Pope and Mays (2020) sum it up by pointing out that such assumptions are divided into two main streams: realism (the world of objectivity) and relativism (governed by subjectivity). In the same vein, Ngulube (2015b) resonates Mack's (2010) idea, and Ngulube

(2015b) adds the third stream called pluralism. This ontological assumption is believed to be in line with mixed methods research. Realism as a worldview that ascertains that the truth can be found only when the right method is used, facts are facts and there is no subjective way to determine the truthfulness of a phenomenon (Jariya 2015; Flick 2018). However, Ritchie and Lewis (2014) argue that there is nothing like pure facts and there is no rigid way of determining facts. From the outset, facts are all selected from a worldwide context by the events of our mind. Relativism is characterised as the one perspective in which interpretations are used in constructing social reality (Ritchie & Lewis 2014). Ngulube (2015b) mentions that pluralism and pragmatism paradigm are a result of attempting to bridge the gap between realism or positivism and constructivism or interpretivism ontologies and epistemologies.

Ontologically, this study relied on the constructivism worldview because the researcher believed that the nature of the phenomenon being investigated is subjective and interpreted differently by different people, as indicated by the motivations above. Data gathered through interviews from LIS schools' HoDs, lecturers, librarians and document analysis were interpreted, which is considered to be a part of a subjective approach based on ontologies by the scholars mentioned above.

3.2.2 Epistemology

Poetschke (2003), Leavy (2017) and Flick (2018) view epistemology as the theory of knowledge. Ngulube (2015b) broadens the concept by stating that epistemology is how one acquires knowledge about reality or the way of knowing about a particular phenomenon. An individual's epistemological position reflects the way they know the world. Flick (2015), Ngulube (2015b) and Flick (2018) identify three types of epistemological assumptions, which are positivism, interpretivism and pragmatism. Positivism is an assumption that considers only phenomena confirmed by the senses to be warranted as knowledge (Cohen, Manion & Morrison 2011; Flick 2014; Johnson & Christensen 2014; Flick 2015; Flick 2018). The advantage of data collected under the perceptions of the objectivism epistemology and the findings of research are usually reliable and support researchers to make scientific assumptions (Flick, 2014). Furthermore, Flick (2014) and Flick (2018) state that in positivist research, statistics are used the most and it is characterised as the natural sciences' assumption. Interpretivism is a viewpoint where there is nothing considered being the real world; rather the

world is constructed socially (Patton 2002; Poetschke 2003; Rehman & Alharthi 2016; Saunders, Lewis & Thornhill. 2016).

Epistemologically, the interpretivism worldview was used for this study. Scholars like Poetschke (2003), Creswell and Creswell (2018), and Flick (2018) perceive interpretivism as the viewpoint that believes there is nothing considered to be the real world; rather, the world is constructed socially. This study is interpretive in nature, as the researcher, based on the data collected, viewed LIS education (digital scholarship) as a social construct that impacts directly on the society and it exists based on interpretations. As indicated by Munyoro (2014), providing outdated training to librarians and information science students may result in them being rendered irrelevant in the job market. The researcher considers this as a social contract interpreted differently by different researchers, depending on the methods used to collect data.

3.3   RESEARCH STRATEGY

Various research strategies are available to be used for deducting or inducting meaning in the research. Soiferman (2010) lists deductive, inductive, abductive and retroductive research strategies. Saunders, Lewis and Thornhill (2016) refer to research strategies as approaches to theory development. Saunders, Lewis and Thornhill (2016) and Flick (2018) concur with Soiferman (2010) by listing these strategies as deductive, inductive and abductive. However, Saunders, Lewis and Thornhill (2016) and Flick (2018) exclude the retroductive research strategy from their list of research strategies. The deductive strategy uses an existing or a new theory to answer a "why" question in social research and it is used to prove theory because it begins with theory (Blaike 2010; Saunders, Lewis & Thornhill 2016; Blaike & Priest 2019). This strategy aims to find an explanation for an association between two concepts through suggesting a theory, the relevance of which can be tested.

Blaike (2010) articulates a retroductive research strategy as one in which the sole purpose is to unveil underlying mechanisms in a certain context and explain observed regularities. The author further states that the strategy's logic relies on the process of building hypothetical models of the structure suggested, thereby producing empirical phenomena. Another strategy is the abductive research strategy perceived by Blaike (2010) and Saunders, Lewis and Thornhill (2016) as the strategy that is used to answer all types of questions. Saunders, Lewis and Thornhill (2016) further state that in an abductive inference, known premises are used to

generate testable findings. However, it answers the why questions by providing an understanding rather than an explanation and it provides reasons other than causes (Blaike 2010; Blaike & Priest 2019). This strategy is more advanced as it uses data collection to explore a phenomenon, in the sense that themes and patterns are identified and located in the conceptual framework; thereafter, they are tested through subsequent data collection (Saunders, Lewis & Thornhill 2016).

The researcher opted for an inductive research strategy, which is used with the qualitative research approach. Thomas (2006), Saunders, Lewis and Thornhill (2016) and Flick (2018) are correct when stating that the inductive research strategy is the strategy in which the researcher primarily reads the raw data to derive concepts, models or themes through interpretation of raw data collected from the targeted population. Thomas (2006) further points out that the inductive research strategy's purpose is to allow the findings of the research to arise from the main, recurrent or significant themes derived from the raw data to build a theory or a model, beside the restraints enforced by structured methodologies. The study was inductive; hence, the researcher collected data and inducted meaning from the data gathered. The collected data gave birth to a proposed curriculum development model inclusive of digital scholarship content.

3.4   RESEARCH APPROACH

There is no consensus among researchers on addressing this section of the study. Different authors call this section the research approach while others call it the research methodology. However, the researcher opted for Creswell and Creswell's (2018) naming of the section. Research approach is defined as a plan for research that spans the steps beginning from the assumptions or perspectives and ending in data collection methods, analysis and interpretation (Leavy 2017; Creswell & Creswell 2018).

There are three research approaches that are detailed in the extant literature, which include the qualitative, quantitative and mixed methods research approaches (Creswell, Plano Clark, Gutmann & Hanson 2003; Greener 2008; Creswell 2009; Bryman 2012; Flick 2014; Creswell 2014; Johnson & Christensen 2014; Ngulube 2015b, Creswell & Creswell 2018). Creswell and Creswell (2018) define qualitative research as the approach in which exploring and understanding the meaning of individuals or groups ascribe to a social or human problem. Adopting qualitative research means that the researcher employs emerging questions and

procedures, data collected from participants' settings and being inductive when analysing through constructing themes from particulars to general (Yin 2016; Creswell & Creswell 2018). Qualitative research emphasises words rather than quantifying the collection and analysis of data (Creswell 2009; Bryman 2012; Neuman 2014; Yin 2016).

Davies (2007), Creswell (2009), Singh (2013), Neuman (2014), and Creswell and Creswell (2018) are of the same viewpoint that quantitative research refers to the organised empirical investigation of a social phenomenon via statistical, mathematical or computerised methods or techniques such as experiments. Creswell (2009) remarks that the approach assists the researcher to provide a clear direction about procedures to be used in the research design. Creswell (2014) cautions that the qualitative and quantitative approaches should not be perceived as rigid, distinct, categories or opposites but that, instead, they should be viewed as different ends of the continuum. Creswell (2014) indicates that in that continuum, the mixed method research presides. Ngulube (2020) suggests that the mixed methods research is suitable for complex research problems where it is impossible to use one methodology to address many components, people or contextual factors. Although this research was complex as there were multiple cases that were studied, the qualitative research approach was deemed more suitable for this study.

3.4.1 Qualitative research

Qualitative research is about exploring and understanding the way in which individuals or groups ascribe to social problems (Mouton 2001; Creswell 2009; Creswell 2014; Brancati 2018; Creswell & Creswell 2018). Every qualitative research project has to ascribe to some of these characteristics, if not all of them. Such characteristics include that qualitative researchers select participants purposively and incorporate small numbers of cases according to their relevance, and the collection of data is designed more openly and aims at a broad picture made by reconstructing the case under study (Powell & Connaway 2004; Flick 2015; Connaway & Radford 2017). Flick (2015) also points out that in qualitative research, open-ended questions are often used and participants are expected to answer those questions using their own words and perspectives rather than being influenced by the researcher's perceptions of life. The ultimate goal of the qualitative approach is to generate theory out of research, place emphasis on understanding the world from the perspective of its participants, and view social life as

being the result of interaction and interpretations as it is governed by interpretivists (Phillimore & Goodson 2004).

Creswell (2014) declares that qualitative research is best suited when addressing a research problem where little is known about the phenomenon, and one wishes to explore more. Flick (2014) reveals that qualitative research is not standardised; rather it is designed to be as open as possible. Moreover, only a few cases are studied; however, they are analysed to their full complexity to gain deeper insight of such cases (Powell & Connaway 2004; Flick 2014).

Researchers who are interested in studying meaning and describing the in-depth understanding of human experience, for instance pain, grief, hope caring or unfamiliar phenomena such as female genital mutilation and many more, would find it difficult to use statistical methods (Mouton 2001; Neuman 2014; Connaway & Radford 2017). Consequently, the qualitative research approach is more relevant to such instances where understanding of behaviour or social phenomena is being explored (Creswell 2014). The implication is that the qualitative approach was relevant to this research since the study considered digital scholarship education in LIS schools using interviews and document analysis.

Creswell (2014) and Connaway and Radford (2017) provide the following strengths of qualitative research:

- Richness and holism, able to uncover complexity, including "thick descriptions".
- Collection during a sustained period that goes far beyond snapshots of "what?" or "how many?" to just how and why things occur as they do and even assess causation as it actually plays out in a particular setting.
- Ability to determine the meanings people attach to the events, processes and structures of their lives and to connect those meanings to the social world around them.

In order to maintain the strength of qualitative researcher, the primary role of the researcher is to be the primary research instrument that necessities the identification of personal values, assumptions and biases at the outset of the research (Pickard 2007; Creswell 2014).

The researcher was influenced by the interpretivism worldview to choose the qualitative research approach. This is because there is limited knowledge on digital scholarship in South Africa; therefore, this approach was deemed important as it permitted a deeper exploration for understanding of the phenomenon under investigation. The researcher collected data using the qualitative design known as a multiple case study. Semi-structured data were collected from LIS schools' HoDs, lecturers lecturing digital scholarship courses, academic and special research council library directors, and digital librarians through semi-structured interviews. The qualitative researcher used interpretations to make meaning of the data. In addition, qualitative content analysis of LIS schools' course outlines was conducted. All the processes that were adopted for this study, from the philosophical assumptions to the data analysis were qualitative driven, as provided in the literature detailed in this section, which made the study qualitative in approach.

3.5   RESEARCH DESIGN

Mouton (2001), Pickard (2007), Creswell (2014), Luo, Brancolini and Kennedy (2017), and Creswell and Creswell (2018) articulate that research design is the overall plan or blueprint that a researcher constructs to conduct a particular study or research. Bryman (2012) states that a research design is a structure that guides the execution of a research method and the analysis of the subsequent data. Bryman (2012) further posits that researchers fail to distinguish between research design and research methods. Greener (2008) defines research methods as strategies or frameworks arranged to collect and analyse data in a manner that aims to unite the relevance of the aim of the research. Bryman (2012) points out that after a researcher has selected a research design, a research method to be used to collect data has to be selected.

Adding to this discourse is Ngulube (2019) who labels this section as the research approach or strategy and refers to research approaches (section 3.4) as research methodology, which is against the naming of Pickard (2007), Creswell (2014), Kumar (2014) Luo, Brancolini and Kennedy (2017), Creswell and Creswell (2018) and Creswell and Guetterman (2018). As correctly pointed out by Ngulube (2019), the different terminologies used by different senior scholars' contribution to research methodology presents confusion in emerging scholars. However, in the case of this study, the naming conventions as per Creswell and Creswell (2018) and Creswell and Guetterman (2018) were adopted, as they are clear and seem to follow the traditional research terminology used by most scholars as indicated above.

Kumar (2014) suggests that the research design acts as a structure for the research being conducted. It is a procedural plan to be followed in collecting, measuring and analysing data, and it also ensures ease of the flow of research from one stage to another. Bryman (2012), Leedy and Ormrod (2013), and Creswell (2014) agree that various research designs are used in social science research, which include those used in quantitative, qualitative and mixed methods research. Creswell (2009), Creswell and Creswell (2018) and Creswell and Guetterman (2018) state that there are surveys, qualitative or quantitative content analysis, experiments, case studies, field research, existing statistics and many others. These research designs are usually related to a certain research approach, for instance, qualitative, quantitative or mixed method research approaches. However, Kumar (2014) declares that these designs can be used across all studies classified as qualitative, quantitative or mixed methods and that selecting a certain design for data collection determines the classification of the study to a large extent. This research used a case study design; hence, LIS schools were considered to be cases. The multiple case study design detailed in section 3.5.1 was adopted in this study.

3.5.1 Multiple-case study

A case study design explores real-life, contemporary bounded systems (a case) or multiple bounded system (cases) over time, through detailed, in-depth data collection involving multiple sources of information and reports a case description (Baxter & Jack 2008; Thomas 2011; Creswell 2013; Starman 2013; Yin 2014; Gustafsson 2017). Yin (2003) and Gustafsson (2017) state that case studies have two functions: they are studies of its own unit and they are studies of large groups of units. There are different types of case studies, which are detailed in Baxter and Jack (2008) as explanatory, exploratory, descriptive, multiple-case studies, intrinsic, instrumental and collective case study similar to a multiple-case study.

Yin (2014) remarks that when a study explores a phenomenon within various units or sections as in the case of the current study where different LIS schools' curricula and perceptions of the LIS job market were explored, it results in a multiple case study design. Baxter and Jack (2008) describe multiple-case study as containing more than a single case and it is usually equated with multiple experiments. Baxter and Jack (2008) and Yin (2014) posit that evidence created from this kind of study is considered as strongly reliable and robust; however, conducting such a study is time consuming and expensive. Nonetheless, multiple case studies have many

advantages and it is still considered to be more concrete, as it provides the platform for comparison (Yin 2014).

A multiple case study was considered as the relevant design for this study because the researcher aimed to explore 10 cases of LIS schools offering LIS education and their academic libraries, as well as research council libraries. Through studying these cases, the researcher identified whether different LIS schools offered education on digital scholarship. Baxter and Jack (2008) and Gustafsson (2017) are in consensus that more than two data collection tools can be used to collect data in a single case study to find in-depth data on the matter under investigation. This study triangulated interviews and document analysis to understand the phenomenon under discussion. Triangulating the data collection tool assisted the researcher in assessing the curriculum comprehensively.

3.6   TARGET POPULATION

The pool of entities, items or individuals that a researcher is concerned about studying is known as the population (Pickard 2007; Beck & Manual 2008; Neuman 2014). Population is also referred as the total group from which particular information is gathered for the purpose of the research at hand (Banerjee & Chaudhury 2010). Creswell (2009), Banerjee and Chaudhury (2010), and Neuman (2014) state that the population include all the members from which the sample has been drawn. In the same breath, Neuman (2014) differentiates a sample from a population by stating that it is the selected group used for the purpose of the study as the representative of the entire population.

In South Africa, there are 10 LIS schools that offer LIS education (Maluleka & Onyancha 2016; Ngulube & Ukwoma 2019; Ukwoma & Ngulube 2020). According to Yin (2014), these are the cases of the study. Ukwoma and Ngulube (2020) reveal that there are different perceptions of the number of LIS schools in South Africa, nonetheless, studies captured in recent studied have been used in this study. The LIS schools in South Africa are UCT, UWC, UL, UKZN, UNISA, UFH, DUT, UJ, UZ and the UP. Specifically, HoDs of LIS schools were the initial targeted group. Individual HoDs assisted in identifying modules and lecturers who taught modules related to digital scholarship. Furthermore, lecturers shared the syllabus in the form of course outlines.

In order to attain an in depth understanding of the phenomenon at hand, the researcher included academic directors in this study. Academic library directors are the people employing digital scholarship librarians and they are informed about the performance of these librarians when they are newly employed. Special research council library librarians and their directors, specifically from the CSIR, the NRF and the MRC were aimed to be part of the study since such libraries indicate high adaptation to new trends brought by the 4IR. However, only one institution from these three participated in the study.

The many above-mentioned digital scholarship librarians from selected academic and special research council libraries have undergone training in South African LIS schools or somewhere else. Gathering data from the employers of LIS graduates clarified perceptions and interest when employing LIS graduates as far as their preferences were concern. This population of the study formed the receiving end of the LIS education and included the practising librarians in the field of interest; therefore, it was worth obtaining their perceptions about LIS schools' curricula.

3.7   SAMPLING PROCEDURE

Sampling technique is the procedure followed when selecting a sample or it refers to the tool used when choosing a sample from the target population (Powell & Connaway 2004; Bryman 2012; Brancati 2018). Sampling is about selecting a few cases, referred to as a sample, to examine in detail so that the researcher learns from them and to understand a much larger set of cases (Neuman 2014). Researchers do sampling because it is not possible or practical to include the entire research population in the study, which is usually the case (Pickard 2007). There are two types of sampling techniques, which are known as probability and non-probability sampling techniques (Creswell 2014; Neuman 2014; Maree 2016).

Various researchers agree that a sample in quantitative research represents a form of a trade-off between the desirable and the attainable (Mouton 2001; Pickard 2007; Connaway & Radford 2017; Brancati 2018). In most cases, association is made between probability sampling and the quantitative research approach, whereby more precise sampling procedures are used to create representatives of the entire population (Pickard 2007; Neuman 2014). Connaway and Radford (2017) articulate that in probability sampling, every element of the population has the probability to be selected. Various scholars list probability sampling techniques as simple

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random sampling, systematic sampling, stratified random sampling and cluster sampling (Mouton 2001; Pickard 2007; Creswell 2014; Connaway & Radford 2017). Methods for estimating the degree of probability are provided through incorporating probability theory that provides foundations for estimating the population parameters and limits sampling errors.

Saunders, Lewis and Thornhill (2016) articulate that research questions, objectives and the choice of the methodology may dictate non-probability sampling. Therefore, this study adopted non-probability sampling techniques in which the selection is done by using a subjective judgement to select participants (Bryman 2012; Saunders, Lewis & Thornhill 2016). Essentially, this implies that some units in the population are more likely to be selected than others. Pickard (2007) indicates that cases in qualitative research are selected based on the matter to be learnt from them and the goal is rarely to make inferences about the wider population, but it is rather to ensure that the results are transferable.

Powell and Connaway (2004) praise non-probability sampling as being easier and cheaper to obtain than probability sampling. However, Powell and Connaway (2004) also state that this kind of sampling have weakness; hence, when selection probabilities are known, one cannot make legitimate statistical inferences. Various scholars argue that rather than generalisation, qualitative research discoveries or findings can only be transferred to a certain case because fewer cases are selected in qualitative research (Powell & Connaway 2004; Pickard 2007; Creswell 2014; Neuman 2014; Luo, Brancolini & Kennedy 2017). Therefore, the goal is not generalisation to the entire population, but rather understanding fewer cases extensively. Accidental sampling, quota sampling, snowball sampling and purposive sampling are detailed in the extant literature as part of non-probability sampling (Pickard 2007; Bryman 2012; Flick 2014; Neuman 2014; Connaway & Radford 2017; Bruncati 2018).

This study used purposive sampling to sample HoDs, lecturers and directors of academic and special research council libraries. To sample digital librarians in both academic and special research council libraries, purposive sampling was also adopted. Purposive sampling is defined by Maree (2016) as the type of sampling based on the judgement of the researcher. Powell and Connaway (2004) articulate that in some instances, it is advantageous to select a sample based solely on one's knowledge of the population being explored and the objectives of the research. Patton (2002) and Yin (2011) support this idea by stating that the logic of purposive sampling is to select information-rich cases to study in depth. However, Yin (2016) states that it is always

challenging to be exact as to which sources to select and why. Miles, Huberman and Saldana (2014) suggest that in a qualitative study, mostly when a multiple case study is employed, the selection of cases is purely based on conceptual grounds rather than representation grounds. These authors further suggest that a minimum of five cases are sufficient; therefore, in the case of this research, 10 cases were initially targeted but only nine provided permission for the study to be conducted.

Furthermore, a criterion in all the LIS schools, selected academic libraries and research council libraries available in South Africa was to determine which LIS schools offered courses on or content relating to digital scholarship (Patton 2002; Yin 2011; Maree 2016). Miles, Huberman and Saldana (2014) indicate that the researcher should check whether the sampling is relevant to the conceptual frame and research questions. This could be achieved by abiding to the criterion used in selecting participants of the study.

The researcher started by analysing the websites of individual LIS schools to assess the curriculum and identify the contents of digital scholarship. Only a few LIS schools had contents on digital scholarship. However, it is worth noting that, within these LIS schools, HoDs were further used to identify lecturers who taught digital scholarship contents. As part of analysing the curriculum, purposive sampling was used to sample lecturers in LIS schools. Participants met a specific criterion to be included as part of the sample of the study. In order for lecturers to be included in the study, they had to be teaching digital scholarship-related courses. Five HoDs were interviewed and five lecturers; totalling 10 participants interviewed from LIS schools.

Furthermore, purposive sampling was used to identify the academic library directors to find out whether the LIS schools' graduates were equipped with digital scholarship skills and knowledge. The study further sampled librarians working in both academic libraries and special research council libraries using purposive sampling. This sample represents the demand part of the study (alumnus of LIS schools). They were included in the study based on their duties in working in digital scholarship sections in the library and because they were mostly products of LIS schools having insights about the needs of the job market. Five directors from both academic and research council libraries and five digital scholarship librarians that participated in this were interviewed, totalling 10 participants from the libraries targeted. There were 20 participants in total that were interviewed in this study.

3.8 DATA COLLECTION PROCEDURE

Data collected by the researcher or the statement of the problem, determines which research design the researcher will use (Mouton 2001; Neuman 2006; Neuman 2014). Various data collection methods were used to collect data such as questionnaires, interviews, observations and documents or contents (Mouton 2001; Patton 2002; Neuman 2006; Pickard 2007; Creswell 2014; Connaway & Radford 2017). For the research at hand, the research aim, the objectives and the nature of data that were collected indicated that the study had to be a qualitative research approach. Firstly, emails were sent to universities with the clearance documents requesting either a face-to-face interview slot or a telephonic or MS Teams interview slot with the HoDs and lecturers. Ultimately, due to the Covid-19 pandemic, institutions in their permission letters opted for the collection of data using other data collection instruments than face-to-face interviews, ranging from Skype, MS Teams or telephonic interviews. The permission letter, interview schedule and informed consent form were sent to LISs' HoDs and lecturers to request slots to interview their staff members. Thereafter, meetings were set up on the platforms indicated above depending on the preferences of the participants.

Furthermore, the same process applied to academic library and special research council libraries' participants. The permission of those located in universities was requested through the institution when the researcher was applying to collect data in LIS schools. Thereafter, emails with the relevant documentation were sent to directors of academic libraries and digital scholarship librarians requesting slots to conduct interviews via MS Teams or Skype.

Permission to collect data from the CSIR, the NRF and the MRC special research council libraries was requested; however, only two provided permissions to collect data, and their letters are appended to this dissertation. Only one participated in this study and data were collected using MS Teams with both the director and the librarian. This was done to identify skills, knowledge and competencies required for the 4IR job market as a result of the shift of the paradigm.

3.9 RESEARCH INSTRUMENTS/ METHODS

Data collection methods are specific procedures used to gather data for the research (Powell & Connaway 2004; Bryman 2012; Connaway & Radford 2017) and there are various data

collection tools or instruments that are popular in social science research, which included questionnaires, interviews, content or document analysis, and observations (Bryman 2012; Creswell 2014; Flick 2014). Data can be collected from various sources as primary, secondary and tertiary data sources. Ngoepe (2012) stipulates that secondary data include the interpretations of primary data. Both primary and secondary information sources were used to achieve the purpose of this study. In conceptualising and contextualising the study, published sources were used such as books, articles, theses and dissertations. In the process of gathering primary data for the purpose of the study, interviews and content analysis were employed as data collection methods. These data collection methods are detailed below.

3.9.1   Semi-structured interview

Brink, Walt and Rensburg (2012) and Creswell (2014) perceive interviews as a method of data collection where an interviewer obtains responses from participants by face-to-face interviews, telephones or electronic mailing. Connaway and Radford (2017) posit that an interview can be done either individually or in focus groups. Although there are two forms of interviews, there are three types of interviews detailed in the extant literature, which include structured, unstructured and semi-structure interviews (Creswell 2009; Brink, Walt & Rensburg 2012). They further state that interviews are mostly used in exploratory and descriptive research. Connaway and Radford (2017) detail the following purposes of using interviews:

- Understanding participants' experience and perspectives via stories, accounts and explanations
- Discovering participants' language forms (how do they talk about things? What words and expressions are used?) may not apply on telephonic interviews
- Gathering information about things or processes that cannot be observed easily
- Finding out regarding the past
- Validating and verifying information gathered from other sources
- Attaining efficient data collection

Every story has two sides. With interviews, there are disadvantages evident in the extant literature such as: a smaller population; sometimes there is a lack of reliability, hence they can be misleading; a lack of interview skills can hinder the whole process (Creswell 2009;

Singleton & Straits 2010; Connaway & Radford 2017; Brancati 2018). Such pitfalls were avoided by the researcher through following instructions provided by Beck and Manual (2008) which guide qualitative researchers to avoid gathering irrelevant data until making relevant conclusions out of the gathered data. These instructions include obtaining an in-depth understanding from the small population, ensuring that there is an interview guide and ensuring that the ideas of the interviewer are not imposed on participants.

Semi-structured interviews were used in this study. Brink, Walt and Rensburg (2012) remark that semi-structured interviews are interviews where there is an element of structured interviews while there are probes that are used to follow up the participant. The interview technique, as a method of collecting data, has various advantages, such as more accurate responses because of contextual naturalness, a greater likelihood of self-generated answers, a symmetrical distribution of interactive power and greater effectiveness with complex issues (Singleton & Straits 2010). Four semi-structured interview schedules were used to collect data from the targeted population. These schedules were used for LIS schools' HoDs (see appendix A), lecturers teaching digital scholarship courses (see appendix B), directors of both academic and special research council libraries (see appendix C), and digital scholarship librarians (see appendix D). All these interviews were conducted using digital platforms, specifically MS Teams, as strict Covid-19 regulations were adhered to during data collection.

Semi-structured interviews with the academic staff (HoDs and lecturers in South African LIS schools) were conducted to find out whether they were aware of the emerging skills, knowledge and competencies in the LIS job market. Data collected using interviews assisted in determining whether LIS schools had the resources required for digital scholarship contents. Furthermore, these interviews were conducted to explore the extent of digital scholarship content in the LIS curriculum.

Thereafter, semi-structured interviews were conducted with directors of academic libraries to find out more about their experiences when recruiting digital scholarship librarians. Furthermore, interviews were conducted with digital scholarship librarians from both academic and special research council libraries, specifically, those who studied in South African LIS schools. This kind of data aided in mining the perceptions about LIS education strengths and weakness in South Africa based on digital scholarship.

3.9.2 Document analysis

Content or documents containing information can be used as data collection technique (Nieuwenhuis 2007). Furthermore, Nieuwenhuis (2007) mentions that, this includes written communication that can help in achieving the aim of the phenomenon being explored. Mouton (2001) asserts that the analysis or documenting of contents including, but not limited to, letters, speeches and annual reports are content analysis. In that sense, content refers to words, meaning, pictures, symbols, themes or any message that can be communicated (Mouton 2001; Nieuwenhuis 2007).

Content analysis is praised because it is an unobtrusive method, meaning that errors that could be presented by interaction with the subject are avoided (Mouton 2001). It is also criticised for being limited when it comes to authenticity of data sources and representativeness of text analysed, which render the validity of the findings limited (Elo & Kyngäs 2008; Beck & Manual 2008; Bryman 2012; Connaway & Radford 2017). In addition, coders usually bring subjectivity to the process of coding. Beck and Manual (2008) provide steps in which such limitations could be avoided in qualitative studies. Among them Beck and Manual (2008) suggest that a researcher has to validate the coding scheme by pretesting it. The researcher did pilot the coding schema on digital scholarship trends introduced to LIS education in South Africa. This was done because failure to validate the coding schema could have resulted to idiosyncratic, subjective data and the end result of the researcher's interpretation being biased, which could have led to the entire project being undermined (Beck & Manual 2008; Connaway & Radford 2017).

In order to supplement data from semi-structured interviews, content analysis of the LIS schools' course outlines was conducted to determine whether LIS schools offered such contents in their curricula. These course outlines were requested from lecturers teaching digital scholarship courses for triangulation and validation purposes of the data received from interviews. Digital scholarship concepts which are discussed in section 1.9 of Chapter One were used to identify digital scholarship contents. These concepts would appear in module names or module units. There were also contents in the course outlines that related to digital scholarship.

3.10   DATA ANALYSIS

Analysing data means organising, integrating and examining data systematically, while searching for patterns and relationships among certain details (Bryman 2012; Creswell 2014; Miles, Huberman & Saldana 2014; Neuman 2014). Neuman (2014) further articulates that analysing data includes connecting it to particular concepts, advancing generalisations and spotting broad trends or themes. Analysing data broadens the understanding and expands theory and advances knowledge. Creswell (2014) and Ngulube (2015a) affirm that researchers should ensure that in any approach they chose to analyse qualitative data, the data analysis procedure should be in line with the data that have been collected and the assumptions of the research approaches. Furthermore, Ngulube (2015a) and Creswell and Creswell (2018) inform that data analysis in a qualitative study occurs concurrently with data collection; however, the final analysis occurs when the data collection process has been completed. Figure 8 illustrates the iteration involved in the stages of data analysis (Creswell 2014):
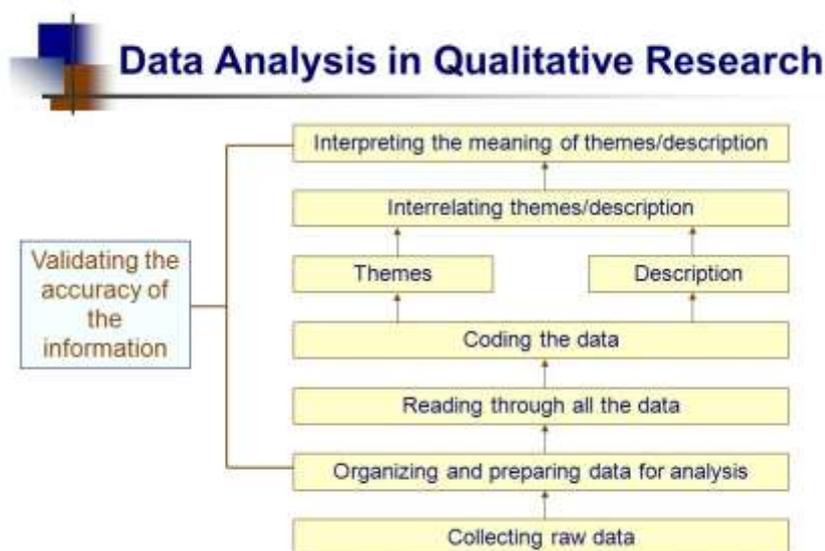
Figure 8: Creswell (2014) data analysis diagram

Creswell's (2014) diagram clearly indicates the steps to be followed when one has completed the data collection process in the qualitative research approach. These steps also relate to the ones provided by Braun and Clarke (2006), Braun and Clarke (2012), Miles, Huberman and Saldana (2014), and Creswell and Guetterman (2018). Miles, Huberman and Saldanas' (2014)

steps of analysing data include data reduction, data display and lastly conclusion drawing and verification. Braun and Clarke (2012) divide the data analysis phases as follows: familiarising oneself with data, generating initial codes, searching for themes, reviewing themes, defining, and naming themes and producing the report. More precisely, the data analysis process proposed by Creswell and Guetterman (2018) is more like the one proposed by Braun and Clarke (2012). Creswell and Guetterman (2018) also suggest a six-step process starting from where the research collects data, prepares data for analysis, reads through the data, codes the data and simultaneously codes the text for description to be used in the research report, and codes the text for themes to be used in the research report. These steps are almost like Braun and Clarke (2012), except that Braun and Clarke (2012) further provide 15point checklist as criteria to use within the six phases they provided on analysing data. Due to the comprehensiveness of the Braun and Clarke (2012) steps in analysing data, the researcher opted to use their steps to analyse data for this study.

For this study, qualitative data were analysed with qualitative content analysis methods, whereby data were categorised according to similarities and thematised for better presentation. This process was guided by the steps presented by Braun and Clarke (2012). The six steps given above assisted in analysing data efficiently; however, these steps are similar to Creswell's (2014) data analysis techniques presented in Figure 8. Although Braun and Clarke (2012) were used to guide the process, Creswell (2014) and Miles, Huberman and Saldana. (2014) were also used to confirm the relevance of the steps provided by Braun and Clarke (2012) in analysing data, as their data analysis processes are almost similar. Braun and Clarke (2012) provide a comprehensive, easy-to-follow data analysis process that fitted perfectly for the purpose of this study and accommodated the use of ATLAS.ti 9 software. Therefore, among the three data analysis processes mentioned in this section, the process of Braun and Clarke was mainly used to analyse data.

This method allowed the analysis of data for both semi-structured and course outlines interviews with the participants. Furthermore, a data analysis software known as ATLAS.ti 9 was also utilised to manage, store or organise and analyse data. Codes were created in this software for better interpretation. A broader discussion on this section is provided in the beginning of Chapter Four of this study.

3.11   TRUSTWORTHINESS OF THE GATHERED DATA

Objectivity and trustworthiness are vital to both research approaches (Powell & Connaway 2004; Creswell 2014; Anney 2014; Korstjens & Moser 2017; Leedy, Ormrod & Johnson 2021). However, Creswell (2014) points out that the criteria for judging qualitative research are different from those used to judge quantitative research. Shenton (2004), and Korstjens and Moser (2017) posit that trustworthiness of qualitative research is mostly questioned by quantitative or positivist researchers; hence, their concepts of validity and reliability cannot be addressed in the same way as in naturalistic work. Trustworthiness is the process of accessing the relevance of the data collected in addressing the question under investigation (Guba 1981; Silverman 2001; Anney 2014). Creswell (2014) posits that the researcher seeks believability, based on coherence, insight and instrumental utility. In order to attain trustworthiness for this study, four constructs by Guba (1981), Bryman (2012), Anney (2014), and Korstjens and Moser (2017) were utilised, which included credibility, transferability, dependability and confirmability. Trustworthiness in this study was achieved through methodological triangulation of content analysis and multiple case studies conducted through interviews. Four types of data sources were used to achieve trustworthiness in this study, which included course outlines, interviews with HoDs of LIS schools, lecturers teaching digital scholarship-related contents, digital scholarship librarians from academic and special research council libraries and their directors.

3.11.1 Credibility

There are several provisions that can be used to achieve credibility (Guba 1981; Pickard 2007; Anney 2014; Leedy, Ormorod & Johnson 2021). Credibility is achieved in qualitative studies through prolonged engagement with participants and persistent observations of those participants or triangulation of the techniques used in the study (Pickard 2007). In this study, credibility was ensured by adopting well-established research methods that are detailed in the research methodology section. Korstjens and Moser (2017) also indicate that to achieve credibility, the researcher must familiarise himself or herself with the culture of the participating organisations. This can be reached through consultation of documents or preliminary visits to the organisation involved. The researcher checked the LIS schools' websites and LinkedIn social network platform and met with some digital scholarship librarians through conferences to check the relevance of the study prior to the actual data collection.

Triangulation of data between semi-structured interviews and content analysis of course outlines was conducted to ensure credibility as supported by Shenton (2004) and Pickard (2007). Anney (2014) ascertains that removing all subjectivity from qualitative study allows a researcher to be constantly alert to this subjectivity and compensate whenever necessary.

3.11.2 Transferability

In a quantitative study, external validity or generalisation is applied; however, in a qualitative inquiry, it is impossible to generalise the findings of the study to a larger population since the sample is usual relatively small (Lincoln & Guba 1985; Silverman 2001; Shenton 2004; Pickard 2007; Bryman 2012). Lincoln and Guba (1985) posit that the problem with generalisations is that they do not apply to particulars. On the same note, Pickard (2007) agrees that the goal in qualitative research is to permit transferability of findings rather than wholesale generalisation of the findings. At least, a reader must be able to relate to their situation or positions and through that, transferability is achieved. Shenton (2004) specifies that this construct can only be determined by the reader when enough information is provided. Furthermore, Korstjens and Moser (2017) emphasise that research transferability in the study depends on similarities between sending and receiving contexts; therefore, the researcher has to collect sufficient detailed descriptions of data in context and report them with sufficient detail and precision to allow judgement. The researcher in this study provided enough contextual information about the fieldwork sites, which would enable the reader to make such a transfer.

3.11.3 Dependability

Pickard (2007) attests that dependability is achieved by an inquiry audit where an external auditor examines the research process. Positivist researchers employ techniques to indicate the replicability of the study (Lincoln & Guba 1985; Korstjens & Moser 2017). Lincoln and Guba (1985), and Korstjens and Moser (2017) further indicate that qualitative research is rigid in that it repeats the same methods because of the changing nature of the phenomenon scrutinised by qualitative researchers. In addition, in qualitative research, dependability is about the manner in which the study has been conducted, and evidence needs to be provided that demonstrates that the methods and techniques used were used appropriately and with relevance to the study being conducted (Pickard 2007; Leedy, Ormorod & Johnson 2021). In view of that, Shenton

(2004) stipulates that in qualitative research, this construct can be achieved through reporting in detail the processes used in the study, so that the future researchers would be able to follow the same procedure when researching a similar phenomenon. This study detailed the processes used in allowing dependability for other researchers. Furthermore, the model by Wolf (2007) on curriculum development and the Gap Service Quality Model by Zeithaml, Berry and Parasuraman (1993) are detailed in Chapter Two to achieve the purpose of the study. The study also used parts of the methods used in similar studies, such as studies done by Munyoro (2014) and Raju (2015).

3.11.4 Confirmability

The concept of confirmability is the qualitative concept equivalent to quantitative objectivity (Shenton 2004). Despite of objectivity being hard to defend in qualitative studies, confirmability can still be ensured by ensuring that results, being subjected knowledge of the researcher, could be traced back to the raw data of the research (Charmaz 1995; Pickard 2007; Bryman 2012: Leedy, Ormorod & Johnson 2021). Charmaz (1995) and Bryman (2012) indicate that data are not merely a product of the observer's perspective, disciplinary assumptions, theoretical proclivities and research interests. Ensuring confirmability in qualitative research is always a problem, since most research instruments are created by humans; therefore, it is hard to avoid being subjective (Patton 1990; Creswell 2013; Creswell & Creswell 2018). In order to ensure that the findings of this study were based on the experiences and ideas of the participants and not that of the researcher, triangulation of the data from interviews with HoDs of LIS schools, lecturers of LIS schools, directors of academic libraries and digital scholarship librarians, as well as the content analysis of LIS schools' course outlines, was adopted. Upon completion of data analysis, data were shared with participants to confirm whether it reflected their original ideas gathered during interviews. A detailed description of the methodology is detailed in the subsections above to indicate that the researcher avoided biasedness.

3.12   ETHICAL CONSIDERATIONS

The researcher considered all the ethical guidelines that impact unethical products in research, including plagiarism, informed consent and objectivity. Ethics in research entail what is right or what is wrong based in the research conducted and the application of ethical principles to scientific research (Powell & Connaway 2004). Ethics are norms or standards of behaviour that

control moral choices and interaction with others in research (NCRE in Norway 2006; Flick 2014). This can include a complex set of values, institutional schemes and standards that helps constitute and regulate scientific activities. Mouton (2001) and Brancati (2018) state that ethics protect research participants from both physical and psychological harm that may be brought about by participating in the project. Ethics also safeguard researchers against intellectual theft such as plagiarism and credit stealing (Bancati 2018). Beck and Manual (2008) state that as part of ethics, one should avoid common pitfalls, such as asking the wrong questions, using an unrepresentative sample which results in findings with much subjectivity and jumping to conclusions. Beck and Manual (2008) offer the following guidelines to be followed when an unethical, free research product is to be achieved:

- Risks to subjects minimised.
- Risks to subjects are reasonable in relation to anticipated benefits, if any, to subjects and to the importance of the knowledge that may reasonably be expected to result.
- Selection of the subject is equitable.
- Informed consent should be sought from each prospective subject or the subject's legally authorised representative.
- Informed consent should be appropriately documented.
- When appropriate, the research plan makes adequate provision for monitoring the data collected to ensure the safety of subjects.
- When appropriate, there are adequate provisions to protect the privacy of subjects and maintain the confidentiality of data.

These legal and ethical guidelines provided by Beck and Manual (2008) form part of the ethical procedures that the researcher followed to avoid an unethical research product.

UNISA provides guidelines and policy documents that show ethical considerations the researcher should follow (University of South Africa 2013). These documents ensure that the researcher avoids plagiarising and harming participants and non-participants, either physically or emotionally. For this research, participants were respected in terms of confidentiality. The researcher ensured that a letter from the university was submitted to the institutions of those who were interviewed for gatekeeping purposes. All documents or materials used were cited or acknowledged correctly so no contraventions were presented in the thesis.

More specifically, an ethical clearance certificate was issued by the UNISA ethics committee, which approved that the study could be conducted. The ethical clearance certificate, the interview schedules, the short proposal and the letter of introduction were sent to all LIS schools and special research council libraries in South Africa. Permission letters were provided by all participating institutions.

To ensure confidentiality, participants were not asked to give their personal details. Privacy and anonymity were considered as vital factors and were strictly observed. Participants were assured that the data received from them would be treated confidentially and used only for the purpose of the study; which was ensured during the reporting stage. During interviews, the researcher ensured that diverting from the interview was avoided and remained within the study parameters; after each interview, a letter of appreciation was provided to acknowledge the participant's efforts in participating in the study.

3.13   EVALUATION OF RESEARCH METHODOLOGY

It is ideal for a researcher to evaluate the methodology employed in a study to outline the weakness and strength in the study. Leedy and Ormrod (2010) are of the view that research methods are imperfect, resulting in the imperfections casting doubts on the findings of the study. Therefore, it is significant to provide a section that evaluates the methodology.

This study employed a qualitative approach and triangulated data collection methods by using semi-structured interviews and document analysis to ensure the trustworthiness of the findings. Furthermore, data were collected from four sets of participants: LIS schools' HoDs, digital scholarship lecturers in LIS schools, directors of academic and special research council libraries and librarians from the two afore mentioned libraries. Goulding (2002) criticises qualitative research as being subjective because it is descriptive, resulting in a lack of rigor and the research being impressionistic. However, Creswell and Zhang (2009) found strength in what Goulding (2002) views as weaknesses. Creswell and Zhang (2009) are of a view that the strength of a qualitative approach is shown in the depth to which explorations are conducted and descriptions are narrated. In the sections such as section 3.11 of this chapter, the researcher addressed how these critiques made by Goulding (2002) were overcame. A detailed discussion

across all sections and choices of research approach, methods and data collection tools has been provided to indicate that the research was scientifically sound.

This study initially aimed to collect data using face-to-face interviews with participants of the study, but due to the Covid-19 lockdown regulations, the researcher had to consider virtual platforms. MS Teams was used to collect data from LIS schools, academic libraries and special research council libraries. Ten LIS schools in South Africa were approached, but only nine granted permission for the collection of data. Despite many follow-ups, the other LIS school in question never provided the permission letter nor respond to the follow-up emails and calls. Within those LIS schools that have provided permission, only five participated in the data collection process. Five HoDs and five lecturers of these LIS schools participated. In total, 10 academics participated in the study. Others declined the request stating that they did not have content on digital scholarship, despite indications that the study included all LIS schools. Several follow-ups were made to LIS schools, but they yielded no positive results.

The same goes for academic libraries; only five libraries participated in the study. Four library directors and four digital scholarship librarians were interviewed. Most libraries would indicate that they did not have the digital scholarship unit in their library in despite the fact that they have been provided with the criteria of digital scholarship and checking their websites to see what library services they offered. Numerous follow-up emails provided no positive responses, some institutions would not even respond to the request. Two special research council libraries granted permission to collect data from their institutions, but still only one participated in the study. The other one never responded to the scheduled appointment to collect data. Due to this, one research council library, one director and one digital scholarship librarian were interviewed. Altogether, 20 participants were interviewed for the purpose of exploring education and training of LIS professionals in digital scholarship in South Africa.

Lecturers and HoDs from LIS schools who claimed that they were teaching digital scholarship-related content in their LIS modules were further asked to provide course outlines or links to the websites for digital scholarship-related courses. Only four participants were able to provide course outlines.

Eight course outlines were accessed from LIS schools. Data saturation was reached in all these interviews and document analysis assisted in cross-checking whether digital scholarship

content were included in the LIS curriculum. Despite many follow-ups from interviewed lecturers to provide digital scholarship-related course outlines, they never sent them, and no contents of each module could be found on their websites either. The researcher had to proceed with the analysis.

3.14   SUMMARY OF CHAPTER THREE

Knowledge of the subject matter is crucial when conducting research; hence, this chapter informed the reader of how this study was carried out. Chapter Three indicates to the reader how the research was conducted. This chapter discusses the researcher's position philosophically and provides the strategies used to make meaning of the data collected. The chapter discussed the research approach, research design, targeted population, sampling procedure, data collection instruments and procedure. A discussion on data analysis and the trustworthiness of the data collected was provided in the chapter. The chapter further provided the ethical consideration that was adhered to by the researcher when engaging with the participants of the study. Thereafter, an evaluation section was provided to wrap up the discussion in this chapter. Chapter Four discusses the data analysis and gives the presentation for this study.

CHAPTER FOUR
DATA ANALYSIS AND PRESENTATION OF FINDINGS

4.1   INTRODUCTION

The prior chapter (Chapter Three) of this study delineated on the research methodology executed to achieve the purpose of this study. Chapter Three provided insight into the philosophical perspective utilised by the researcher in exploring digital scholarship curriculum in South African LIS schools. Other key aspects of the research methodology chapter were addressed such as the research strategy, research approach, research design, data collection instrument, targeted population, sampling techniques, data analysis, trustworthiness and evaluation of the research methodology. Having provided evidence on the methodology used in this study in Chapter Three, the current chapter presents the data analysed through document analysis (course outlines) and semi-structured interviews conducted with LIS schools' HoDs, lecturers responsible for teaching digital scholarship-related content, directors of libraries and digital scholarship librarians. The presentation of findings was organised in line with the themes derived from the collected data informed by the objectives of the study outlined below, which were based on the conceptual framework used for this study:

  i.   Analyse the LIS school's curriculum in South Africa for digital scholarship content
 ii.   Map the LIS curriculum for digital scholarship content in South African LIS schools
 iii.   Establish the perceptions of employers on LIS graduates based on digital scholarship
 iv.   Examine the knowledge, competencies, and skills of the LIS schools' graduates for digital scholarship
  v.   Recommend a framework for the development or redevelopment of the programme structure with the inclusion of digital scholarship in South African LIS schools.

Data analysis denotes organising, integrating and examining data systematically, while searching for patterns and relationships among certain details (Neuman 2014). Neuman (2014) concedes that analysing the data includes connecting it to particular concepts, advancing generalisations and spotting broad trends or themes. Analysing the data broadens your understanding, expands theory and advances knowledge. Ngulube (2015a) affirms that researchers should ensure that any approach they choose for analysing qualitative data should

be in line with the data collected and the assumptions of the research approaches. Furthermore, data analysis in a qualitative study occurs concurrently with data collection; however, the final analysis occurs when the data collection process has been completed (Miles, Huberman &Saldana 2014; Ngulube 2015a). For the purpose of this study, qualitative data were analysed with content analysis methods during which data were categorised according to similarities and thematised for better presentation. This process was guided by the process suggested by Braun and Clarke (2012), which operates under these steps: familiarising oneself with data, generating initial codes, searching for themes, reviewing themes, defining and naming themes and producing the report.

4.2   DATA ANALYSIS

The data for this study were collected using semi-structured interviews conducted via MS Teams. The MS Teams semi-structured interviews were recorded as per the agreement with the participants. For ease of access, the recorded interviews were pinned on MS teams to ensure that they were always at the top. A research journal available on ATLAS.ti 9 was used to write contributing factors that assisted in data analysis of the study. The interview recordings were transcribed after an interview session ended. All the participants' perceptions were displayed in the study and their responses were quoted verbatim. Furthermore, the researcher collected course outlines from LIS schools in order to corroborate the responses from the HoDs and the lecturers who were involved in digital scholarship. The data from course outlines were qualitatively analysed and presented in this chapter.

Based on the data gathered from LIS schools, five HoDs and five lecturers teaching digital scholarship were interviewed. Thereafter, university libraries were also used for interview purposes, particularly, four directors of library services and four librarians conducting digital scholarship activities. The researcher concluded the data collection by interviewing a director of library services and a digital scholarship librarian from a special research council institution. A total of 20 interviews were conducted for the purpose of this study as elaborated in Chapter Three.

Confidentiality and anonymity are ethical practices designed to protect participants. Therefore, in this research study, participants were assigned code numbers used on all subsequent documentation   to   ensure   confidentiality   and   the   confirmed participants   were

given pseudonyms. The names of universities in the study were not mentioned in the analysis to ensure that privacy and confidentiality were maintained. The codes were assigned according to the order in which the interviews were conducted, as reflected in Table 8. The same notion was adopted to name the course outlines (see Table 9).

4.3   PRESENTATION OF FINDINGS

This chapter focuses mainly on the presentation of the findings based on the themes extracted from the interviews conducted for this qualitative study. Both interviews and document analysis formed part of the presented data in this section. All the sets of data were analysed together to achieve the main aim of the study, which was to explore the education and training of LIS professionals in digital scholarship in South Africa. The ATLAS.ti 9 software facilitated data organisation and management of the interview transcripts and course outlines used for this study.

Thematic analysis was used in this study, as guided by Braun and Clarke (2006), Braun and Clarke (2012), and Miles, Huberman and Saldana (2014). In line with Braun and Clarke (2012), Kiger and Varpio (2020) posit that one needs to select vivid, compelling examples, conduct final analysis of construct and relate the research questions back to the analysis. The six phases suggested by Braun and Clarke (2006) and Braun and Clarke (2012) were followed in thematic analysis and included familiarising yourself with data, generating initial codes, searching for themes, reviewing themes, defining and naming themes and producing the report. Braun and Clarke (2019) later renamed the phase 'searching for themes' to 'generating initial themes' to emphasise that themes are not in the data, pre-existing analysis or awaiting retrieval, but they are born during the analysis of data (see Table 7 for themes, sub-themes and categories which were derived from codes). Practically, the 15-point checklist of the criteria for good thematic analysis by Braun and Clarke (2006) was used to facilitate the process of analysing the data, from data transcription to report writing. The 15-point checklist these authors discovered in 2006 was still relevant as Braun and Clarke (2019) reflect on it.

This 15-point checklist was used as a guide in the analysis of the data and ensured effective data analysis, as all the points were followed in transcribing, coding, analysing and report writing in this study (Braun & Clarke 2006; Braun & Clarke 2012; Braun & Clarke 2019). Furthermore, Braun and Clarke (2019) state that codes (created via ATLAS.ti 9 software)

should be collected into potential themes and all the relevant data should8 be gathered for each potential theme (generating initial theme). The ATLAS.ti 9 software was used to organise and analyse the data further. In the use of the software, the criteria outlined by Braun and Clarke (2012) were used as a framework to code data, generate themes and embark on report writing of this particular study.

Based on the interviews' transcripts conducted, main themes, sub-themes and categories emerged as an approach of presenting the findings. Mainly five themes were identified from the data, which were also aligned to the objectives or research questions outlined in this present study.

These themes included (a) the LIS curriculum; (b) incorporation of digital scholarship content in the LIS curriculum; (c) perceptions of LIS employers on LIS graduates; (d) digital scholarship knowledge, skills and competencies; and (e) development or redevelopment of the LIS schools' curriculum structure. Table 7 offers an overview of the themes, sub-themes and categories that were generated during the course of analysing the data which in turn informed the presentation of the findings. Themes were used as main headings; sub-themes were used as sub-headings and categories included the concepts that could be expected in the presentation supported by the verbatim replies from the interview schedules and extracted quotations from course outlines.

The reposting or analysis phase was presented in a way that data from interviews were provided and, thereafter, where applicable, document analysis data were provided.

Table 7: Themes, sub-themes & categories

THEMES	SUB-THEMES	CATEGORIES
Theme 1 **Library and Information Science (LIS) curriculum**	1.1 Understanding digital scholarship	- Digital technologies - Digital literacies, - ICTs - Scholarly communication tools, - Research and teaching & learning

	1.2 Teaching digital scholarship	- Offering contents on digital scholarship - Not sure if they offer contents on digital scholarship - Interdisciplinarity of digital scholarship - Contradicting digital scholarship with ICTs
	1.3 Focus on digital scholarship contents in LIS curriculum	- ICTs - Digital curatorship - Scholarly communication - Technology as enablers - Metadata standards - Digitisation - OA - RDM - Copyright issues and publishing
	1.4 Importance of teaching digital scholarship in LIS schools	- Relevance to the dynamic information society - Moving with times - Preparing students for the digital world
	1.5 Types of training interventions available for digital scholarship academics	- Formal LIS education - Vocational courses - Short courses - Seminars/ workshops - Conferences - On-the-job training
	1.6 Facilities used for teaching digital scholarship and their appropriateness	- LAN - Websites that host journals for example - High-speed laptops in situation of the dawn of Covid-19 & connectivity - Open-source software - Software for creating digital libraries - Access to Resource Description & Access (RDA) & web Dewey - Simulators to simulate data

		• Innovative hubs • 3D scanners
	1.7 Appropriateness of the infrastructure	• Lack of infrastructure • Relevant infrastructure • ICTs lacking • Lack of manpower & relevant skills
	1.8 Promotion of digital scholarship education by LIS schools	• LIS employers' perspective on the promotion of digital scholarship education by LIS schools • Less LIS schools offering digital scholarship • Use of LIASA & other platforms to promote digital scholarship
	1.9 Identifying desirable digital scholarship contents for the curriculum	• Research • Decolonisation • Collaborative approach
	1.10 Nature of offering digital scholarship in LIS curriculum	• Online (Zoom & MS Teams as tools) • Face to face • Research projects
	1.11 Experiences of teaching digital scholarship courses	• Courses were attracting many students • Lack of practical aspect of digital scholarship • Unawareness of students about digital scholarship
Theme 2 **Incorporation of digital scholarship content**	2.1 Level of digital scholarship infusion in the LIS curriculum	• Basic/advanced digital scholarship contents infusion in the LIS curriculum • Depends on the level either postgraduate or undergraduate as determined by NQF levels • Too much theory & less practicum

		• Contradictions
	2.2 Alignment of the course objectives with the 4IR trends	• Recurriculation to include digital scholarship • Exposure to technology • Contents on the 4IR • Relevance with the job market in LIS • More integrated learning for students • Research on recent developments • Relevance with the digital world • Inclusion of the AI
	2.3 Digital scholarship content to be incorporated in the LIS curriculum	• Digitisation • Digital curatorship • RDM • Metadata standards • Copyright-related contents • Technological enablers in LIS • OA • Open educational resources • Understanding the applications of POPI & PAIA Acts
	2.4 Stakeholders consulted for curriculum development regarding digital scholarship curriculum	• LIS schools academics • Interdisciplinary fields, e.g. computer science, IT, IS, software engineering, history and other STEM related fields. • LIS practitioners • Current students • Quality assurance committee • LIS professional bodies, e.g. LIASA • Benchmarking with sister LIS schools

	2.4 Gaps & redundancies in the curriculum regarding digital scholarship	- Lack of practicals - Lack of African epistemologies (research wise) - Lack of contents on digital scholarship - Repetitions of the same contents in different levels of studying
	2.5 Strategies to best train LIS professionals on digital scholarship	- Formal & informal courses - External & internal training seminars - Workshops on digital scholarship activities - Conferences relating to digital scholarship - Attending library workshops on digital scholarship
	2.6 Opportunities presented by digital scholarship education in LIS	- Marketability - Employability - Understanding the digital environment - Managing different digital information for work & personal purpose - Interdisciplinarity - Digital scholarship producers through MOOCs and OERs - Different opportunities outside traditional librarianship
Theme 3 **Perceptions of LIS employers on LIS graduates**	3.1 Expectations of employers regarding digital scholarship competencies	- Be able to navigate digital scholarship activities at the basic level - Should be able to identify the knowledge gaps - Expected to understand OA, RDM & publishing ecosystem

		• Relevant education in digital scholarship • Must have digital scholarship skill sets • Digital scholarship to be embedded throughout the qualification courses • Producing librarians competent in the digital environment
	3.2 LIS schools offering solid digital scholarship education	• Mentioning of excelling institutions in digital scholarship, UP and UCT and UJ
	3.3 Challenges encountered when employing digital scholarship librarians	• Limited candidates for selection • Lack of experience • Lack of awareness as far as digital scholarship is concerned
Theme 4 **Digital scholarship knowledge, skills & competencies**	4.1 Digital scholarship units and activities in the library	• Digitisation section & data curatorship • RDM • IRs • Digital library services • Digital publishing platforms • Advocacy for OA
	4.2 Requirements of a digital scholarship librarian	• A minimum of a bachelor's degree • At least 5 years' experience in the academic environment • Knowledge in digital scholarship • Skills to survive in research & digital environment
	4.3 Skills development training available for digital scholarship librarians	• Research visibility training • Partnerships with research offices

		• Training workshops (webinars & face to face) • External service providers
	4.4 Challenges experienced by digital scholarship librarians	• Lack of technical skills in librarians • Librarians were scared of the technology (technophobia) • Reluctance to learn new things • Employment of IT or computer science candidate
	4.5 Suggestions to improve LIS education on digital scholarship	• Consult practitioners • Have a practical component for digital scholarship • Conduct research in the area of digital scholarship • Attend conferences & workshops • Add contents on digital scholarship into LIS curriculum • Have short learning courses
Theme 5 **Development or redevelopment of the LIS schools' curriculum structure**	5.1 Challenges of incorporating digital scholarship contents	• Lack of resources such as funds & skills • Reluctance from academics to engage digital scholarship • Awareness of digital scholarship from academics • So many logistics & there is a lack of manpower to drive the recurriculation process • Stakeholders, e.g. public libraries not seeing digital

		scholarship as relevant • Being informed by Euro-centric perspectives • Working in silos, avoiding interdisciplinary • Lack of research around digital scholarship
	5.2 Overcoming the challenges presented by the structuring of digital scholarship contents	• Awareness of digital scholarship • Training & workshops • Acquiring relevant digital scholarship or digital scholarship resources • Using open-source software • Open to more African perspectives • More research to be done on digital scholarship • Collaborate with institutions that have digital scholarship units
	5.3 Challenges arising from digital scholarship related jobs	• Lack of librarians with qualifications in other fields • Few candidates with necessary skills • LIS schools not teaching digital scholarship related courses • Deciding between IT/ Computer Science people and librarians • Financial constraints • Adapting to fast changes

	5.4 Strategies to overcome challenges of digital scholarship related jobs	- Recalculating to include digital scholarship related contents - Offering short learning programmes - Training academics on digital scholarship - Incorporating digital scholarship across the LIS curriculum - Have more practicals - Benchmarking with relevant institutions
	5.5 Models used for structuring digital scholarship contents	- No model - Using themes - Using the LIASA standards - Process of consulting relevant stakeholders

4.4 DEMOGRAPHIC DETAILS OF THE PARTICIPANTS

The demographic profile of participants in this study comprised HoDs, lecturers (both junior and senior), directors of libraries and digital scholarship librarians, as shown in Table 8. Their educational qualifications ranged from honours degrees to doctoral degrees and their experience ranged from 5 to 20 years of working either in LIS schools or academic libraries or special research council libraries. Therefore, they were all experts in the area of LIS, whether as academics or practitioners as far as digital scholarship was concerned.

Table 8: Demographic details

Quote no	Job title	Years of experience	Highest qualification
LIS schools' profile			
HoD-1	Head of Department-Senior Lecturer	11-15 years	Master of Technology in LIS
HoD-2	Head of Department-Senior lecturer	0-5 years	PhD in Information Studies

HoD-3	Head of Department- Senior lecturer	6-10 years	PhD in Information Studies
HoD-4	Head of Department- Professor	11-15 years	PhD in Information Science
HoD-5	Head of Department- Senior Lecturer	0-5 years	PhD in LIS
DS L-6	Digital scholarship lecturer- Senior Lecturer	16-20 years	PhD in LIS
DS L-7	Digital scholarship lecturer-Lecturer	6-10 years	Masters in Language Sciences & Master's in Creative Arts
DS L-8	Digital scholarship lecturer- Lecturer	0-5 years	Masters of Information Science
DS L-9	Digital scholarship lecturer- Lecturer	0-5 years	Master's of Arts (Information Science)
Academic and special research council libraries			
DS D-10	Digital scholarship director- Manger Information specialist	11-15 years	Master's in Information Technology
DS D-11	Digital scholarship director- Director library services	6-10 years	Master's in Information Science
DS D-12	Digital scholarship director- Director library services	0-5 years	PhD in LIS
DS D-13	Digital scholarship- Director library director (acting)	16-20 years	PhD in Information Studies
DS D-14	Digital scholarship director- Manager scholarly communication	6-10 years	Honours in Information Science

DS LBRN- 15	Digital scholarship librarian- Information systems & resources librarian	11-15 years	Master's in Information Technology & Postgraduate Diploma in LIS (PGDLIS)
DS LBRN- 16	Digital scholarship- Librarian: academic services	16-20 years	Masters in Information Technology
DS LBRN- 17	Digital scholarship- Librarian	0-5 years	Honours in Information Science & registered for Master's in Digital Curatorship.
DS LBRN- 18	Digital scholarship librarian- Collection developer: archival resources	6-10 years	Master's in Digitisation
DS LBRN-19	Digital services librarian	6-10 years	Master's of Information Science
DS L-20	Digital scholarship- Lecturer	0-5 years	PhD in Information Science

4.4.1 Course outlines of universities that offered digital scholarship

Attached to the interviews conducted with lecturers teaching digital scholarship were course outlines that were requested after an interview session for digital scholarship-related modules. From ten academics that participated in this study, only four were able to provide course outlines for digital scholarship courses that have units relating to digital scholarship. The course outlines were organised according to the name of the university that provided them, as illustrated in Table 9. They were given a code name, such as UNIV1 CO1, CO2, UNIV2 CO1 and so on to ensure anonymity and confidentiality.

Table 9: Course outlines

University (UNIV)	Course outline (CO)	Name of the course

UNIV1	CO1	Resource Description and Communication
	CO2	Principles of Digital Curation
	CO3	Digital Curation
UNIV 2	CO4	ICT Innovation and Emerging Technologies
	CO5	ICTs Literacy and Skills
	CO6	Digitisation in Libraries
UNIV 3	CO7	Data Curation and Management
UNIV 4	CO8	Computer Literacy

4.5 THE LIBRARY AND INFORMATION SCIENCE (LIS) CURRICULA

The findings of this study revealed the following sub-themes: understanding digital scholarship, teaching digital scholarship. focus of digital scholarship in LIS curriculum, importance of teaching digital scholarship in LIS schools and training interventions available for digital scholarship academics. Furthermore, the other sub-themes that formed part of this theme included facilities for teaching digital scholarship and their appropriateness, promotion of digital scholarship by LIS schools, identifying desirable digital scholarship contents for the curriculum, nature of offering digital scholarship in LIS curriculum and experiences of teaching digital scholarship courses. Therefore, this theme sought to analyse the LIS curriculum in order to determine the extent to which digital scholarship was offered in LIS schools. Figure 9 on page 111 indicates the thematic relationships on the LIS curriculum theme:
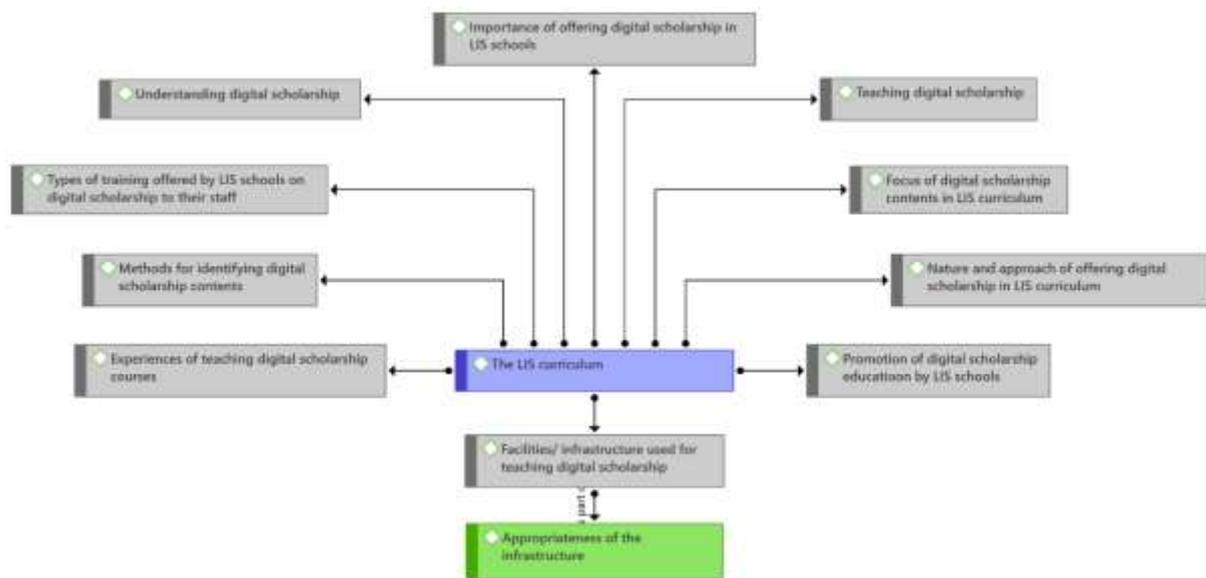
Figure 9: the LIS curriculum

4.5.1 Understanding digital scholarship

Prior to asking technical questions about a concept, it is always paramount to discover whether participants understand the concept under exploration. Digital scholarship is an emerging concept in the library environment (Rumsey 2011; Verma 2015; Mantoya 2017; Dahl 2018; Ocran & Afful-Arthur 2021); hence, it was vital to seek the participants' understanding of the digital scholarship concept.

All participants of this study, including HoDs, lecturers, directors of libraries and digital scholarship librarians, were requested to define the concept 'digital scholarship', based on their understanding. Participants had a different understanding of the concept 'digital scholarship'; however, there seemed to be common terms that appeared in most of the definitions across most participants. Most participants cited the advent of digital technologies, troubleshooting, digital literacies, ICTs, networking and scholarly communication tools in the library environment as digital scholarship informed terms. In addition to that, interdisciplinarity, collaboration and open scholarship were cited as being digital scholarship oriented. Data presentation ranges from academics to librarians. Particularly, the word cloud below displays the terms that were used to define digital scholarship by the participants who answered this question (see Figure 10 on page 112):

Figure 10: Digital scholarship terms

Participant HoD-2 stated the following:

When we are talking about digital scholarship, we are talking about scholarship that is facilitated by digital technology, specifically digital devices that could be your computers and smart cell phones. Digital technology has something to do with the software that is enabling teaching within the digital devices. Furthermore, digital scholarship has something to do with open scholarship, for instance, MOOCs and OERs and the research part of it. In the research part that may include your IR and the electronic publishing. In a nutshell, digital scholarship has something to do with scholarship which is about learning, teaching and research using digital technologies and platforms. Networks and networking are important in the era of digital scholarship.

Along the same lines, other participants understood digital scholarship as the management of research, its use and the management part of research in a digital environment. For instance, participant HoD-4 defined digital scholarship as:

It deals with the field of managing research and showing that it is disseminated and used. It deals with digital humanities in the virtual electronic environment for managing that research not in a traditional research environment, meaning that those that are in conventional format can be transformed through imaging like digitisation and others and that are born digital are

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managed. For example, going further, I would say RDM and digital curatorship and digital humanities. Partly, it concerns networking as well. Usually, the terms digital scholarship and humanities are used interchangeably.

Participant DS L-7 also elaborated that:

There are various meanings to the term; the first one is using digital data for research, for instance, in digital humanities where electronic data is used for research purposes. Further to that, data mining or text mining using electronic data and tools for research purposes. The second definition will be electronic publishing, publishing scholarship and journal publishing electronically, like OA journals or electronic journals and open educational resources. The third one is scholarship around what it means to be digital so there is kind of philosophical and theoretical aspect of the meaning of digital scholarship, specifically the teaching and learning part of OERs and Online teaching and learning. The internet is essential for communication and collaboration purposes.

On the other hand, participant DS D-10 articulated that:

It is the use of digital or internet tools and technologies to open up science. This has transformed science and has opened up research to the scientific community and outside the scientific community.

Participant LBRN-18 indicated that digital scholarship supports collaboration and interdisciplinarity in the academic world:

I am not exactly sure what it is, but for me, it is about you work less with paper and more with digital; that would include scholarship where you can work with people in the digital field, in other words, you can have research projects with people in other countries and never see them because you will be doing it over the internet or digital means. So, I can do research with somebody in Norway or Russia or Australia using digital media. In such cases, knowledge of troubleshooting and coding is important to keep the devices up to date.

4.5.2   Teaching digital scholarship in LIS schools

Participants from LIS schools were asked to indicate whether they offered digital scholarship content in their respective LIS schools. The question was asked to determine whether LIS schools taught digital scholarship in their qualifications. Some were confident that they offered

digital scholarship and others were uncertain as to whether they offered it or not. There were also those who said they did not offer digital scholarship in library-related qualifications; however, they were planning to review their curriculum or already reviewing it.

A few LIS schools offered digital scholarship in their course content.

Participant HoD-1 clearly indicated that:

I think because my institution is a university of technology, so there is a lot of using technology to enhance the librarians that we actual send out. So, we have like modules that are ICT at level one, two and three in our diploma. In the 4th level we also have ICT four. In 3rd year, we give students a digitisation project where they actual have to learn the basics in designing their digital library and they get assessed at the end of the year. They also learn about how to use the computers and stuff like that. Digitisation in libraries is the module that we offer in the Higher Diploma which we started last year.

In support of participant HoD-1 notion, participant DS L-7 stipulated that:

I have taught programmes in PGDLIS, firstly, in each of the courses, there is a component around digital scholarship, whether it is resource management or use things like how to access online databases, how to do effective searching electronically, how to code HTML, information architecture and taxonomy, for instance, RDA is covered in online taxonomy tools such as web Dewey. That is all in the PDGLIS. In the PGDLIS in a course called research methods and user studies, we offer some components of technology theory. Components of digital scholarship are integrated in different courses where there are relevant in the PGDLIS.

In the MLIS programme, there is a one-year course in digital curation. The course is aimed at helping librarians to understand digitisation, electronic collection management and RDM.

Although, this was the case, other LIS schools did not offer content on digital scholarship in LIS-related programmes. Nevertheless, they were in the process of recurriculating their curriculum to include digital scholarship. Participant HoD-4 witnessed that recurriculation was indeed taking place in LIS schools, he further stated that:

Currently at our institution, we have three undergraduate programmes, which are BA Archives and Record Management, Bachelor of Information Science and Higher Certificate in Archives which is an access qualification to undergraduate degrees. On the three mentioned

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programmes, none that has digital scholarship content. However, the Bachelor of Information Science is being recurriculated moving from a three-year qualification to a four-year qualification. The recurriculation process has been approved internally and externally.

In the proposed qualification, there are a number of modules that will address digital scholarship and we have moved towards that because we have realised that if we are not current in this 4IR, our qualification will become redundant. We need to move with the changes of time; hence, we have included new things in curriculum including digital scholarship. Modules being included include RDM as a module.

We also have technology which deals with ethics on ICTs, managing information using ICTs, coding, database, and information systems. We also have web technology designs; all these modules are digital scholarship modules.

Other LIS schools' participants were of the view that digital scholarship cuts across different fields, as it was also part of the Archives and Records Management stream, which was part of qualifications offered by LIS schools. Other than that, they indicated that archives were related to libraries, as these usually resorted under the same department and they had the same goal, which was to organise and store information for easy retrieval by users. Therefore, the archives and records management curriculum also taught digital scholarship related content. Participant 4 HoD further pointed out that:

For me, digital scholarship or digital humanities is interdisciplinary as it also touches on the archival side. At honour's level, we have recurriculated the Honours of Archives and Records Management. Already, we have three modules that address the issues of digital archives and records management. These include digital/data curatorship, information governance and digital records forensic which also include some elements of digital transformation and it talks about automation processes. These ones are not about research at all; they are about records and evidence.

In consensus with participant HoD-4, participant DS L-8 lamented that digital scholarship was part of archives and records management. Specifically, participant DS L-8 echoed that:

We want students to have the skills to select the best software to manage the digital records, we teach them the digital repository, we also teach the blockchain technologies, cloud storage, open data, digitisation. In digitisation, we teach them steps one need to follow and the

legislative prescripts to be followed when digitising. Records have moved from traditional methods of storing and now we supposed to store in a digital environment, therefore contents on digital scholarship need to be taught.

Based on the interviews, it was evident that in the Bachelor of Library and Information Science (BLIS) degrees, there were no content that related to digital scholarship. Most qualifications that taught content on digital scholarship included mostly postgraduate degrees, as indicated by participant HoD-1, participant HoD-4, participant HoD-5 and participant DS L-7. Digitisation was taught at the PGDLIS and participant 1 HoD's LIS school did not have a BLIS degree, participant HoD-4's LIS school taught digital scholarship content on the Archives and Records Management Honours, their Bachelor of Information Science degree had none of digital scholarship-related courses.

Furthermore, participant HoD-5 also shared the same sentiments, but indicated their LIS school had two undergraduate qualifications, which were BA Information Science and BLIS. Only the BA Information Science degree, which was a three-year qualification, contained content on digital scholarship. However, this qualification did not necessarily target the library environment. The qualification that targeted librarians was the BLIS qualification, which was a four-year qualification. However, it had no content on digital scholarship.

Participant HoD-5 specifically stated that:
There are two qualifications in the department at undergraduate BA which focuses on the IT aspect and the BLIS focus on the library part of LIS profession. I will talk about the BA Information Science, as this one has contents on digital scholarship.

Course outlines were analysed from LIS schools, specifically those that submitted their outlines. The purpose or objective statements were used to check whether they taught content on digital scholarship. Comparing data from some other academics' interviews and course outlines, lecturers sang the praises of their institutions' offering of digital scholarship-related contents while course outlines indicated that they were only training their students to be computer literate, as evidenced in UNIV 4, CO8 course outline of the computer literacy programme. Document CO8 stated that:
This module aims to equip students with a comprehensive understanding of Information Science and Information Literacy in an information society. Students will be introduced to both

manual and computerised skills in locating, accessing and processing information according to the information need.

Other LIS schools content did have contents on digital scholarship, as witnessed in UNIV 1. document CO1 stated that in their outcome statement:

At the end of this course, students will understand the principles, standards, frameworks and models used in resource description, creation of bibliographic and other datasets and will be able to manage authority control systems. They will be able to create and assign metadata for a variety of formats and datasets. They will become familiar with digital technology including library management and content systems to be able to select the most appropriate technology in a range of applications and settings. Students will be able to create typologies of ICTs in the knowledge environment particularly in the scholarly communication terrain and develop skills in their application in a variety of situations and environments. They will be introduced to digital curation and understand the broad concepts of ICTs as they apply to the principles and practices of resource description that supports effective scholarly communication.

4.5.3   Focus of digital scholarship content in LIS curricula

Academics were asked about the focus of digital scholarship in their respective LIS schools, and all 10 participating academics provided an answer to this question. Participants from LIS schools indicated that they offered ICT, digital curatorship, scholarly communication, technology as enablers, metadata standards, digitisation, OA, RDM, copyright issues and digital publishing processes. Figure 11 on page 118 illustrates the focus of most LIS schools regarding digital scholarship:

Figure 11: Focus of LIS schools on digital scholarship

Participant HoD-1 claimed that:

They basically teach them ICT, like about information that is found electronically, how to use computer to access MS Word, as some students come from a rural area or township, they never had access to a computer before enrolling, so they must be taught from scratch. As time goes, they learn how to do online cataloguing, but we do it on paper and we ask someone in a once-off workshop to demonstrate to our students how online cataloguing is done.

Participant HoD-5 indicated that:

I think our focus is to ensure that our students are digitally literate to ensure that our staff have content knowledge, appropriate pedagogical knowledge to transfer not only traditional information, but digital information and having the technological knowledge to make use of the resources and to support students. In addition, our focus would be to include digital scholarship in our exit outcomes, secondly train staff to have that technology knowledge to impact digital scholarship to students and lastly focus will be to ensure that students leave the programme digitally literate. Troubleshooting, multimedia, networks and networking are part of the focus of our content.

Participant DS L-9 articulated the focus of their LIS school as far as digital scholarship was concerned and it was related to most of what other participants claimed as the focus of digital scholarship in their LIS schools. This participant pointed out that:

Digital scholarship in LIS curriculum has to cover the understanding of concepts in its introduction, digital information infrastructure which may include the variety of ICT tools that are enablers of digital scholarship. Online scholarly sources both sources that need subscription and OA sources, legal aspect of digital scholarship, I have observed that most LIS schools lack the legal aspect, for instance, intellectual property issues, copyright, other Act that govern information such may include Protection of Personal Information (POPI) and Promotion of Access to Information Act (PAIA) Acts and benefits and challenges of digital scholarship.

The analysis of course outlines showed that few LIS schools had content that dealt deeply with digital scholarship related contents. At UNIV 1, document CO1 provided the following topics as their focus on digital scholarship:

- *Metadata-related contents*
- *Applications of digital technologies relevant to the principles and practices of information transfer and scholarly communication*
- *Digital curation (digital collection, construction and preservation)*
- *Digital scholarship*
- *Scholarly communication and its universal access*
- *Digitisation*
- *RDM*

At UNIV 2, document CO4 felt it was mostly about digital managing of digital libraries, as indicated in their content on digital scholarship. Their contents included:

- *Historical development of digital libraries*
- *Strategic management of digital libraries*
- *Software and hardware used in digital libraries*

4.5.4   Identifying desirable contents for digital scholarship

Academics, specifically lecturers who were actively engaged with the curriculum, were requested to share methods used to identify desirable content for digital scholarship in their

respective LIS schools. Participants had varied opinions as to how one could identify content for a proper curriculum on digital scholarship in LIS schools. However, research seemed to be the common factor in the responses they gave. Among others, Participant DS L-7 revealed that:

The main thing I do, is to keep up with research around decoloniality and electronic information sources. I follow journals, researches on Twitter around themes to do with data feminism, critical approaches to technology and critical approaches to online teaching, also like the major archives and museums that are doing digitisation, I follow conferences and proceedings that have to do with digital scholarship projects in Africa.

Notwithstanding the importance of research, participant DS L-8 also indicated the importance of consultation with relevant stakeholders on the area of interest to benchmark. DS L-8 acknowledged that:

Research was used to identify the desirable contents in my module. The research was done by InterPARES Trust on the re-alignment of the curriculum in the whole African continent. The study recommended that we need to fully realign our curriculum and also standardise our curriculum in the whole of African continent. Following that recommendation, there was a workshop by the International Council in Archives (ICA), the purpose of that workshop was to introduce the study materials that were developed by ICA with the view to standardise the curriculum across Africa. What we did with this module we made sure that we use the study materials from ICA to inform the contents of what we are teaching in this module. Whatever that we are teaching, we ensure that it is relevant and internationally benchmarked. Consultation with relevant stakeholders, for instance, professional bodies, academics from other LIS schools and practitioners were consulted. It is a good curriculum that can equip students with all the necessary skills they need to manage the digital records in the corporate world.

During the interview, one of the participants praised the importance of having the course outlines with aims and objectives, as the best fundamental framework that one could use to identify the desirable curriculum content. Participant DS L-20 asserted that:

The course outline is there, and the aim and objectives are there as basic frameworks, however, research is also continuously produced, and it is my responsibility to evaluate what is new from the literature and I see that it can fulfil some of my course objectives and then I integrate it. I know that there should be some sort of a model that I should use to identify the contents but there is none so far. I solely stick with the literature or research.

4.5.5   Importance of teaching digital scholarship in LIS schools

All the participants of this study were asked to provide the importance of teaching digital scholarship in the LIS curriculum. The purpose of the question was to ground participants' perceptions regarding the importance of the phenomenon under exploration. Participants indicated relevance to the dynamic information society, moving with times and preparing students for the digital world as key important factors to teach digital scholarship by most LIS schools. The following responses derived from academics to practitioners.

Participant HoD-2 remarked that:

We are living in the digital world, we are talking about the IoT, the 4IR, even before that automation is also part of the digital world, technology now is what drives scholarship, so it is quite important for us to teach digital scholarship because we are living in a society whereby almost everything comes to scholarship teaching, learning and research is driven by digital technologies.

Along the same lines, participant HoD-4 concurred as indicated in his statement:

It is because we need to be relevant, that is where the world is moving towards in terms of our field, after this interview, you might need to deposit the recordings into the IR as part of RDM and other researcher can use it as secondary data analysis, so, this is the way to go. Students need to be aware of these and where the institutions of higher learning are going in terms of this so that when they are employed there, they become relevant and also in the field of digitisation, automation and digital transformation. If we continue to teach old things, chances are we might not attract students anymore. Our funding, the high percentage is based on enrolment so if we do not attract students, our qualification might be phased out as we will not be funded, so we need to move with times.

Participant DS L-7 suggested that:

The integration of digital scholarship into our curriculum is very essential because librarians and information professionals both practitioners and academics need to be in the forefront of digital scholarship. This is because they are drivers of information development, they are the ones dealing with processes of generation, organising, using, storing of information, all these processes are happening in a digital environment. The current decade requires them to be

competent with ICTs, they must have skills of digital scholarship and be aware of it. Therefore, they will be able to engage in digital scholarship activities.

Participant DS D-14 articulated that:

It is imperative, it is beyond important, it is essential given that we are now in the digital dispensation, I don't think any curriculum right now in the LIS sector should be without digital scholarship. For me, I don't think that digital scholarship should be a standalone module, it should cut across the whole curriculum and be manifested in all the courses offered as it is a critical thing. Personally, to me, when you are talking about digital scholarship, it is like the blood that the body needs or the water the body needs, the LIS curriculum needs digital scholarship for survival and relevance.

Participant LBRN-18 lamented that:

I think it is quite important because of trying to accommodate the 4IR trends and the digital phase, not that traditional librarianship has no place, but I think that the 4IR and going to the digital age I really think that it is important to incorporate it into the LIS studies. Whereas before we were learning just about search methods and history of libraries, I think we have come to an age where there is a digital phase. I mean my work, I don't even touch physical books, I am always working with digital research publications such as online journals, all ranges of publications, so much information is available in the digital space.

4.5.6   Training interventions available for digital scholarship academics

Participants from LIS schools were asked about training opportunities they were exposed to in order to develop digital scholarship skills and knowledge. The purpose of the question was to find out whether LIS schools provided training opportunities to their staff members. Internal, external and general research training in digital scholarship opportunities were deemed important for LIS academics.

For example, participant HoD-4 articulated that:

Mostly because of high workload, we rely on the individual lecturers to upskill themselves through Personal Development Plans (PDPs) and if there is training on digital scholarship from external providers, they can attend one-week short courses on that. We also rely on those who do research at the high level and, they infuse the findings into the curriculum. The

university also supports lecturers in that area. We also seek advice from external consultants especially on study material development. Solely, we rely on internal lecturers to upskill themselves as they will be learning new digital scholarship skills in the process. There is no formal training, but individual lecturers identify the gaps and sometimes we approach other lecturers to identify such gaps.

Participants from LIS schools, which included HoDs and lecturers teaching digital scholarship-related courses, were asked to identify the forms of training they embarked on to understand digital scholarship as it was an emerging niche area. Participants cited different forms of trainings available to them to understand digital scholarship, including formal LIS education programmes or qualifications, vocational courses, short learning courses, seminars or workshops, conferences and on-the-job training as key opportunities available for their development. One of the participants (HoD-2) elaborated that:

There is no training per say that is offered by the department, but there are lot of trainings that are being offered by the university, it could be the university library, they have quite a number of trainings on digital scholarship, for example, your OA and scholarly communication seminars are offered by the library. There is also a department called Centre for Innovation in Learning and Teaching (CILT), which is hosted by Centre for Higher Education Development (CHED) and is the department at our university that offers short course and content on digital scholarship, they do not call it digital scholarship; however, they are teaching digital scholarship related content. Essentially, I would say the university library and CILT are the two departments that offer training in digital scholarship to the staff and also the research office although they have their own terminology except the term digital scholarship. I used to attend external workshops before joining my current institution. Conferences on digital scholarship play another important role.

Despite different trainings identified by various academics, one participant (HoD-1) indicated that:

Most of our staff members were trained in this LIS school, so they have gone through the programme. So, they have the IT understanding to them. They are also involved in individual or self-learning. There is no training available except that academics must develop themselves.

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Training LIS academics on emerging trends had become so critical that most scholars emphasised capacitating academics by offering trainings or formal qualifications on digital scholarship. For instance, participant HoD-5 remarked that:

The skills development is normally on an individual's customise schedule, there are e-learning, online assessment and feedback workshops offered by the Teaching and Learning Centre. There are various workshops ran by the library that touch on digital scholarship and such workshops deliberate on accessing the IR, the OA routes that we can take when we are publishing. So, all of those things are on voluntarily basis.

4.5.7 Infrastructure and its appropriateness for teaching digital scholarship contents

All participants of the study were asked about the infrastructure used for teaching digital scholarship. Those who were teaching in LIS schools were further asked whether the infrastructure or facilities were relevant. Practitioners were asked the question as most of them studied in LIS schools in South Africa or had access to LIS schools in their respective universities. Almost all the participants identified hardware and software infrastructure as necessary to be used for teaching digital scholarship. Among other things, interviewed participants mentioned computer laboratories (LANs), high-speed laptops and stable connectivity, open source or subscription software, access to online metadata standard resources such as RDA or wed Dewey, innovative hubs, 3D scanners and having websites that host journals.

Participant HoD-3 indicated that:

We use the online platforms. We have a general computer laboratory in the university to teach our students digital scholarship related lessons. However, in the wake of the Covid-19, we have stopped. Therefore, high-speed laptops and stable connectivity are required as some software are heavy in processing.

Along the same lines, participant DS LBRN-12 suggested that:

Previously, I would say we need computer laboratories. However, given the current situation, we do not need them anymore as students are no longer coming to campus, the services and facilities we need to make available is to ensure that firstly, our students have access to devices, secondly, they have access to connectivity data, so that they have access to software and

lecturers through virtual classes. There is a live chat facility used mostly by academics and their students. Proper software, devices and connectivity will help.

Although, computer laboratories were cited to be important for teaching digital scholarship-related activities, most participants cited Covid-19 as the biggest hindrance to conducting classes in the computer laboratory context. They relied on ZOOM and MS Teams for teaching digital scholarship-related content, participant HoD-5 highlighted and complained that:

Personally, I like hands-on training which is normally conducted in the computer laboratory or in a conference centre which has Wi-Fi and allows staff to bring their own laptops. Currently, a lot of the trainings have been online through Zoom and MS Teams, there hasn't been hands on training entirely, it is just theory. They just talking the talk no walk the walk. Which is not good for our students.

Notwithstanding that LIS schools' academics perceived digital scholarship-related infrastructure differently, there are similarities such as what participant DS LBRN-16 mentioned:

In terms of hardware, you need a scanner that scans at a certain DPI. Subscribe to software, maybe from SABINET. Connect students with the library so they access the practical aspect mostly digitisation projects, IRs. Get students to familiarise themselves with different repositories. You also use the open-source software for practical purposes.

Despite the idea that LIS schools were supposed to purchase their own infrastructure to properly teach digital scholarship, one participant (DS L-6) stated that:

In terms of metadata and IRs and stuff like that, I usual work closely with the library, I work with the person doing the metadata and online cataloguing. There are some kinds of trainings that we request the person to come to offer to our students; however, this year due to Covid-19, it was not feasible. The person offered training on digitisation, metadata, IR and copyright laws. We also depend on external organisations as we take our students to the National Library of South Africa (NLSA) in Pretoria to witness the machinery used for library services such as digitisation scanners. So basically, we rely on both external and internal infrastructure to bridge the gap we have internally.

4.6.6.1 Appropriateness of the infrastructure

Academic participants were questioned about the appropriateness of the infrastructure or facilities used for digital scholarship. They remarked on a number of issues they experienced in their respective LIS schools as far as the infrastructure was concerned. Only one participant indicated that the infrastructure used for teaching digital scholarship in his LIS school was relevant. Participant HoD-2 boosted that:

As much as I can say, it is not 100% appropriate but I can say it is 99% appropriate, whatsoever, we have in our institution, they provide us with the required infrastructure; for instance, if I am looking for a software or hardware for teaching and learning, the institution will always provide.

Among infrastructural issues identified by participants in this study, a lack of both manpower, ICT infrastructure and funding from their universities was also a problem. For example, participant HoD-1 indicated that:

Not really appropriate as our students exceed the amount of resources or maybe the money allocated to us, so you often find that there isn't much of the resources available for each student, some are disadvantaged or they have lesser time, although it has improved but not to the level that is satisfactory. Coupled with that, is the issue of lecturers having no digital scholarship knowledge in our LIS school. We are planning to capacitate our staff through workshops and other relevant trainings.

In consensus with participant HoD-1, participant HoD-5 stated that with the advent of Covid-19, the situation had worsened in LIS schools regarding the lack of infrastructure. Specifically, he stated that:

The infrastructure has been always the burning issue; the infrastructure has been always insufficient. During the Covid-19 pandemic, we found that our students didn't have the resources necessary to fully participate in the online environment, even though they may have the literacies, but the digital divide is very real in the African continent.

4.5.8 Promotion of digital scholarship education by LIS schools

Participants from academic and research council libraries were asked to share their views on the promotion of digital scholarship education in LIS schools. It was evident that some LIS schools promoted digital scholarship through embedding it in the curriculum. They also publicised the knowledge of digital scholarship through workshops, conferences and endorsed

their curriculum through LIS professional bodies. Participants cited that digital scholarship in the LIS curriculum was mostly at postgraduate level; there was nothing much at undergraduate level.

Participant DS LBRN-11 lamented that:

I think in the postgraduate level, it is sufficient. However, I cannot say the same with the undergraduate level, although I am not too conversant with the curriculum.

Participant DS LBRN-12 felt that it varied from different LIS schools in the country by stating:

I think it has got pockets of excellence, I don't think it is a very well planned or well organised drive in the LIS sector. There are some institutions that are doing pretty well, they have renewed their curriculum and they have become experts in that area, and some are lagging behind. I think we need to get to a point whereby irrespective of where you are coming from, you get an acceptable offer in terms of comparing you with others.

Participant DS LBRN-13 shared these sentiments by elaborating that:

Jah definitely, UP and UCT have really been pushing, perhaps UNISA has. And I have just not been aware because, as none of my staff who are busy with postgraduate studies and registered with UNISA. But, yes, I think that you actual do the in-your-face marketing as well as use LIS associations as your vehicle such as LIASA and the interest groups of LIASA and push your agenda there of your particular institution. That is what UP did, they worked with the Kaniki (Conic) Foundation and then they eventual forced the students that they have to present at LIASA conferences. Other librarians attending listened to the paper and they like "ohh, I can do this. I must register" and that is how you get people to enrol for course with digital scholarship. I think we definitely have to use those platforms to advocate for digital scholarship. Otherwise, we will be left behind. In short, I can say some institutions are promoting digital scholarship while others are not.

Participant DS LBRN-19 reported her concern of fewer LIS schools offering digital scholarship in their curriculum. Specifically, it was stated that:

I believe they are trying their best to meet the clients' needs and provide relevant services, as digital scholarship is a worldwide phenomenon. Many universities have established a digital scholarship unit to support this initiative and ensure that support and awareness are created to the researcher. However, the LIS schools need to improve the curriculum to meet the needs

of the job market. Only few LIS schools (1 if not 2) are teaching digital scholarship-related courses.

4.5.9   Nature of offering digital scholarship in LIS curriculum

Participants from LIS schools, specifically lecturers, were asked to provide the teaching methodologies and modes they use to offer digital scholarship-related content. Regarding teaching philosophies used, some cited student centredness and collaborative learning. Prior to the Covid-19 pandemic, some universities offer teaching on a face-to-face basis and some used a blended approach. However, with the arrival of the Covid-19 pandemic, almost all the institutions had moved online and Zoom and MS Teams were cited as major teaching modes. Learning Management Systems (LMS) were also cited as platforms that were used for teaching and learning digital scholarship related content. Participant DS L-7 highlighted that:

The teaching methodology used is student-centred constructivist and critical method, collaborative learning. We use a whole lot of different methods, we use flip classroom methods. We use SAKAI platform for online teaching and learning. MS teams and Zoom are also used as teaching modes.

Participant DS L-9 clarified that:

Primarily, before we were face to face, we had a little bit of blended even before the Covid-19, but not the full course was offered online. We had some kinds of blending in terms of using LMS. But since Covid-19 outbreak, we have been online.

Most participants cited Covid-19 and the digital world as the game changers in most LIS schools, which were mainly characterised by the use of fast-moving technologies. Participant DS L-9 remarked that:

Well, in the department, we have adopted blended learning. Due to Covid-19, only the online teaching and learning is feasible, but specifically for the modules I have mentioned early. However, even before the Covid-19, we have been using technologies in the LAN environment because of the 4IR. We have seen the use of smartboards to demonstrate to students. Nonetheless, Covid-19 disturbed the manner we teach which was mostly face-to-face in the LAN to observe the regulations to curb the virus.

4.5.10 Experiences of teaching digital scholarship courses

Academic participants were asked to share their experiences regarding the teaching of digital scholarship in their respective LIS schools. The categories that emerged from this theme included that courses were attracting many students due to new trends, a lack of the practical aspect of digital scholarship and unawareness of students of digital scholarship education. Participant HoD-1 mentioned that:

In my experience, what I have realised is that some of the students were not aware that was part of digital scholarship, they may know about IR and online publishing yet not aware that is part of digital scholarship. Not everyone knows about such a term and processes of digital scholarship. Some of the students did not know about open scholarship, OERs, MOOCS, online publication process it is something that they learn when they are in class. You find that there are mature students who are doing the course part-time who will know about digital scholarship. When it comes to my colleagues, everybody knows about digital scholarship as teaching done online mostly and Covid-19 has forced everyone to do teaching online which is part of digital scholarship. We had to come up with some innovative ways of teaching, we used more digital content than before, all of last year (2020), the notes, presentation videos and audios were done online. Again, when it comes to publication, everything is done digitally, you have got your online publications you have got everything done online.

Participant HoD-2 suggested that:

The Honours programme is the new qualification that has been implemented this year (2021), there are above 75 students. The qualification attracted so many students as it addresses the current trends. The qualification is purely online. It was popular to students as it had a high number of students. The programme is highly engaging as the modules are interrelated. The new qualification when compared to the older one attracted more students because of the comprehensiveness of the digital scholarship-based curriculum. The feedback that we are receiving is very positive in sense that it addresses issues in the digital environment that librarians are experiencing in their individual workplace. However, we are yet to do a full evaluation at the end of the academic year.

This was supported by Participant HoD-4 when stating that:

The experience of teaching digital scholarship in my LIS school is that we have academics who do not understand the practical applications of digital scholarship, so it becomes hard to

transfer these skills to students. Covid-19 has affected the only opportunity our students had which was to observe in libraries as we are currently working remotely. I believe if LIS schools can collaborate with STEM fields, better results can be achieved as they are advanced in digital scholarship activities.

4.6. INCORPORATION OF DIGITAL SCHOLARSHIP CONTENT

The theme on incorporation of digital scholarship content into the LIS curriculum resulted in the six sub-themes, which included the level of infusion of digital scholarship in the LIS curriculum, alignment of the course objectives with the 4IR trends, digital scholarship content to be incorporated into the LIS curriculum, stakeholders consulted for digital scholarship curriculum development, gaps and redundancies in the LIS curriculum and opportunities presented by digital scholarship in the LIS profession. The aim of this theme was to mine perceptions of LIS professionals, both academics and practitioners, on what should encompass digital scholarship content in LIS schools and who should be involved in the curriculum development. Figure 12 represents the relationships of the sub-themes under the incorporation of digital scholarship content theme:
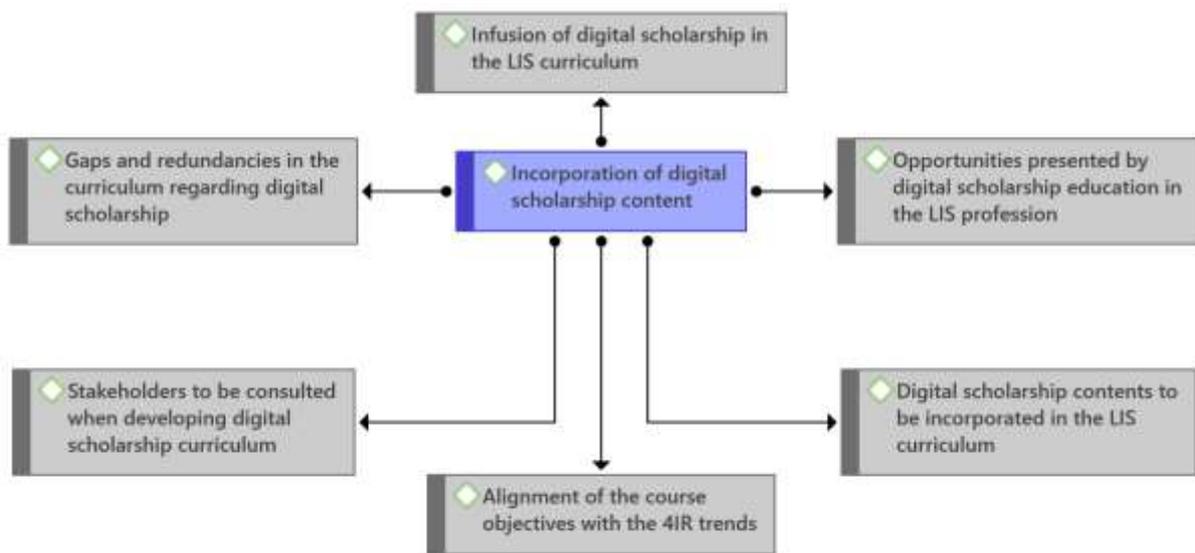
Figure 12: Incorporation of digital scholarship content

4.6.1 Infusion of digital scholarship in LIS curriculum

The participants that reported that they had digital scholarship content in their LIS schools were asked to indicate the level of infusion of digital scholarship in their curriculum. This question

aimed to find out about the depth or shallowness of digital scholarship in the LIS curriculum. Among other things, participants indicated that there was basic to advanced digital scholarship content infused in their LIS curriculum, but it depended on the level (postgraduate or undergraduate)as determined by NQF levels. However, there was also too much theory and too little practical work and contradictions in the curriculum.

Participant HoD-2 contended that:

Okay, I am teaching the postgraduate course, it is at NQF level 8, whatever I teach must be pitched at that level. My colleagues usually, they teach at level 9, I want to believe that the intensity there is at that particular level. So, in my course, I usual teach them at a basic level, which is all the definition of the concepts around digital scholarship, and we go a little bit deeper by teaching the theory of digital scholarship. There is no practical part of digital scholarship. The assessment is usually a project on digital scholarship for instance in our last assessment, students were required to conceptualise an IR whereby they plan, implement and market it.

Participant HoD-5 who held a BA Information Science degree said:

The three-years degree is more infused with digital scholarship than the four-year degree and that is the shortcoming of the four-year degree that we need to improve. In the three-year degree, in every module that is offered there are components of digital scholarship. However, we have nothing on digital scholarship on library-focused degree, we are planning to recurriculate.

Participant HoD-4 whose content was embedded in the Honours in Archives and Records Management articulated that:

For the archival honours, out of five modules, four of those modules are purely digital scholarship modules and one is 36 credits and the whole qualification is 96 credits based on digital scholarship. The team that designed that qualification was invited to Israel to present the curriculum at the digital curatorship conference. So, it is really heavy.

The curriculum that will be introduced for the Library Science degree, over 10 modules will be based on digital scholarship, which include RDM, data analysis, fundamentals of research methodology in information science, electronic publishing and six modules on technology. These modules are all focused on digital scholarship.

Participant DS L-6 mentioned that:

Digitisation we offer it as a whole module in the undergraduate level at the 3rd level. We also offer it in the advanced diploma as a module. Digitisation is a very big part of the curriculum as it is offered in the third level and postgraduate level as a module. In terms of other aspect of digital scholarship, it is very scattily infused in different modules across the qualification.

Other participants expressed concerns that digital scholarship in their curriculum was very basic. Participant HoD-3 expressed that:

I would say our digital scholarship part in our curriculum is not that advanced, but we are working on revamping our curriculum, we are in the process of recurriculation in doing so. We are coming up with new modules; one of the modules will be digital scholarship.

Participant DS L-9 outlined that:

I can loudly say it is basic because it is offered at an entry level of a degree and a unit in a course or module it not an entire module focusing on digital scholarship. So, it is at a very elementary level.

4.6.2   Alignment of the course objectives with the 4IR trends

Academics were asked whether their course objectives were aligned to the 4IR trends. The reasoning behind this question was that LIS schools' course objectives had to be aligned with the new trends. Almost all the participants reported that their course objectives were aligned with the current trends and others reported that they were revising the course objectives as they had embarked on the recurriculation journey. Participants highlighted recurriculation to include digital scholarship, exposure to technology, contents on the 4IR, relevance with the job market in LIS, more integrated learning for students, research on recent developments, relevance with the digital world and inclusion of the AI as reasons for alignment.

Participant HoD-1 expressed that:

We did recurriculation and realigning of the curriculum; we started our new programme in 2018. If you ask our students about 4IR they will tell you, they find it trendy. Students from our time compared to the current ones, the current ones have exposure to technology, and they are more open to learning new technological trends compared to the old ones.

Participant HoD-2 was uncertain whether we were on the 4IR yet or not, he stated that:

There is quite a debate on whether we are in the 4IR already or we are still going there. Our curriculum is basically structured in a way that it includes some components of the 4IR, however, that is at a basic level due to the debate as to whether we are there yet or not. However, when the trends point that we are in the 4IR, there is supposed to be an alignment because we do not have to be caught with our pants down and at the same time we do not have to teach something that is not reality. There are contents on information processes, data analytics and so forth, so the curriculum must have such components which are part of digital scholarship. Usually, our curriculum is based on what is currently happening. In our department, we still feel that the 4IR is still coming and we need to prepare the students for that revolution.

Participant DS L-7 asserted that:

It is something we constantly do, so every year, we evaluate our courses to see if they are on track with the recent research and developments.

Other participants indicated that their contents are not aligned with the course objectives as far as the 4IR trends were concerned hence they were recurriculating. Participant HoD-3 elaborated that:

We are already recurriculating as we have realised that the objectives need to be realigned to meet the needs of the current job market. However, the process is still on going.

Participant DS L-6 revealed that:

Yes, definitely we will realign our objectives based on the 4IR, as I said we did go into curriculum renewal a few years ago, we try to incorporate most of the digital scholarship aspects, what we need to do now is to go into more details into cloud computing and integrated library systems, digital literacies and all of that. It needs to be included into the actual undergraduate curriculum, what I am currently doing now, I am introducing a lot of 4IR related topics to our masters' students for topic selection purposes for students to research and we are hoping for digital scholarship and their research to be published in the IR.

The same question in another version was asked to practitioners, both directors and digital scholarship librarians. The aim of the question was to identify practitioners' perceptions of

whether LIS schools should re-align their curriculum with the trends brought by the 4IR in the LIS field based on digital scholarship. Participant DS LBRN-12 stated that:

Yes, I think we need to align with the 4IR especially given that where the sector is going and again how information has evolved, the fact that there is so much information especially, with the 4IR it can make the life easier in terms of gaining access to information but with that again I am going back to my point that with every good thing, there is some negativity around; there is some abuse, there are some people who will take advantage of a good thing and turn it on its head, people are now able to manipulate information and use it for their ulterior -motives. In terms of digital scholarship, I think it is important that we incorporate it to what we offer and do. In the LIS sector, there has been a lot of incorporation of virtual assistance, for instance, having digital software answering reference queries, I mean that degree of automation is taking us to another level. Some will argue that it is a threat to human resources, and I think depending on how you look at it, it could be a threat or an opportunity that absolutely the 4IR is shaping our lives and again the reality as information specialist can be excited about technology but there are so many people who are concerned that they will lose their jobs because of technology.

Participant DS D-13 alluded that:

It is absolutely vital that we keep track of what is happening in the industry or private sector, and I know with government institutions it takes a bit long to catch up. However, there is gotta always be someone who is constantly scanning the environment and see what should be incorporated for the next generation of librarians.

Participant DS LBRN-16 indicated that:

Yes, definitely, in terms of 4IR, LIS schools need to align the course objectives with the current trends, as I have mentioned this is where the world is going. I know that your research is focused on academic institution; however, I have a lot of experience on government institutions, where there is obviously not a lot of expertise in digitisation. Most people do LIS qualifications, their focus is mostly on a public library setting so when students come to our library to do their work integrated learning, they actual learn more about digital scholarship and we get to notice a lot of gaps. Therefore, LIS schools definitely have to realign.

Participant DS LBRN-19 pointed out that:

Definitely, for the LIS profession to remain relevant to the market, it must understand the trends to be able to offer efficient services to the clients in a most convenient and effective way.

4.6.3 Digital scholarship content to be incorporated in the LIS curriculum

Participants, specifically directors of libraries and digital scholarship librarians were asked to indicate content or units that they would like to have in the LIS curriculum regarding digital scholarship. The question was asked to understand their perceptions based on the content of digital scholarship, as they were experts in the LIS profession. Among other things, participants cited digitisation, digital curatorship, RDM, metadata standards and tools like Dublin core, copyright-related contents, technological enablers in LIS, OA, bibliometrics, OERs and understanding the applications of the POPI Act and PAIA as contents to be incorporated into the LIS curriculum. Figure 13 displays most of the content that participants shared regarding digital scholarship:

Figure 13: Digital scholarship content to be incorporated in the LIS curriculum

Participant DS LBRN-11 indicated that:
I think certainly about bibliometrics and webometrics as one certain aspect, being able to look at citations and being able to offer that kind of assistance to all researchers. I think that kind of skill is required in the curriculum to introduce students to the digital tools that are available.

In the other university library, I know they can focus to things such as Endnote for bibliographic management, which is required for their research, but in terms of training for types of skills that are required at a librarian level, I would say more can be done, these include bibliometrics, open scholarship, open sources, OERs and all the kinds of related tools used in digital scholarship for instance Dublin Core.

Participant DS LBRN-12 highlighted that:

I think first of all, what needs to be done, there needs to be a collaborative approach, what is happening in my opinion is that there are various LIS schools around the country, and we know that there are few that closed, reducing the number of the existing ones. The reality is that they are operating in their own little silos, so you get to the league of the universities that have got the best of curriculum, technology and the budget and they become the place to be. In contrast, then you have got the smaller guy like us, who do not have many resources and expertise in the area of digital scholarship, so my thinking is that a collaborative approach which is coordinated by LIS sector as a whole can help merge the gap. We need to move away from silos tendencies, and again I can understand that from the competitive point of view, each institution is trying to find their edge in terms of attracting students. Nevertheless, if we as the LIS sector want to advance the profession, we need to find some common ground.

Participant DS D-15 articulated that:

Most definitely the ability to find information, because that has always been the strength of the information specialist or librarian and so on, is that they know where to find good and trustworthy information. And that is where we differ from the internet where you can find anything and you do not know how trustworthy or true it is, and information specialists must have that skill and knowledge to be able to find and produce trustworthy information. They must be also able to understand how computers and networks work on a fairly good level because, especially with the 4IR where even appliances talk to one another, it is necessary that they would be able to understand the field and work with it properly.

Participant DS LBRN-19 noted that:

E-research – digital tools to conduct research and investigations, citation, analyse, prepare outputs, e-learning and teaching– collaborative platforms to learn, teach, research, publish, preserve and retrieve information, data management and data mining – digital management of research data including collection, analysis, preservation, publishing, curation and reuse,

epublishing, networking and communication – information resources should be linked interactive and available online.

4.6.4 Stakeholders consulted in content development for digital scholarship

All the participants that formed part of this study were asked to identify stakeholders relevant for digital scholarship curriculum development process. Participants identified LIS schools academics, other scholars from other disciplines such computer science, IT, humanities and software engineers, LIS practitioners, LIS schools' current students, quality assurance committees, LIS professional bodies such as LIASA, and benchmarking with other sister LIS schools international or national. Additionally, SAQA and the Department of Higher Education and Training (DHET) were also identified as the key stakeholders to be consulted for any curriculum development.

The Figure 14 below shows the concepts that were mostly cited by participants on this sub-theme:

Figure 14: Stakeholders to be consulted

Participant HoD-1 advised that:

There are curriculum development champions who do the admiration part of it, the team of our academics, advisory board from the university, students from integrated learning and feedback from the supervisors in the work-integrated learning.

Participant HoD-2 alluded that:

The library staff are key stakeholders; why? Because they are the ones who are practically involved in digital scholarship, researchers (in the department of LIS profession in general) and the research office. Professional boards for instance LIASA and other organisations such as IFLA. Other departments such as computer science, IT, IS and data science can also be consulted. In our department, we have multidisciplinary team, for example, there is a colleague who have a PhD in Computer Science and one who has IT and other colleagues from the library as a digital scholarship section.

Participant DS L-8 indicated that:

Professional associations are the people who have been professionals at some point, they have worked with all these things we are teaching and they are also developing standards. They are also making recommendations to the relevant government institutions with regards to the issue of legislations and policy directions, those people I fully encourage that they are consulted. Again, you might find that there are professionals who are not fully participating in these professional associations. Engage those scholars. Benchmark with other LIS schools which are offering these courses, at some point, we invited a colleague from other sister LIS school in our archive lecture to give an address on digital curation. I think that is some kind of networking because once you engage other scholars offering the courses, you are more likely to identify the challenges and come up with solutions. One thing that we take for granted is consultation with students to get a sense of what to expect. This enables proper student support in a proactive manner.

Participants from libraries also shared the same group of stakeholders. Participant DS LBRN-11 indicated that:

Certainly, I would say the practitioners and industry. We are both industry and practitioners because we serve as an advisory board for LIS schools, we have an MoU with our LIS school here in the university so that we can be of greater assistance with the LIS training so that our students come out from the LIS school having the attributes that we are looking for. For instance, they are problem solvers and they have technological skills that are required in the

LIS profession. Certainly, as the industry we feel that we can share recent developments in the library with LIS schools in a formal or informal way. So, academics and practitioners are key stakeholders. I am not sure about students. The library associations will have to be there as well to provide guidance and advice from the national perspective. Their voice should be heard and respected by LIS schools. I must say though our association is not as strong as other associations, for instance the ALA, they have big stake on what is taught in the curriculum.

Participant DS D-14 articulated that:

You know curriculum development is an issue of the academics that are delivering the curriculum, only if our students are aware, they can be in the forefront of developing the curriculum or informing it, they are stakeholders in a sense that they will be recipients of curriculum. In addition to that, the Council on Higher Education (CHE) can also be consulted, as they know the requirements of the curriculum. The other stakeholders will be the employers as they are the key stakeholders, as they know the types of skill sets that they need. I would also imagine the DHET in the context of South Africa and other civil societies such as LIASA and Committee of Higher Education Libraries of South Africa (CHELSA) and South African National Library and information Consortium (SANLiC). Basically, the library directors across the nation (SA) who are primarily employers and consider public libraries as well. I cannot overemphasise the importance of academics as key stakeholders in this process as they are key drivers of curriculum transformation and development.

Participant DS D-17 shared that:

The usual stakeholders will be students and the academics, but as far as the requirements of the field are concerned, it is important to remember that what is happening in the field has an impact on the curriculum so as far as the key stakeholders are concerned, I would say practising librarians or libraries should be considered. There are dramatic changes in the field I believe that practising librarians do need to be stakeholders. Professional bodies are important, such as LIASA, if we are talking about the training of librarians. Interesting enough, professional associations within the working environment that guide or that provide guidelines in terms of required skills as far as positions in the workplace are concerned, I would say that you would also need to include some of association or organisation in the private or public sector that has inputs into the kinds of skills requirement. LIASA is one but there are other professional bodies as well that exist. We had a case where a law graduate had done a

PGDLIS, his focus is the law library, and so labour organisations will have to be part of those stakeholders.

4.6.5   Gaps and redundancies in the LIS curriculum

Participants were asked about the gaps in the LIS curriculum regarding digital scholarship. Only one participant expressed that their curriculum did not have any gaps or redundancies and the rest of the participants indicated that there were gaps and redundancies in their curriculum. Most of the participants cited a lack of practicals in the curriculum, a lack of African epistemologies (in terms of research), a lack of contents on digital scholarship and repetition of same content in different levels of the curriculum. Participant HOD-1 declared that:

The curriculum is so thorough, I know from personal experience it is not like we just preparing a librarian, we are developing people so that when students leave the system after three years, one could tell that we have developed citizens. The are no redundancies, we have structured our curriculum very well. What one learns at the first year became a continuation at the second year. Our students are very marketable, two students just finished, and they are employed at the NLSA and others at eTV.

Some participants indicated their concerns as far as gaps and redundancies were concerned in the curriculum. For instance, participant HoD-2 commented that:

I think there is quite a lot of redundancies when it comes to our master's level, there are components that I want to believe they are being repeated in the courses. For example, you will find that digital curation is taught as a special course and also as a component in a particular course. So, there is quite a lot of duplication at the master's level.

The gaps that we are having in this particular moment is contents that have to do with the 4IR, I think that is lacking one way or the other. Yes, one way or the other we are teaching that, but it has to be specific for the student to understand that we are preparing them for that revolution. This has to be done in details.

On the other hand, participant HoD-4 also supported that:

Yes, there are lots of gaps, hence for our side we decided to recurriculate and identify that gap and in other institutions those that haven't recurriculated. There is a gap, and they are offering old curriculum. A certain institution has recurriculated and is offering 100% digital

scholarship qualification. Other two institutions are leaning more on IT. Others still offer the traditional curriculum meant at producing traditional public librarians. The other gap is information about the big data. That need to be incorporated in the curriculum as it forms part of digital humanities or scholarship.

Participant DS L-7 added that:

Gaps are in African through readership, meaning that it is not easy to find high quality published peer reviewed scholarship. Where we do find African scholars publishing, they are publishing from the western informed perspective rather than from a more critical perspective that looks at issues such as decoloniality, for example.

Participant DS L-8 revealed that:

I think the only gap I can mention now is the practical aspect of what we are teaching. We are fully on theory, although our module is technical, but it is more based on theory than practical like, for an example, if you teach students about digital repository, we need this digital repository to demonstrate to students on how it is structured.

Practitioners from both academic and research council libraries were asked to share views regarding gaps and redundancies that they may have observed from the LIS curriculum regarding digital scholarship. Their concerns were similar to the ones possessed by academics. Participant DS D-15 expressed that:

Training of librarians should address present day needs and realities, that is why I recommend the inclusion of a large practical component to the LIS curriculum, to make it relevant.

Participant DS LBRN-16 observed that:

The honours programme I did at UP was very good, although it did not go specifically into different digital scholarship content, but it had aspects or units relating to digital scholarship. Although this was the case, I feel like there were definitely some gaps as most of the things are at the basic phase of digital scholarship. Sometimes you still find things like information searching at the honours level, in my case I feel like some of the things are redundant at the postgraduate level as they are there at the undergraduate level. That is why for my master's I just want to focus on digital curatorship as I feel this is very informative.

I don't even think that the qualifications I did impacted in my career choices as a digital scholarship librarian. If I can be quite honest, the whole of the things that I learnt towards digital scholarship were from the workshops that I attended, partnerships with institutions that had digitisation and RDM projects.

Participant DS D-17 expressed that:

There is a bit of a gap when it comes to OA in terms of what students need to understand, we have discovered that there is limited understanding about how IRs work. I understand that LIS schools might want to fill this in theory a little bit more, but there are things that as far as theory is concerned doesn't extend as far as practical will in terms of making someone function effectively from day one or day two. That is something that should be interrogated efficiently, so when it came to gaps that we observed, it would be limited discussions on OA, digital services, digital technologies that have been applied and limited knowledge of RDM which is fairly a new area yet there is so much information to develop the curriculum. There is too much focus on the history of very ancient libraries and with curriculum that has been shortened, the history courses should be shortened into units to make room for other courses for instance the digital scholarship and 4IR applications in LIS.

4.6.6 Opportunities presented by digital scholarship in the LIS profession

Digital scholarship is one of the emerging areas in the LIS profession that has presented so many opportunities both on the LIS academic side and the academic or special research council library side. In view of this, participants were questioned to point out any opportunities that were presented by digital scholarship. Participants identified marketability, employability, understanding the digital environment, managing various digital information types, interdisciplinarity or collaboration, producers of MOOCS and OERs, and different job opportunities, as 4IR opportunities in the LIS profession. The opportunities were indicated by academic participants to the practitioner's order.

Participant HOD-2 indicated that:

We are training our students to be part of the larger information society or sector not necessarily only libraries. There is quite a lot of opportunities that our curriculum offers to students, for example, apart from traditional librarianship, students can work as digital curators, working with IRs. We also attempt to teach them to be publishers through digital

publishing, which is not really part of traditional librarianship; however, the libraries have become publishers with introduction of digital scholarship. Apart from that, we are also teaching our students to be part of the larger digital scholarship producers in a way that they are able to make use of OERs. They should be able to create their own content and post it as MOOCs. They should be able to use the different open education scholarship found online for the upliftment of their communities or their scholarship.

Participant DS L-6 identified that:

As I said, the opportunity for me now is obviously to offer short courses because, we already have digital scholarship, but we need to expand on that and include more current trends, for instance, copyright for online resources, publishing, and more. This will allow practising librarians to upskill themselves. Furthermore, students exiting the LIS schools will be rendered relevantly in the job market.

Participant DS L-8 remarked that:

There is a lot of opportunities, for instance, interdisciplinarity, such as working with different departments for teaching and research. There are digitisation and archiving projects all the time such as the Nelson Mandela Foundation, six museums and there are 500 archives that students are employed to perform digital scholarship related activities.

Another interviewee, participant DS L-9 perceived that:

The greatest opportunity with this curriculum is that the students will be able to manage any type of digital information, it could be for work purposes or personal information. This curriculum will also equip them with the skills to select the best cloud storage.

Participants from both academic and special research council libraries were questioned about opportunities brought by digital scholarship education in the LIS profession. Participants indicated differing views. Some of them expressed that traditional librarianship was still relevant; however, skills and knowledge update were highly recommended to be able to thrive in the new job positions.

For example, participant DS D-10 claimed that:

I believe traditional librarianship offered by LIS schools is still relevant and important. I just think new innovative methods and new content is needed as an extension. Cataloguing is still

needed by data librarians, for example, to be able to manage vast amount of data and metadata, in digital scholarship data is a new commodity of information that has to be shared just like the final research output that could be in the form of an article.

Participant DS D-13 stated that:

I have heard of GIS librarianship as well and all of these things. Those are terms that were coined just the other day and I don't even really know what they do but I know UCT has a GIS librarian. So…. jah there are definitely so many digital scholarship opportunities.

Participant DS D-14 presented a different notion compared to other participants. The participant revealed that:

To me, honestly speaking, the opportunity of being a digital scholarship librarian, I see a business opportunity, I see a person graduating becoming an entrepreneur specifically an information consultant. Doing much more and having many businesses opened, this thing of I am graduating from a LIS school to be employed as a librarian, I see that changing with the introduction to digital scholarship.

Only one participant expressed that LIS schools' curriculum did not present an opportunity for digital scholarship-related positions in the library, as their focus was narrow and the curriculum covered digital scholarship at postgraduate level only. Participant DS D-17 specifically suggested that:

Not really. At postgraduate level, the opportunities exist, as I mentioned at UCT postgraduate diploma where the focus is very narrow in terms of academic institution. In terms of other LIS schools not really, I haven't seen any opportunities. This makes it hard for students to get positions in academic or research council libraries. The perception of being a librarian is still limited in this country in terms of people attributing all librarians to a public library librarian even in universities, so the opportunities are very limited. I have done a recent work integrated learning programme with students from most LIS schools across the country, what I have realised is that LIS schools do not prepare students effectively to work in the wider digital environment beyond public libraries.

4.7   PERCEPTIONS OF EMPLOYERS ON LIS GRADUATES

In the case of this study, directors of academic and special research council libraries were considered to be employers of digital scholarship librarians, as they were the ones who decided on the specifications of a digital scholarship librarian. Based on this theme, three sub-themes emerged, which included expectations of employers regarding digital scholarship competencies, LIS schools offering solid digital scholarship education and challenges encountered when employing a digital scholarship librarian. These sub-themes were elaborated in the subheadings below. Figure 15 displays the relationship of the sub-themes according to the perceptions of LIS employers on LIS graduates regarding digital scholarship.

Figure 15: Perceptions of LIS employers on LIS graduates regarding DS

4.7.1   Expectations of employers regarding digital scholarship competencies

Directors of both academic and research council libraries were asked to share their expectations regarding digital scholarship competencies from LIS graduates. Participants pointed out several competencies that digital scholarship librarians had to possess. Among others, they indicated that LIS graduates must be able to navigate digital scholarship activities at a basic level, should be able to identify the knowledge gaps, and must understand OA, RDM and the publishing ecosystem. In addition to that, the participants suggested that digital scholarship must be embedded throughout the four-year LIS degree. Across all the responses, an understanding of digital scholarship activities was observed by all participants as an important competency among candidates who aspired to be digital scholarship librarians.

Participant DS D-10 elaborated that:

I think library science is still relevant; however, it needs to be coupled with other new programmes to enhance and innovate LIS. Computer competency is critical.

Participant DS D-13 articulated that:

My expectations are that at least a third-year student should be able to know how to go about to navigate digital scholarship activities and to know a little bit more, they don't have to know everything because of course they will know once they have been employed, but they must have the basic knowledge and be able to identify the gap on what they know.

Participant DS D-14 stated that:

Obviously, I am expecting them to deliver digital scholarship and to build skillsets in that area because that is an imperative area; hence, I don't believe that it should be a single course where sometimes a student may opt not to take. I believe that all these facets of digital scholarship must be embedded in every course that is taught in LIS schools whether it is introduction to library and information science or metadata, digital scholarship must be there. It must be featured in every course.

Participant DS D-15 postulated that:

LIS schools should produce competent librarians who are able to provide services in predominantly online environments. The Covid-19 pandemic has ushered a new way of working where online LIS service delivery has become mandatory.

Participant DS D-17 claimed that:

My expectations in terms of my experience, would be a greater understanding of OA which has been fairly limited. I would like to see publishing ecosystem, so that students are more aware of what goes on the background in terms of how research outputs or articles are generated, a better understanding of RDM in terms of the research data life circle.

4.7.2   LIS schools offering solid digital scholarship education

Participants were asked to share their views about LIS schools that were offering solid digital scholarship education in their curriculum. Surprisingly, only three LIS schools emerged as the ones that had a curriculum in digital scholarship. These schools included the UCT, UP and UJ.

Participant DS D-10 identified the following:

UJ, School of Information and Knowledge Management

Although unsure, participant DS D-13 was of the view that:

At the moment, I don't want to be unfair, but I have only heard of the UCT and UP model they were leading on the RDM and of course, they do library online publishing and they actual won an award about a month or two ago. Perhaps, the other universities do have but I am not familiar, I am just so bias because two of my staff are doing a course with UCT and we have invited the lecturer to come and teach a four-week course to some of my other staff members rather than spending the money paying for logistics to UCT. The course was related to RDM and online publishing

One participant felt that even though there were two LIS schools that were offering solid digital scholarship curriculum, she preferred to groom someone internally. Participant DS D-14 specifically elaborated that:

I haven't employed anyone for digital scholarship, it is because I know that I might not even get such a person. Well, I am aware of the UCT curriculum, but I would rather get somebody that is very experienced and tech-savvy and have high attitude of technology in it functions as enabler of digital scholarship, then I would capacitate that person towards digital scholarship activities. I prefer an internal experienced somebody, instead of a new graduate with less experience possibly half-baked in the digital scholarship area. Even here, I have capacitated someone who have been working at the library for some time and doing Master's in Computer Science. The thing with these new graduates is that it takes time for them to learn and sometimes lack professionalism. If I were to identify, I would identify UCT and UP graduates.

Participant DS D-17 remarked that:

Not too many of them. If you want names, what I would say? UCT has a postgraduate diploma that focuses on academic libraries. Their courses are essentially postgraduate diplomas, master's and PhDs with none at undergraduate degree. I have seen that student from that schools in particular have actually done better when it comes in interviewing them and appointing them.

4.7.3   Challenges encountered when employing digital scholarship librarians

Library directors were in a better position to point out challenges encountered when employing a digital scholarship librarian. This question was asked to identify these challenges with the hope to later uncover solutions to the identified challenges. Participants provided various challenges encountered when employing a digital scholarship librarian. Among others, the limited pool of candidates for selection, the lack of experience among the candidates and the lack of awareness as far as digital scholarship was concerned were identified. Some even mentioned that they eventually employed people from outside the LIS field due to the lack of candidates.

Participant DS D-10 claimed that:

Librarians do not have technical science skills, for most sciences were never their subjects from basic education right through tertiary education. It then takes a while before an information specialist gets accustomed to science and supporting science researchers in Science, Engineering and Technology disciplines.

Participants DS D-13 revealed that:

Jah well, they are too scared. People are scared about digital scholarship, as I told you that now I have got a digital scholarship librarian, I had only two internal applicants. I think we also had about ten externals, but when we shortlisted, we narrowed it down to two externals, so in totally I had only four as they lacked the skills to be called for interviews. The only candidate that I have employed has a M.IT and PGDLIS which he decided to do like very recently to get a library qualification, but he was very much IT aligned. So yes, there is a fear from people to embrace it, they think it's too high end, or they will say that "no I am not digital inclined". There also seems to be a reluctance from even some of the younger generations.

Participant DS D-14 contended that:

Obviously, because I haven't employed anyone, I won't know, but what I knew from the on-set is that I am not going to get the person. Especially, if I am looking for an experienced individual because I was reviewing some information from UCT and you find that those who are experienced there will not come to the university like ours. I would rather groom and capacitate my internal team on digital scholarship, so as far back as 2018, I already spotted my team and have sent them to different workshops. It is hard to attract a digital scholarship librarian. I am even trying to get graduates from IT and computer science to fill in this gap as most librarians do not have these digital scholarship related skills. I find the ones from IT and computer science

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techno-savvy and have high aptitude of technological understanding they even understand metadata and information architecture in a deep way.

Participant DS D-17 indicated that:

So, one of the challenges is, there are not many candidates who are suitable, the pool of candidates is limited, as far as knowledge is concerned, they may be knowledgeable but there would be a lack of experience. One of the things we have come across fairly recently is that places they came from; they were not exposed to broader multiple library functions as we would expect them to be. The problem is that digital scholarship is a very broad field and in terms of its requirements and the manner in which we work as an institution, is such that we work very broadly across the spectrum of the library itself, in other words, all of the library services, including faculty librarianship and beyond, you also work with the technology transfer office to work on the policies for data handling and data management plans and polices for the research office and the library. These things are not taught in most LIS schools which limit the skills, knowledge and competences. People need to broaden their understanding of what digital scholarship is and that is far beyond the traditional library practices.

4.8   DIGITAL SCHOLARSHIP KNOWLEDGE, SKILLS AND COMPETENCIES

The theme on digital scholarship knowledge, skills and competencies sought to discover relevant skills, knowledge and competencies required for digital scholarship-related positions. This theme resulted in five sub-themes, which were digital scholarship units and activities in the library, requirements of digital scholarship librarian and skills development training available for digital scholarship librarians challenges experienced by digital scholarship librarians and suggestions to improve the LIS education on digital scholarship formed the sub-themes. Figure 16 on page 150 below illustrates the relationship between the sub-themes of digital scholarship knowledge, skills and competencies:
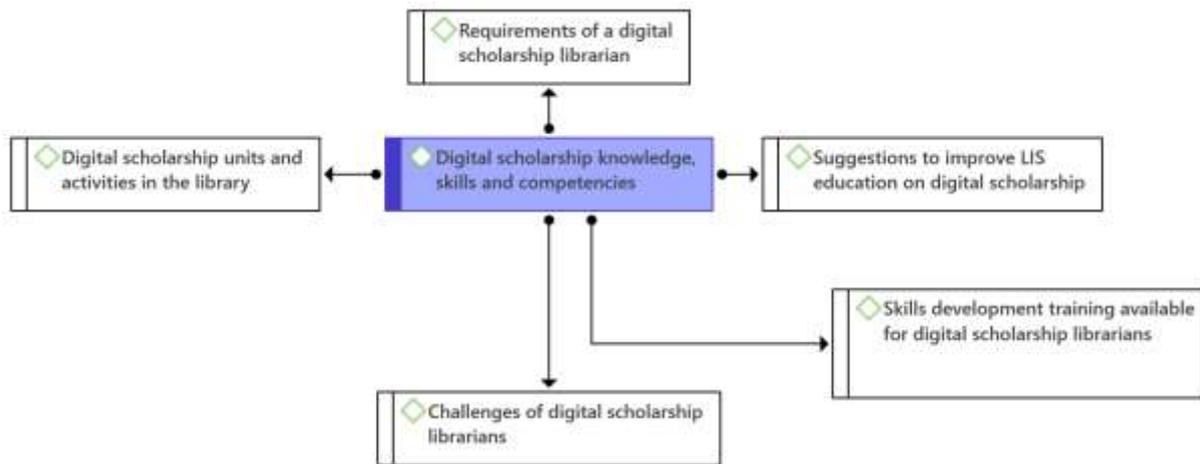
Figure 16: Digital scholarship knowledge, skills and competencies

4.8.1 Digital scholarship units and activities in the library

Participants working in the library, including library directors and digital scholarship librarians, were requested to share their views based on the units and activities performed in the digital scholarship section. The question was asked to identify the new digital scholarship developments brought by the 4IR technologies. Most participants mentioned the digitisation and data curation unit, RDM unit, IR unit, digital research services, digital publishing platforms, metadata and advocacy for OA as units available in academic libraries. In addition to that, when asked about activities they perform in the digital scholarship section, participants indicated that they uploaded theses and dissertations to the IRs, digitised and curated data, performed metadata-related activities, managed e-journals, performed digital research services and performed advocacy for OA. Participants spoke about units and activities concurrently in their responses as these two are closely related.

Participant DS D-10 explained that:

To support research by playing an advisory role, advising on good publishing practices, advising on research visibility and advocating for OA, science and educating users of the changing scholarly communication landscape, training, marketing, providing information by conducting subject based comprehensive literature searches using expert techniques of putting together search strategies that produce relevant results when ran in science information databases, setting up alerts and current awareness services, being embedded, identifying tools, products and services that can be introduced at different phases of research and building

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relationships, being visible to researchers, having close proximity to research, we achieve this by attending research and project meetings.

Participant DS LBRN-11 expressed that:

What I have done I have integrated the digital scholarship centre activities, such activities include acquisition, cataloguing, digital library services and IT services and support. Those are the four kinds of things I deal with. Specifically, we have metadata librarians, acquisition digital library services or digital scholarship, IR, digitisation, digital archive, RDM and bibliometrics.

Participant DS LBRN-12 echoed:

It is a fairly new area; we have appointed a librarian for digital initiatives which include, the RDM which comes with the Data Management Planning (DMP) tool and the library publishing aspect, what we are doing here, we are promoting open scholarship of manuscripts.

Participants DS D-14 indicated that:

Digitisation, we have got a lot of print rare, special collections in our university as our university has a huge collection on the struggle and liberation of South Africa, so we have started the digitisation centre. We have started the RDM and data curation processes. Within digitisation, there is digital curation and management of the digital library services, making sure that they are accessible and safe. We also have IRs and data repositories. We ensure that resources (special and rare collections) are digitised. We also ensure that relevant data is deposited and managed through RDM. There are policies that we have to follow as far as RDM is concerned. There are individual librarians that are responsible for these services.

Participants DS LBRN-16 remarked that:

My section deals with copyright. I deal more with OA advocacy and growing the repositories. We ensure that the institution's research is accessible and also ensure the electronic thesis and dissertations (ETD) repository is accessible. We are also outsourcing digitisation companies to digitise old print theses and dissertations and then perform metadata on them and upload them. In the research repository, we upload institution's output from Scopus, Research Gate and upload the outputs into the repository. We also conduct workshops on OA and research integrity.

Participants DS D-17 pointed out that:

Running the university journal publishing section, which includes developing new journals, training editors, researchers, journal managers to function effectively in the publishing ecosystem. The other part is RDM where I manage the research repositories, responsible for troubleshooting the software as well as publishing the research data projects and on top of that I have to function as a data curator. In that role, I need to know the extent of the content of the data to be curated whether or not it is legally compliant with the POPI Act as well as Copyright Act. I need to be aware of the intellectual property issues as far as OA is concerned. Additionally, I am responsible for repositories for both theses and research outputs repositories. We also ensure advocacy within the university, so we talk to various faculties both supervisors and postgraduate students, we train them on OA and avenues available for publishing. We offer various courses on digital scholarship and ethical behaviours in the digital environment.

Participant LBRN-18 noted that:

We don't really have a unit of digital scholarship that I know of, we have various staff members fulfilling parts of that making digital materials available and that is from the collection developer who purchases databases and electronic journals and things like that and the non-commercial developer who runs the IRs of our university where research from staff and students is made available for access to the world; for instance, the staff who makes their electronic books, journal articles and book chapters available for students in their e-Reserves section where these things are scanned for copyright clearance so that students can use these articles freely. There is also a digitisation unit where archival materials as well as journal articles and book chapters are scanned to be readily available online. There are also metadata librarians who record these digitised materials so that they are available and accessible.

Participant LBRN-19 indicated that:

We currently do not have a fully established digital scholarship unit, but our information services offer support in many aspects that addresses digital scholarship.

Information specialist and library technical service streams offer support in scholarly communication, provide tools that enable researchers to improve their writing, tools to support referencing, prevent plagiarism, provide access to resources remotely outside our institution. OA to publications is promoted to ensure visibility, networking and collaborations through the

OA repositories and encouraging researchers to publish in OA journals. Researchers are also encouraged to register for researcher ID and ORCID and have online profiles or presences to enable visibility, collaboration, and networking.

The records management stream addresses digitisation and curation of data and outputs of the research and innovation processes including the sharing and dissemination of these outputs.

Data mining is one of the components of digital scholarship, using technology to compare, find patterns and correlations within large information and datasets to predict outcomes. However, there are no resources to support this function as yet. As information professionals, we rely on our peers such as engineers and technologist to develop such applications.

4.8.2   Requirements of a digital scholarship librarian

Participants were asked to indicate the requirements of a digital scholarship librarian. Participants cited that a minimum of a bachelor's degree was vital, at least three to five years' experience in the academic library environment, knowledge in digital scholarship and technical skills to survive in the research and digital environment were crucial. Among the knowledge requirements of digital scholarship, RDM, digitisation, IRs, metadata, scholarly communication, bibliometrics and OA knowledge appeared from most of the responses. Skills that were required included computer literacy, interpersonal skills and communication skills were cited as important requirements.

Participant DS D-10 cited that:
A candidate should hold a relevant postgraduate degree in LIS or equivalent, should be comfortable working in a digital environment. Working in a team is important for collective learning, knowledge sharing and transferring.

Participant DS LBRN-11also indicated that:
You need to be a qualified librarian, experience in an academic library, expert knowledge of digital scholarship frameworks, tools and activities, expert knowledge around policies on OA. We also want somebody who have got knowledge of open-source tools such as D space or other repository software. Finally, the person must have high level of analytical skills.

Participant LBRN-12 stated that:

It will have to be somebody who is a librarian, even if it is not a full librarian qualification can comprise of IT qualification and maybe a postgraduate qualification in LIS. There should be an experience of IT field together with LIS experience. They should understand the facets of digital scholarship.

Participant DS D-13 elaborated that:

Let me just try and think back to that. We want five years' experience of having worked in the academic library and we actual… because it was our first post ever, we did not have high requirements as I was saying to you we were trying to introduce people so that they would learn together with us let's put it that way. However, going forward, obviously, I would say that we will now rework if this person leaves and we have to re-advertise, I will definitely ask them knowledge of IRs, RDM, library publishing and the various platforms that you can use.

Another participant from this study, a library director, expressed that every librarian must have digital scholarship-related skills and knowledge to perform all the library activities, as the digital scholarship had affected aspects of the library. Participant DS D-14 elaborated that:

I would like all my librarians to be digital scholarship librarians because I think from my point of view, I think every librarian now must be a digital scholarship librarian, because we are dealing with digital scholarship in every part of the library. Specifically, to the question now, the librarian must be techno-savvy and the person must have profound knowledge of spreadsheet access, Comma Separate Values (CSV) file and all five formats. The person must be very conversant with all metadata formats, digital artefacts, competency in metadata format, competency in media formats and content types.

Participant DS D-17 pointed out that:

In our organisation, it will require someone with at least a bachelor's degree, we advertised recently, an honours degree is preferable, master's or even a PhD will be an added bonus; however, we do need someone with the minimum of five years' experience in a digital environment, familiarity with various digital repositories as well as digital services that the library provides or subscribes to. Someone with the understanding of how databases work and capable of providing training. We also would like someone who understands the academic institutions and the make-up of the academic institution, so that they understand research administration.

Participant DS LBRN-19 was of the view that:

A BLIS degree as a minimum requirement and at least three years' experience in an academic or research library. Understanding of technology, the changing scholarly landscape, and principles of information provision and management.

4.8.3   Skills development training available for digital scholarship librarians

Digital scholarship librarians and their directors were asked to share skills development training available for librarians in developing digital scholarship skills and knowledge in the libraries. The question was asked to identify skills development for digital scholarship as it was an emerging area that was continuously developing, and most librarians were trained before the 4IR. Among others, skills development training included research visibility training, training workshops (webinars and face to face), short learning courses, partnering with the research office for external training and use of external service providers.

Participant DS D-10 stated that:

There are so many training activities we expose e-resource librarians to, such include research visibility, author profiles (ORCID), managing citations and h-index, using social research platforms such as LinkedIn, ResearchGate, author publishing workshops, predatory publishers' awareness, reference management and OA training, different models of OA publishing.

Participant DS LBRN-11 indicated that:

In my institution, I would say we have a very strong partnership with the research office, so we are usually part of all the trainings they offer in this area. There is also a staff development programme in the library, in the past three years, trainings on RDM, bibliometrics and OA journals and open monographies software have been provided. We have skilled our senior and junior staff members on digital scholarship. You know digital scholarship is interconnected, so every librarian needs to understand digital scholarship. We also train our data curatorship librarian in this area through workshops. We are appointing from within, so we insource services of institutions such as SABINET to do the reskilling for our librarians in the digital scholarship area. I am planning to have a librarian responsible for the POPI Act, archives librarian and the publishing one. All these librarians will be offered relevant training. As much

as I am, reskilling from internally, LIS schools need to take control of these areas, I can tell you that my staff qualified recently, however, they do not have any of the digital scholarship skills and this says a lot about our LIS school's education. LIS schools have an important role to play. You are working in the LIS school, and I am sure that you know that you cannot confidently say that your students can walk out of the LIS school and be able to perform the digital scholarship roles.

Participant DS D-13 revealed that:

Well, I have sent my digital scholarship librarian and my traditional cataloguers to UCT training course. We invited a UCT lecturer to come and teach here. As a host institution, we invited sister LIS schools to be part of the training. Trainings are on digitisation and RDM in academics libraries.

Participant DS D-14 stated that:

Honestly speaking, they are workshops mentioned earlier, you know, there has been workshops organised by LIASA, UP and University of Witwatersrand (Wits) on digital scholarship, so we take our staff there. It is a pity that Covid-19 happened because I have planned to take my staff to the United Arab Emirates in 2020; it was going to be the three weeks intense course on digital scholarship. Staff members also attend webinars or workshops on OA, scholarly communication and related topics.

Participant DS LBRN-16 speculated that:

There are a lot of courses that we have as trainings, such will include course on bibliometrics offered by Web of Science and Scopus, there is also Cape Consortium that has workshops on the emerging trends in LIS.

Participant DS D-17 was of the indicated that:

I train my staff on RDM, what it is, how it works, and various software used to clean up data. I would train people on how research and data repositories work in terms of digital scholarship. We train them on databases in terms of building research profiles, for example, when the researcher has published with SCOPUS, so we offer trainings on bibliometrics to help researchers and determine their impact factors. We train staff on research management tools such as Endnote or Mendeley. We train staff on how to publish and to be aware of the various Acts such as Copyright and the POPI Acts.

Participant DS LBRN-18 noted that:

Well, we find courses and we are requested to attend these courses, depending on the funds available, we are allowed the time and opportunity to attend these courses. There are no formal trainings within the library itself, we learn from experts from outside. Our university library is a full member of the digital preservation collation, so from there, since last year, we get very good information and training opportunities especially during these online times to attend those courses.

Participant DS LBRN-19 alluded that**:**

We have been trained on digitisation and digital curation, data management (data mining in future) and OA and repositories through workshops and conferences. I have also attended a short learning course offered by UCT.

4.8.4   Challenges experienced by digital scholarship librarians

Digital scholarship librarians were asked to identify the challenges they experienced in their day-to-day activities as digital scholarship librarians. It was expected of librarians to experience digital scholarship challenges because it was an emerging area in both academic libraries and special research council libraries. Challenges indicated by most digital scholarship librarians included the lack of technical skills among librarians, librarians were technophobic instead of embracing it, they were reluctant to learn emerging skills and knowledge, a lack of awareness of digital scholarship among funding bodies and there seemed to be employment of candidates from the IT, computer science or other related fields.

Participant DS LBRN-11alluded that:

One of the challenges is institutional buy-ins, you know as an academic library, we are proactive, while we may have the tools and the systems in place certainly for digital scholarship to be effective, you need the academics and researchers to buy into it, if I can use the example, I mean one thing everybody is struggling with in the country is RDM or data curation, so I would say institutions have to buy into these concepts.

Participant DS LBRN-12 stated that:

One of the challenges I have observed as I mentioned earlier is resistance by staff to the new ways of doing things and the feeling from others that digital scholarship present uncertainties to their job security. Then there is this notion of change management, where people fear change, we need to remain relevant to the trends, so we cannot become emotional and personal about change. Change management can be a problem as it stumbles the process when not done properly.

Participant DS LBRN-16 complained about the lack of policies as far as digital scholarship was concerned, specifically the participant stated that:

I think the Copyright Act problem that has been not signed up until now, although the basics are there but the discussions are still going. In addition to that, the digitisation policy has been going on for like ten years and nobody has come up with the final draft. I think if we have something nationally, obviously that will guide what will work in a department or higher education institution. That will make things easy. The other problem is that academic libraries employ candidates from other fields that are technologically inclined.

Participant DS LBRN-19 was of the view that there was a lack of training to equip them to be a relevant digital scholarship librarian. Specifically, participant DS LBRN-19 stated that:

Digital scholarship as an initiative requires certain skills, expertise and knowledge. The challenge is the transition and change that is required. Most librarians had to teach themselves and figure things out on their own.

Participant DS LBRN-19 pointed out that:

There is a lack of courses in most LIS schools that equip students with digital scholarship skills and knowledge. This usual result in academic libraries or special research council libraries employing candidates from STEM fields to take over librarian positions.

4.8.5   Suggestions to improve LIS education on digital scholarship

Participants were asked to suggest ways to improve LIS education on digital scholarship. Library directors and digital scholarship librarians were in a good place to provide suggestions, as they worked with digital scholarship activities on a daily basis, and they knew what could improve the curriculum. Participants revealed that consultancy with practitioners, extending the practical component on digital scholarship-related courses, conducting research on digital

scholarship and attending conferences and workshops on digital scholarship were deemed important. Furthermore, adding relevant content on digital scholarship in the LIS curriculum and having short learning courses or programmes for continuous learning were identified as important approaches to improve the LIS curriculum regarding digital scholarship.

Participant DS D-10 attested that:

Workshops and training on the area through short learning courses are important for equipping digital scholarship librarians. The LIS schools need to ensure that their staff members are well versed with digital scholarship and are able to pass the knowledge to students. They should learn and collect practical information from industry and private sector on what are the expectations of the LIS profession, where and how LIS skills fit in different types of organisations, public or private, what additional soft skills are needed. LIS schools should collaborate with other interdisciplinary fields. Blending the curriculum so that LIS students become accustomed to computers, computer technologies and innovations to complement current LIS modules and curriculum. LIS schools to monitor the external scholarly communication landscape that is constantly changing so as to align the curriculum accordingly.

Participant DS LBRN-11 indicated that:

We set up the MoU between practitioners and academics, so that we are cognisant of the fact that not everything can be taught in the LIS curriculum can be general, as graduates are not employed by either academic or public libraries only. So, there should be electives that students will have to select so that they can specialise. We have identified the gap that the new recruits lack knowledge to work in the digital scholarship environment. The soft skills for digital scholarship are much required, for instance, for communicating with researchers and understanding their needs and processes. Our curriculum is too rigid. This needs to change.

One of the participants in this study appreciated the beauty of collaborating with international institutions to benchmark as far as digital scholarship was concerned. Participant DS D-13 stated that:

Yes, so our institution was the first university to participate in collaborative online learning (COIL) which is an initiative from University of New York. So how it works is, if you are teaching digital scholarship at 3rd year level in our institution, you hook up with a lecturer teaching at New York and perhaps one whose teaching in Brazil so you can have ¾ partners, so your students interact with each other using the online platforms and you share the content.

You can ask them to do online presentations, so they learn about different contexts such as South Africa and how we look at digital scholarship and that goes for other participating partners. So, the students and the lecturers actually benefit from this process as far as trends are concerned, this is a whole notion of internationalisation. It is time consuming but very helpful. I also think that in South Africa we also tend to look and collaborate with the developed world and fail to check what our neighbours in Africa are doing, this has to change. If we look at that, we can achieve Africanisation regarding digital scholarship. We also need to stop this thing of that the resources are lacking in our neighbouring countries, look when the US or China started working with us, we had poor infrastructure, but they worked with us despite that.

Participant DS D-14 articulated that:

I think it is based only on offering it, there is nothing critique about it. When it is offered, they should do the theory part and go and do the practical aspects. The library school can teach theory and assign students to university libraries so that librarians can show them the practical aspect of it. The academics will have to update the curriculum and stop being comfortable with old contents.

Participant DS LBRN-16 suggested that:

Definitely, we are basically dealing with research, postgraduate students to senior staff members. We deal with concepts such as copyright, repositories, research integrity, predatory journals, digitisation (strategy for digitisation) so LIS schools must improve their curriculum by adding these components in the LIS curriculum. I must say, when I had to do my first digitisation project, I noticed so many gaps relating to the curriculum, so such information will have to be included in the curriculum, also ensure that students are prepared for digital space and copyright implications. I think all the LIS schools need to incorporate digital scholarship. I am thinking moving away from the notion that the library has shelves and books and moving towards a more digital scholarship applications and implications environment. Metadata standards are also important for the inclusion into the curriculum. Benchmarking and understanding the digital scholarship landscape are also important for LIS schools academics.

4.9   RE-/DEVELOPMENT OF THE LIS SCHOOLS' CURRICULUM STRUCTURE

Based on the Wolf's (2007) curriculum development framework, after analysing the existing curriculum, one must develop/redevelop/ the curriculum. This theme gave birth to five sub-themes: challenges of incorporating digital scholarship into the LIS curriculum, overcoming the challenges presented by the structuring of digital scholarship content, challenges arising from digital scholarship-related jobs and strategies to overcome challenges of digital scholarship-related jobs and presenting findings about models used when developing a digital scholarship curriculum in LIS schools. It was deemed pertinent to illustrate the relationships among the sub-themes, as indicated the Figure 17 below:
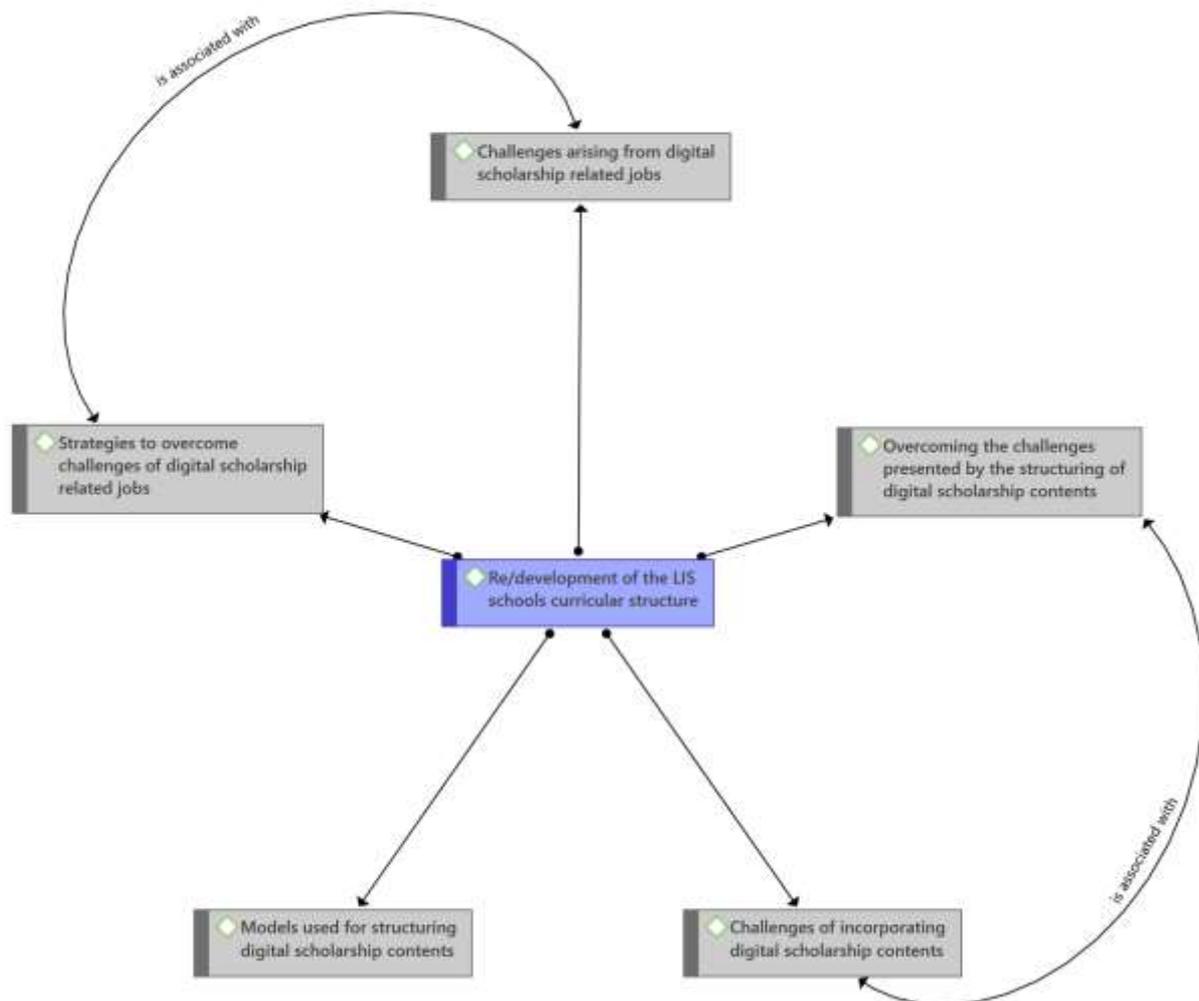
Figure 17: Re-/development of the LIS curricula structure

4.9.1 Challenges of incorporating digital scholarship contents

Participants from LIS schools were asked to indicate which challenges they faced when incorporating digital scholarship contents into the LIS curriculum. Participants identified various challenges they experienced. Among other challenges, a lack of resources such as funds

and skills, reluctance from academics to engage in digital scholarship, awareness of digital scholarship from academics and being informed by Euro-centric perspectives were the most cited challenges identified. Furthermore, a lack of research, working in silos and avoiding interdisciplinarity were other challenges identified by participants. The responses were as follows.

Participant HoD-1 articulated that:

I don't think we have included so much, but not as specific as your study or LIS qualifications will desire. So, the problem is incorporation of digital scholarship contents. There is also a lack of resources and funding. You know digital scholarship infrastructure costs a lot of money and sometimes we have got a lot of students, then we can accommodate even in a classroom situation. Many more private institutions can move these things forward, at the same time, I think we can offer what we can. I just feel like your study will give light to much more that we need to include. I can see awareness is the problem.

Participant HoD-2 indicated that:

In my current institution, there are not so many challenges; however, from where I come from, it would be reluctance from academics to contribute digital knowledge. For instance, there is a perception that when you contribute your research to your IR, that research is not peer reviewed. Secondly, there is a lack of skills from academics when it comes to digital scholarship. Mostly, other academics are not aware of what digital scholarship is and there is a lack of infrastructure and necessary knowledge and skills.

Participant HoD-4 noted that:

Firstly, it was resisted from academics themselves. The industry itself because some will argue that they are not doing such things, so it is not necessary. For instance, the public library would say it is not applicable to them. My argument was that you can transform such a library to be current or in future that skill will be necessary in such a setting. Digital scholarship should also make provision for librarians in rural communities. The other problem will be the practical aspect of the module as the modules are mostly theory. There is also lack of training and awareness on digital scholarship.

Participant DS L-6 cited that:

As I said, the course is not offered as a standalone or separate module, so students do not understand what digital scholarship is all about, but in terms of us as lecturers, we incorporate it in a way although we don't specify that these are digital scholarship content. This makes it difficult for students to spot or identity digital scholarship related job advertisements.

Participant DS L-7 mentioned that:

There is resistance from all the scholars to incorporate digital scholarship into their curriculum. We tend to be informed by the Euro-centric perspectives and seem reluctant to take an African developing more leadership perspective that is kind of critical from what we are receiving from the west. We work in silos so we're kind of reluctant to work in an interdisciplinary approach through working with other academic departments. There is also a fuss on technology in the expense of information; for instance, when scholars think of including digital scholarship, they think of programming and coding, yes, that is important, but they forget information literacy, the theoretical and philosophical parts.

Participant DS L-9 revealed that:

As I mentioned earlier, that in the development of curriculum, I use literature that is recently published, so the shortage of research in digital scholarship has been the problem. Again, the manner in which our students transit to the university from high school is a problem, when they first enrol to the university, they know nothing about digital scholarship. The current teaching and learning culture is always a challenge, but which can be viewed as an opportunity as well. It empowers the constructivist teaching methodology. The other challenge which is mainly an embarrassment is that some academics do not know about digital scholarship of which I think it is a fact that they are not aware.

4.9.2   Overcoming the challenges presented by structuring digital scholarship contents

Participants from LIS schools were further asked to provide solutions that were used to overcome challenges that arise from incorporating digital scholarship contents into the LIS curriculum. Participants suggested that awareness of digital scholarship, training in the form of workshops and seminars, acquiring relevant digital scholarship resources, openness to African perspectives, increasing research into digital scholarship and collaboration with other LIS institutions for benchmarking were identified as overarching solutions to the challenges identified in section 4.9.1.

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Participant HoD-1 elaborated that:

I think having workshops and stuff, you know with LIS, there are always new things that are coming out and if you don't know about it, you just get stuck in your own ways of doing things. By making digital scholarship visible through awareness, for instance, now I know you are working in the area I can ask that you come lecture my class on digital scholarship. Awareness for the funding institution is also important, as they are the ones who fund digital scholarship projects.

Participant HoD-2 suggested that:

Training and the provision of resources that are required is necessary. Let us train our people and the university must provide the necessary resources to ensure awareness among relevant stakeholders. I would advise LIS schools lecturers to have workshops and conferences on digital scholarship and attend support systems to ensure that we familiarise ourselves with curriculum development. Awareness needs to be in place for LIS professionals on digital scholarship.

Participant HoD-4 addressed that:

We have used the open-source software to bridge the practical gap in our modules. Referring students to organisations that already have an infrastructure for such, if I may give an example with that archival curriculum, for the four modules, we normally encourage students to use one institution as their case for every activity that they are doing including their research, the other one for records forensic for information governance and digital curatorship and the research report. We always encourage them to use one institution throughout, if they have got access to that institution, they can use their infrastructure at the end and their portfolios can still even be taken back to that institution to solve problems. Academics themselves don't have any choice rather than to adapt to the new environment. The industry must be convinced through presentations, from our side, we had to go the see the metropolitans in South Africa and LIASA for endorsement. Awareness is key.

Participant DS L-6 articulated that:

We need to specify in the curriculum that we have digital scholarship contents so that our students will be aware and be able to identify such. The best solution is to give the academics enough time when it comes to development of the study materials. One must be relieved of other

duties and focus on study guide development. Again, pairing the junior colleague with a senior one as the senior colleague will have the necessary experience for developing study materials. Awareness workshops are also vital. The training is more required to tackle the challenge of lack of skills and knowledge on digital scholarship.

Participant DS L-7 cited that:

I think LIS scholars need to take a more critical perspective on technology in general and on information as well not just believe that we must do everything that America tells us to do. African scholars need to develop their own solutions to their own problems in the developing world. We need to identify our own challenges and work with them from an emancipatory point of view to open up digital scholarship more to communities and community needs.

Participant DS L-9 proposed that:

More research needs to be done on digital scholarship. Workshops need to be conducted across all academic disciples to familiarise and train academics on digital scholarship and its opportunities. Digital scholarship can be recommended as part of high school level subject to curb the digital divide.

4.9.3   Challenges arising from digital scholarship related jobs

Participants from academic and special research council libraries were asked to identify challenges that arise from the increase of digital scholarship positions in libraries. Librarians identified various challenges, which included a lack of librarians with qualifications in other fields, few candidates with the necessary skills and LIS schools were not teaching digital scholarship-related courses. Furthermore, deciding between IT, computer science professionals and librarians was a challenge, financial constraints were experienced and adapting fast to changes were also challenges presented by the momentum of digital scholarship positions in libraries. Most participants were of the view that finding the right person for the job was the major challenge. The responses were as follows.

Participant DS D-10 indicated that:

The challenge is that people required to be information specialist or information librarians do not hold a science qualification to be able to support science research, especially in subjects such as physics, chemistry and mathematics.

Participants DS LBRN-11 articulated that:

I think there are too few people that have the necessary skills in the country at the moment. I can say we rely on a lot from UCT and UP at the moment, we have a collegial agreement. Currently, UCT have trained us on publishing and our website sits on the UCT server and we are expected to train the next institution. So, there is a lack of skills in this area. There is no one that is going to come from LIS schools and say they can do this. UP is strong in the RDM, so they help us in training our staff in the area of RDM. Again, attracting graduates from UCT and UP is a problem as they are few. Therefore, there is a limited pool of candidates to fill digital scholarship positions.

Participants DS LBRN-12 narrated that:

I think finding the right person; the kind of person we need to do this kind of work is somebody who have the IT skills but somebody who is proficient in marketing, branding and promotion. So basically, someone who is articulate in speaking in various forums, IT guys are somehow fit for the job, however, they are mostly good with the computer and lack soft communication skills. On the other hand, current librarians lack understanding of technological trends. The challenge is getting someone who can portray both these skills.

Participant DS D-13 noted that:

I think one of the challenges, that would come to mind, it will probably be financial constraints, if you are going to be teaching certain things, your students should have something in the classroom that will give students that exposure because you cannot teach in the vacuum, for instance, if we are talking about 3D printers and things like that. How would they even begin to know what it really is about and yet if they go overseas, this is a standard thing that is in any public or academic libraries in that setting. I am talking about first world really, so I think financial constraints could be a major challenge. Also lack of leadership by the departments, as I keep on saying you gotta have someone who is constantly scanning the environment and not wait for things to fall on our lap and then we be like "what we should be doing". For instance, if we look at Covid-19, we have seen the City of Johannesburg and Ethekwini City Libraries, all these libraries were closed for months and then only started, so the people would have kindled and they could continue reading their books. But the greater population didn't have access to that technology or training, those really are our big challenges. In addition, we need to have policies that support digital scholarship. Policies of government and universities

should speak to these things. Likewise, the policies, procedures, and processes, we just don't have the sufficient knowledge about the lack of infrastructure in our society in my view.

Participant DS D-14 felt that there were no challenges except that people feared technology or the advent of digital scholarship instead of appreciating it. The participant specifically stated that:

I don't see any challenges; I see opportunities that the academics and the LIS profession need to embrace the changes. Honestly, I see exciting opportunities that are there, that have been trapped by people fearing technology which I am not sure why because technology is such an enabler, digital scholarship is real such an exciting aspect that should be there in the curriculum of a librarian. For instance, look at the fire that happened at UCT if it was not for digital scholarship, specifically, digitisation project, all the special rare collection housed in the burnt library could have been lost.

Participant DS LBRN-18 postulated that:

I think staying on the forefront, you know things change so fast, but just staying abreast of the new changes is quite challenging. Digital scholarship is not an old phenomenon or discipline and some of the aspects are still being tested and implemented. Due to its dependence on technology and the fact that technology changes rapidly, the digital scholarship itself is ever changing as new digital tools are introduced, therefore, it is hard to keep up with the developments.

Participant DS LBRN-13 echoed that:

The other challenge will be that most of the things learnt are from on-the-job training. Nothing much from LIS schools I have studied, therefore this indicates that there is a shortage of people with digital scholarship skills and knowledge.

4.9.4   Strategies to overcome challenges of digital scholarship related jobs

Participants from the job market were further asked to provide solutions to the challenges they identified in section 4.9.3. Among other strategies to overcome challenges related to digital scholarship jobs, librarians recommended that recurriculation should take place to include content on digital scholarship, LIS schools should offer refresher or short learning courses, digital scholarship should be across all LIS schools' courses or modules, more practicals should

be included in digital scholarship courses and LIS schools should benchmark with institutions that had a proper digital scholarship curriculum.

Participant DS D-10 suggested that:

Introduce technical modules such a basic computer science, project management, basic financial management to the LIS curriculum as electives to accommodate different types of librarians.

Participant DS LBRN-11 reasoned that:

You have to leave aside formal education and training; we are trying to create national networks. Through our publishing training, we will try and share the skills throughout the continent.

Participant DS LBRN-12 articulated that:

The reality is that you are never going to find somebody who is a perfect fit, but you can find someone who is a close fit and develop that person towards your needs. Nonetheless, we have to try providing relevant training and LIS schools should provide refresher courses.

Participant DS D-13 expressed:

Jah, oh gosh where does it starts, at legislation? Possibly I think, if you remember, look our public libraries are managed by Department of Arts and Culture, you have Department of Basic Education for school libraries and Higher Education for academic libraries, so it should really start there. I mean, I was absolutely astounded at the beginning of the year, when the Wits students were on strike and the Students Representative Council (SRC) president came and spoke on eTv and he said that "they are telling us that we must use the student portal and we must do this and do that, do they know that some of these students who come here into Wits have never hold a laptop in their hands?" What I am saying is that we are not aware of the challenges we have at the ground, we just look at the few and decide. So, I don't think in terms of that, our government, but not just government, we need to have more crusaders to curb the digital divide first. The legislation should allow that through implementation.

Participant DS LBRN-18 proposed that:

There should be awareness, you know one should be aware and give a variety of people an opportunity to attend these courses or conferences or workshops; all the various things so that

they can bring back the information and share with the other colleagues because not everybody can attend everything, that is too difficult. But if there is a sharing community within the LIS sector, the profession can move forward.

4.9.5   Models used for structuring digital scholarship content

Academics were requested to share models that they used for curriculum development in their respective LIS schools regarding digital scholarship. Most academics indicated that they used no model in curriculum development regarding digital scholarship; others indicated that they used themes, not models, using LIASA standards on digital scholarship and consulting relevant stakeholders on digital scholarship. Participant HoD-1 indicated:

There isn't really a model, like the IT module that we offer library components and IT components, but it is not as visible as we would wish it to be.

Participant HoD-2 expressed:

I would not be sure, as this is what I have found to have already been implement in the department. Personally, I wouldn't say that there is a particular model that is used to structure the curriculum. However, I can tell you about the process of developing the curriculum whereby themes are used. In my own curriculum, I teach the whole concept of digital scholarship. I break it down into different themes for instance, scholarly communication, IRs and so on. This entirely depends on individual lecturers.

Participant HoD-3 elaborated that:

As I said, we do not have a module on digital scholarship, but I cannot say we have a model that we are using. We anticipate using the standards released by the LIS professional board (LIASA) on digital scholarship as a foundation for our curriculum development regarding the phenomenon.

Participant HoD-4 indicated that:

What we did was consultations with stakeholders from different types of libraries; based on that, we identified the gaps and looked on the gaps that are there and our current qualifications and developed the curriculum. We did not follow a model, but we followed a process.

One participant in this study admitted to the use of certain models for digital scholarship curriculum development. For example, participant HoD-4 expressed that:

Look, I use a couple of models to help me conceptualise on digital scholarship, you know I use the eight learning events. This model talks the advancement of technology in universities. We use integrated learning for feedback. We also contact stakeholders.

Participant DS L-7 noted that:

I don't think there is a model; there are key themes that we make sure they are addressed around digital scholarship and decoloniality. Each course convener is required to develop their courses the way they feel works the best in the constructivist approach that we use. We don't use models in a way we use approaches and themes. Fundamentally, we use a continuous process as our courses are reviewed every year based on themes.

It depends on the scholar. For instance, some people find models very useful while some don't find them useful, as they prefer flexibility in curriculum development on digital scholarship.

Participant DS L-8 expressed that:

The module emanates from the InterPARES recommendation and the ICA workshop that was held in Botswana. Basically, it is the process rather than the model that is used for curriculum development in digital scholarship based on digital curation and organisation module.

Participant DS L-20 indicated:

Currently, I don't use any model as digital scholarship does not have a stand-alone module.

4.10   SUMMARY OF CHAPTER FOUR

The chapter presented the findings of the study collected through semi-structured interviews with selected participants, including the HoDs of LIS schools, lecturers teaching digital scholarship, directors of library services and digital scholarship librarians. Furthermore, data from course outlines in LIS schools were also presented in this chapter. Data were analysed thematically. The ATLAS.ti 9 software assisted in the analysis process. This software was used to code the data, to create verbatim responses, word clouds and networks that facilitated the analysis and presentation process. Five major themes based on the objectives of the study were used to present the findings of this study. Particularly, the LIS curriculum was analysed; LIS

curriculum incorporation of digital scholarship content was presented; employers' perceptions were discovered; skills, knowledge and competencies of digital scholarship were identified; and, eventually, data about development or redevelopment of the curriculum to accommodate digital scholarship contents was analysed and presented. The study found out that most LIS schools were not offering content on digital scholarship due to a lack of relevant 4IR infrastructure and the available workforce to offer such education. The study indicated that the LIS schools that were teaching digital scholarship lacked the practical component. Academics revealed that a shortage of literature on digital scholarship led to a poor infusion of the concept in the curriculum. The study further pointed out that the LIS school failed to consult with relevant stakeholders when developing the curriculum.

The following chapter (Chapter Five) provides the interpretations and discussions of the findings as presented in this chapter. The literature and conceptual underpinning are used to support or rebuff the findings.

CHAPTER FIVE

INTERPRETATIONS AND DISCUSSIONS OF THE RESEARCH FINDINGS

5.1   INTRODUCTION

The previous chapter (Chapter Four) presented the findings of the study collected via semi-structured interviews from participants of this study from the LIS schools and research council libraries. There was also a corroboration of findings from the course outlines of digital scholarship courses. The findings were presented according to the themes that emanated from the objectives of the study and the data collected for this study. This chapter interprets and discusses the findings from training and education of LIS professionals in digital scholarship in South African study. This chapter aims to describe and interpret the significance of the findings based on what is already known (in terms of literature) about the problem that was explored and explains new insights brought by the findings of this study (Ofulla 2013; Creswell & Creswell 2018).

Interpretation of the findings is all about providing the findings of the study at hand with other related studies, which aid in the establishment of theories and support the continuity of the research (Daniel & Sam 2011). The findings of this study are considered based on the literature on LIS schools' education and training, specifically digital scholarship as a concept. The chapter discusses and interprets findings based on the following main themes and sub-themes:

- Library and information science curriculum
- Incorporation of digital scholarship content
- Perceptions of LIS employers on LIS graduates
- Digital scholarship knowledge, skills and competencies
- Development or redevelopment of the LIS curriculum structure

5.2   LIBRARY AND INFORMATION SCIENCE CURRICULA

This theme dealt with the extent to which digital scholarship is covered in LIS schools. Raju (2017b), Mahlatse, Pienaar and Van Deventer (2018) previously commented that only a few LIS schools in South Africa provide digital scholarship education. As a result, Raju (2017b) suggests that LIS schools must review and revise their curriculum to include digital scholarship

content to meet the demands of the digital environment. Therefore, according to Mahlatse, Pienaar and Van Deventer (2018), it was necessary to analyse the curriculum to understand the status quo after a few years. This theme is outlined properly in the sub-themes below:

5.2.1   Understanding digital scholarship

The study revealed that the participants had different understandings of digital scholarship; however, there seemed to be common terms that appeared in most of the definitions across participants' responses. Most participants cited the advent of digital technologies, troubleshooting, digital literacies, ICTs, networking and scholarly communication tools in the library environment as digital-scholarship informed terms. In addition to that, interdisciplinarity, collaboration and open scholarship were cited as being digital scholarship orientated. The participants comprised LIS schools' HoDs, lecturers teaching digital scholarship, and directors of academic and research council libraries and digital scholarship librarians.

Based on the study findings, one could define digital scholarship as the use of digital tools and platforms for scholarly communication regarding research, teaching and learning among the academic communities. Among other concepts that were evident from the study findings, digital scholarship was also related to the use of digital technologies for the promotion and advocacy of OA and collaboration activities in the library environment, which include electronic publishing, publishing scholarship and electronic journal publishing, like OA journals or electronic journals and OERs.

The assertions made by the participants from this study were no different from the understanding of digital scholarship projected by the literature. Rumsey (2011), Lewis et al. (2015) and Iqbal and Yadav (2021) perceived digital scholarship as the use of digital evidence and methods, authoring, electronic publishing, computational curation and preservation, and digital use and reuse of scholarship for research, tuition and general communication. More precisely, the University of Washington Library (2021) defines digital scholarship as the scholarly activity that uses the new possibilities for teaching and research paved by digital media, which include, but are not limited to, new forms of collaboration, new publication forms and new methods of visualising and analysing data. This definition summarised most of the definitions by participants as far as understanding of digital scholarship is concerned.

Therefore, the findings of this study concurred with the previous studies that were conducted on digital scholarship.

5.2.2   Teaching digital scholarship in LIS schools

The notion that libraries are expected to have spaces to accommodate the new, emerging community needs and LIS schools should be able to teach these new skills in their curriculum was explored in this sub-theme (Ogburn 2012; Sinclair 2014; Wexelbaum 2016; Raffagheli 2017). This study discovered that some participants were confident that they offered digital scholarship, whereas other participants were uncertain as to whether they offered it in their LIS schools. In addition to that, some participants further articulated that they did not offer digital scholarship in LIS-related qualifications but they were planning to review their curriculum, and others were already reviewing it. The study also revealed that digital scholarship content was offered as units in modules offered in the LIS curriculum.

These findings are in line with those of Raju (2017b), as the study indicated that only few LIS schools had been offering digital scholarship content in their curriculum. Mahlatse, Pienaar and Van Deventer (2018) claimed that UCT was offering a master's digital curatorship qualification and that there was no curriculum for digital scholarship in the undergraduate courses across all LIS schools. They further highlighted that the UP recently introduced M.IT in Big Data degree, which has a module on RDM and digital curatorship. This was also supported by this study as it was shown that undergraduate LIS-related qualifications had no contents for digital scholarship. The findings indicated that LIS schools that were planning to renew their curriculum were indeed working towards achieving the aim of LIS education, as indicated by Muthu, Sivaraman and Singh (2015). This suggests that there was a need to offer LIS education that met the recent needs and emerging technological trends in the LIS environment.

Corroboration of findings from course outlines with the interviews revealed some contradictions as far as digital scholarship content was concerned. Comparing findings from these two sets of data revealed that some lecturers sang the praises of their curriculum; but when checking the course outlines, it was computer literacy-related courses that were not as intense as digital scholarship-related content. Tu and Xu (2018) suggest that LIS schools must have content on RDM, making digital collection, digitisation of analogue materials, OA, digital

curatorship, GIS and mapping as evidence that they are indeed teaching digital scholarship in their curriculum. Assessing course outlines from some other LIS schools, it was discovered that there were no contents that were related to digital scholarship. Raju (2015), and Wood and Evans (2018) underscore that LIS schools in South Africa were struggling to provide the digital scholarship skills and knowledge required in the digital environment. Evidently, based on the findings of this study, most LIS schools lagged behind when it came to offering digital scholarship content in their curriculum.

5.2.3   Focus of digital scholarship content in LIS schools

The study found that digital scholarship contents in LIS schools in South Africa focused on ICTs, digital curatorship, scholarly communication, technologies as enablers of digital scholarship, metadata standards, digitisation, managing IRs, OA, data librarian, RDM, copyright issues and digital publishing processes. Furthermore, troubleshooting, multimedia, networks and networking were also cited as digital scholarship contents that were evident in the LIS curriculum when covering digital scholarship.

The validation of these findings was done through document analysis of course outlines. The findings from the course outlines showed that metadata-related contents, applications of digital technologies relevant to the principles and practices of information transfer and scholarly communication, digital curation (digital collection, construction and preservation), digital scholarship, scholarly communication and its universal access, digitisation and RDM were identified as key contents for digital scholarship in the LIS curriculum. These findings confirmed the interview findings of this study based on those LIS schools that offered digital scholarship content.

Parts of the digital scholarship focuses that were discovered by this study matched other findings that were previously identified by other authors like Wise, Henninger and Kennan (2011), Wexelbaum (2016), Lippincott (2017), Tu and Xu (2018) and Ayinde and Kirkwood (2020). Wise, Henninger and Kennan (2011) identify networking and troubleshooting, ICTs, copyright issues in the library environment and development of digital libraries as the key focus of digital scholarship in the LIS curriculum. In line with this, Wexelbaum (2016) indicates that GIS and mapping, digitisation, OA and scholarly communication should be part of the LIS curriculum to enhance digital scholarship education. Lippincott (2017) further provides

management of IRs and metadata handing as important aspects of digital scholarship in the LIS curriculum. In line with the findings of this study, Tu and Xu (2018) indicate that LIS schools should offer data librarian training, data visualisation, methods and tools application, digital curatorship and RDM to meet the growing needs of the LIS job market. All these contents collaborated with the findings of this study. Nonetheless, only two course outlines had digital-relevant content. The implication was that other LIS schools did not offer digital scholarship, as claimed by the interviewed academics. Evidently, Mahlatse, Pienaar and Van Deventer (2018) indicated that there were only two LIS schools offering education on digital scholarship and only at a postgraduate level.

5.2.4   Identifying desirable contents for digital scholarship

The process of identifying contents for curriculum development is vital (Zohrabi 2008). Generally, the objectives of the course act as the foundational framework towards the identification of any contents as far as curriculum development is concerned (Zohrabi 2008). In agreement with this, Richard (2007) states that a sound curriculum should be based on the needs analysis of the environment and the recipients of the curriculum.

The study discovered that LIS schools' participants were conducting research using the existing literature on digital scholarship to identify desirable digital scholarship content. Using the course objectives of the digital scholarship course was cited as the most used strategy for the identification of LIS curriculum contents. The study also revealed that participants were consulting relevant stakeholders in identifying desirable contents on digital scholarship. These findings buttressed with Wallace (2002) and Richard (2007) that course objectives were used as baseline for curriculum development.

The notion of research being key to curriculum development is supported by a number of authors as important in developing a sound curriculum that reflects the current trends in LIS education (Wallace 2002; Seleznyov & Czerniawski 2020). Wallace (2002) states that research should be guided by the objectives or topic that the course focuses on in order to yield the required results. The findings of this study were similar to Wolf's (2007) recommendation that when the curriculum is developed, relevant stakeholders should be consulted. Specifically, Wallace (2002) recommends a committee consisting of faculty members, students, alumni and

industry (employers and practitioners) stakeholders as key stakeholders for curriculum development. The study confirmed the findings evident in the literature.

5.2.5 Importance of teaching digital scholarship in LIS schools

Si et al. (2013) caution LIS schools that, in the near future, there would be a demand in digital scholarship related jobs in the library environment. This automatically translated into the importance of digital scholarship content in the LIS curriculum. Various authors have claimed that digital scholarship among students brought about the potential of new solutions to challenges through new ways of thinking (Klein 2010; Scanlon 2018; Schwab 2018). A lack of skills in training in digital preservation has been identified as one shortcoming that hinders the preservation of digital resources, which is part of digital scholarship (Ngulube & Masenya 2019).

The current study discovered that teaching digital scholarship in the LIS curriculum was for them to remain relevant in the dynamic information society. Such findings of this study agreed with the study done by Ayinde and Kirkwood (2020) who indicate that the failure of LIS schools to teach digital scholarship relevant courses could result in computer science or ICT specialists and software engineering specialist showcasing in the job market. The current study further revealed that LIS schools were moving with the times and preparing students for the digital world, as they were important factors in offering digital scholarship in LIS schools. Klein (2010) states that there had been a shift from traditional disciplines as a result of digital humanities and digital practices, and the current study also discovered the same findings. King (2018) highlights that due to the shift of the paradigm, LIS schools should prepare students for digital scholarship-related jobs. These findings concur with studies mentioned above.

Concurrently, Adams and Gunn (2013) suggest that information specialists should be trained in digital scholarship as there is an emergence in the work atmosphere of the cutting-edge knowledge, ingenuity and new ideas that make a big difference in advancement. This is parallel to the findings of this study, as it was shown that LIS schools offered digital scholarship to prepare students for the ever-changing digital environment.

Moreover, participants also expressed that including digital scholarship content in the LIS curriculum was paramount to the 4IR trends and for marketability purposes of LIS graduates.

Conforming to the findings of this study, Lekhaya (2019) suggests that in order to survive and embrace the hype of the 4IR, the curriculum should provide a space for the trends brought by the 4IR in the LIS profession. The study was also in consonance with the findings from Mardiana (2019) by stating that education in general had to change to suit the needs of the job market. Wood and Evans (2018) mention that the massive volumes of information, which consist of born-digital and digitised information and is accessible through web platforms provided scholars with an opportunity to connect deeply despite time and geographic barriers, enhancing collaboration. Authors like Chisita (2009) propose the need to update the LIS curriculum to be more market driven, techno-perineural in approach and competency based, which the current study discovered was important for a viable curriculum for digital scholarship in LIS education.

5.2.6 Training interventions available for digital scholarship academics

Liang and Chen (2018) acknowledge that it is paramount for LIS schools' academics to capacitate themselves with digital scholarship content, as it is an emerging area and the necessary skills set in this area remains a dilemma. The study affirmed that both external and internal training interventions were important to train LIS academics in digital scholarship-related skills and knowledge. The study further reported that formal LIS education programmes or qualifications, vocational courses, short learning courses, seminars or workshops, conferences and on-the-job training were crucial for imparting digital scholarship skills and knowledge among academics. Particularly, the study findings informed that LIS academics must embark on continuous education for lifelong learners in general.

These findings reported by this study were in line with the findings of Laal, Laal and Aliramaei (2014) who propose that LIS academics must use both external and internal training opportunities as a type of continuing education in the form of formal or informal education. The findings of this study confirmed King's (2018) findings that LIS schools' departments must use the existing services offered by their university libraries or digital humanities sections to re-skill or polish their skills in digital scholarship. External service providers were also cited as paramount for skills development. These findings are similar to the those of Kaur (2015) who correctly points out LIS schools' lecturers lack digital scholarship knowledge and skills, and suggests that the services of experts from the external service providers will have to be

used. Wexelbaum (2016) supports that private institutions must be used to train lecturers in digital scholarship as these are more advanced on digital scholarship education.

In line with the findings of this study that seminars or workshops and conferences were important for digital scholarship skills development, Longmeier and Murphy (2021) state that it is important for LIS academics to attend workshops and conferences for skills development purposes. Rumsey (2011) further suggests that education and training based on the new skills, including conventional literacies, should be incorporated into the graduate and post-graduate education programmes to provide for the life-long learning needs of the LIS profession based on digital scholarship. Participants in this study revealed that they have attended short learning courses on digital curatorship, RDM and data librarian training to enhance their skills in digital scholarship, as it is an emerging area suggested by their university's centre for innovative teaching and learning. King (2018) supports that lecturers must attend all the digital scholarship training offered by the library, the research office, the digital humanities centre or the teaching and learning centre. Masenya and Ngulube (2019) outline that information specialists should attend workshops and conferences on the preservation of digital resources to establish or polish their skills so as they can surge in the digitally oriented environment.

Job training was also voted to be a key learning skills development aspect for lecturers who were involved in digital scholarship. The study revealed that lecturers must be partners with digital scholarship librarians to observe the trends in the library environment. Ocholla and Ocholla (2014) admit that on-the-job training assists professionals to understand concepts quickly. Ocholla and Ocholla (2014) propose that lecturers should join groups available with practitioners and engage in the workshops or training to remain relevant in their teaching.

5.2.7 Infrastructure and its appropriateness for teaching digital scholarship content

Manda (2006) and Edegbo (2011) mention that for LIS schools to provide proper education with digital scholarship impacting skills, knowledge and competencies, students must have access to hardware and software used for IT or ICT skills, knowledge and competencies. The study identified technological infrastructure, including hardware and software infrastructure, as necessary to be used as infrastructure for teaching digital scholarship. The study further elaborated that computer laboratories, high-speed laptops and stable connectivity, open source or subscription software, and access to online metadata standard resources, such as RDA or

web Dewey, innovative hubs, 3D scanners and having websites that host journals, were considered relevant for teaching contents on digital scholarship. The Commonwealth of Learning (2020) states that universities will have to acquire IoT technologies to enhance the infrastructure used for digital scholarship activities.

In agreement with this study, previous studies, such as the study done by the Commonwealth of Learning (2020) proposed the acquisition of smart devices in order to offer digital scholarship content. McCullough (2014) identifies the following as facilities identified in this study that should be used for teaching digital scholarship: smart classrooms or laboratories, which comprise MacPro computers, scanners and software for media creation, and powerful personal computers for the data services practicals. McCullough (2014) further indicates that peripherals for video production, including sound and light kits, were also considered key parts of facilities that are used for teaching digital scholarship. Although these findings were related; they were very advanced compared to those identified in this study. The reason for this might be based on the assertion made by Munyoro (2014) that the LIS schools have not bought infrastructure to offer proper skills in digital scholarship. This was blamed by participants on a lack of budget allocated to LIS schools in South Africa to purchase the infrastructure, as also declared by Liang and Chen (2018) in other parts of the world.

5.2.7.1 Appropriateness of the infrastructure

Wolski and Richardson (2014) mention that, in most institutions, scholars experience the challenge of acquiring the relevant facilities for teaching and learning digital scholarship due to a lack of awareness or funding in those LIS schools. In this study, only one LIS school participant revealed that they had no concerns about their infrastructure used for offering content on digital scholarship and should there be a need to acquire a new device, their school had the budget to do so. This was in agreement with the findings of McCullough (2014) who points out that other institutions have the necessary infrastructure for digital scholarship.

The other LIS schools admitted that the infrastructure used for teaching digital scholarship in their respective departments was not appropriate. The findings discovered that a lack of manpower and technological infrastructure were mostly acknowledged by participants as the main hindrances to offering a solid digital scholarship content. Furthermore, it was also indicated that limited funds were allocated for infrastructural developments that meet the needs

of teaching in the digital environment. The study findings also suggested that due to Covid-19 which resulted in teaching having to be done online, the situation in LIS schools was worsened as far as infrastructural appropriateness was concerned. These findings supported Kaur's (2015) findings in that although LIS academics might be aware of the new trends, a lack of infrastructure to offer these contents remained an overarching barrier to offering digital scholarship.

The current study shared the sentiments of Ocholla and Bothma (2007) that LIS education do have some disparities due to a lack of infrastructure, including ICTs in the curricula. A lack of funds also limits the level of training opportunities for skills development, which results in a lack of manpower in the LIS schools to teach digital scholarship-related modules. Ocholla and Bothma (2007) further state that due to the limited budget, LIS failed to employ qualified academics. Connaway (2015) states that a lack of skills and knowledge in digital scholarship affects the human capacity in teaching and learning phenomenon. Attached to these assertions, Ocholla (2000) and Sharma (2005) ascertained that for the LIS schools to attract more students, they must invest in a good curriculum supported by relevant infrastructure and the hiring of qualified, full-time academics. This study discovered that this was not the case, as it was revealed that a limited budget was allocated to LIS schools to purchase the infrastructure and hire a qualified workforce.

5.2.8   Promotion of digital scholarship education by LIS schools

Promotion of digital scholarship by LIS schools to library professionals remains an important aspect for awareness and endorsement. The study discovered that participants had mixed perspectives when asked whether LIS schools were properly promoting digital scholarship education. Participants felt that some LIS schools were promoting digital scholarship and others were not. The study pointed out that LIS schools that had contents on digital scholarship were marketing their programmes via formal qualifications that were offered at postgraduate level. Evidently, LIS schools that had no contents on digital scholarship had nothing to promote in this regard. The study further found that LIS schools in South Africa publicised their digital scholarship education via workshops, conferences and endorsing it through LIS professional bodies such as LIASA.

Similar to the findings of this study, Goh and Sandars (2019) discovered that lecturers were expected to engage with the scholarship of discovery to identify emerging knowledge through research and to disseminate and apply the skills and knowledge to practice. The implication was that academics must be able to integrate their findings of the research into the curriculum and to transfer such skills to practice through training workshops or conferences.

The study supported the findings of Mahlatse, Pienaar and Van Deventer (2018) in that only a few LIS schools in South Africa promoted digital scholarship in their qualifications (UP and UCT), which translated into a lack of digital scholarship promotion.

In line with this, Raju (2017b) indicates that LIS schools were struggling to include digital scholarship in their curriculum

5.2.9 Nature of offering digital scholarship content in LIS curriculum

The study revealed that studentcentredness and collaborative learning approaches were used in LIS schools, and that, prior to Covid-19, most lecturers in other LIS schools were teaching on a face-to-face basis in the computer laboratories, some lecturers have adopted a blended learning mode and others were teaching through a distance learning mode. However, due to the Covid-19 pandemic, all universities moved their teaching to online through LMS. MS Teams and Zoom were cited as communication channels most used for teaching and learning during the Covid-19 pandemic.

Kinash, Knight and McLean (2015) highlight that as digital scholarship took over, digital content has the potential to be a disruptive pedagogy and to accelerate an overall shift from didactic lecture to constructive learning approach. Student-centred learning approach is at the heart of constructive approach (Kinash, Knight & McLean 2015). This study confirmed these findings from Kinash, Knight and McLean (2015). Ferguson et al. (2017) also introduced a new set of teaching methods brought by the 4IR, which were online in nature and were already in use and supported collaborative learning and student centredness. These new methods of teaching made teaching and learning viable, despite time and geographical location.

Cloete (2005) and Normore (2013) support that there were various ways in which LIS academics taught their students, such as face-to-face communication, distance learning and

online learning. However, due to the Covid-19 pandemic, face-to-face teaching methods were deemed irrelevant for accommodating social distancing and to curb the Covid-19 pandemic. Online communication platforms such as MS Teams and Zoom were used as a form of communication between lecturers and students. Nonetheless, this affected the practical aspect of teaching digital scholarship as Koehl et al. (2019) state that face-to-face communication classes yield high results for linking theory with practice. These authors share that lecturers and students use the computer laboratories to demonstrate digital scholarship activities, in this manner, students would be able to grasp both the theoretical and practical part of digital scholarship. Chaturvedi, Purohit and Verma (2021) also realised that online learning replaced the face-to-face classes through livestreaming of classes using MS Teams, Zoom and Google meetings to enhance the synchronous mode of learning across the globe as a measure to ensure lecturer visibility and demonstration of concepts that require practicals. The authors noted that the Covid-19 pandemic, coupled with the 4IR, had been the major reason for this paradigm shift in teaching and learning. The findings of the current study concurred with previous studies evident in the literature.

5.2.10 Experience of teaching digital scholarship courses

The study identified that experience of LIS academics was varied when it came to teaching digital scholarship. Nevertheless, participants shared that programmes with digital scholarship were attracting more students due to the new trends compared to their pervious programmes. A lack of practical aspect in the digital scholarship-related courses was also cited as a component that was lacking and students were unaware of digital scholarship contents in the LIS curriculum. These findings confirmed Sharma's (2005) study in that LIS schools that had updated their contents and had proper infrastructure attracted more students to their programmes. Wood and Evans (2018) caution that LIS schools that have outdated contents regarding digital scholarship could lead to more consequences such as being irrelevant in the new work environment and qualification rendered irrelevantly, resulting in a high rate of unemployment of LIS professionals compared to their Computer Science, ICTs and IT counterparts (Harris-Pierce & Liu 2012; Ayinde & Kirkwood 2020). In line with this, one participant indicated that when LIS schools fail to update their contents, it could lead to low enrolment or even unemployment of the candidate. Therefore, this study suggested that LIS schools should update their curriculum to attract students to their programmes.

The findings of this study, as confirmed by Mutula (2009), indicated that LIS schools lacked the practical aspect and the computer laboratory to teach digital scholarship. Wolski and Richardson (2014) endorse that the issue of a lack of practicals as the result of the lack of infrastructure for the new digital environment, particularly those involved in digital scholarship, as stakeholders only think of infrastructure as being the physical enterprise. Scanlon (2017) also indicates that the challenges that come with the lack of the practical aspect could result in poorly trained graduates.

O'Brien (2010) states that a of lack awareness of senior management, students, lecturers and other stakeholders makes the experience of teaching digital scholarship unpleasant. It was also discovered by this study that students from LIS schools were unaware of the digital scholarship content. This made it hard for them to grasp the concept of digital scholarship or to identify that the employers were asking about digital scholarship activities during a job interview that. This study hoped that this could be solved by placing students in institutions that have digital scholarship infrastructure to enhance their practical aspect and unawareness.

5.3   INCORPORATION OF DIGITAL SCHOLARSHIP CONTENT IN THE LIS SCHOOLS' CURRICULUM

Raju (2015) suggests that LIS schools must infuse contents on digital scholarship into their curriculum to meet the needs of the digital environment as it was discovered that these contents were lacking in most LIS schools. Raju (2015) and Craft (2018) propose that following should be incorporated into the LIS curriculum: creating and providing access to digital documents and data, metadata handling, managing IRs, GIS and mapping, copyright issues, and issues around RDM. These trends were considered to be emerging by these authors in the LIS profession. Muthu, Sivaraman and Singh (2015) state that as the changes are occurring fast in the information profession and the library environment is giving way to digital environment; therefore, LIS schools' lecturers must acquire skills to operate in the digital environment. This theme covered the contents that had to be covered by LIS schools in their curriculum: level of infusion of digital scholarship; gaps, redundancies and opportunities presented by the digital scholarship education; stakeholders to be considered when developing a digital scholarship-related curriculum; and alignment of the course objectives with the 4IR trends. These sub-themes are discussed and interpreted as subheadings below.

5.3.1 Infusion of digital scholarship into the LIS curriculum

This sub-theme assisted in discovering the level of incorporation or infusion of digital scholarship in the LIS curriculum for this study. The study discovered that digital scholarship contents were evident in the LIS schools' curriculum, mostly at postgraduate level. It was indicated that these contents were infused from a basic level to an advanced level, depending on whether it was a unit in a course, a course itself or whether the qualification was about digital scholarship. The study further pointed out that, in most cases, digital scholarship contents displayed more theory and there were no practical units demonstrated in the module.

The findings that the digital scholarship content was evident at postgraduate level confirmed the findings by Mahlatse, Pienaar and Van Deventer (2018) that digital scholarship in South Africa was offered at postgraduate level. These authors cited this as a challenge, as digital scholarship job opportunities were evident in both junior and senior job positions. Raju (2015) indicated that there were pieces of information in courses in the LIS curriculum that deal with digital scholarship.

Another comment made by participants in this study was that there was no practical aspect in digital scholarship. This assertion is in line with Muthu, Sivaraman and Singh (2015) who state that there was a lack of practical knowledge of digital scholarship because of a lack of capacity of lecturers, as they were not capacitated with the current skills and knowledge required for digital scholarship. Along the same lines, Ali and Bakhshi (2013) note that collaboration can assist in curbing the lack of the practical side of studies. The LIS academics should partner with practitioners in the library to gain relevant skills on digital scholarship (Ali & Bakhshi 2013; Kaur 2015). This is further supported by King (2018) who states that the academic libraries have proper infrastructure and expertise for digital scholarship, therefore, the LIS academics may gain more from the collaboration between the two parties.

As the current study indicated that LIS schools lacked content on digital scholarship, Khan and Bhatti (2012) suggest that LIS schools should update their programmes to meet the needs of the ever-changing digital world. The implication was that digital scholarship should be evident at all levels with emphasis on the undergraduate level to ensure that students were better prepared for job positions in digital scholarship.

5.3.2 Alignment of the course objectives with the 4IR trends

Alignment was sought between the course objectives with the 4IR trends in this study. The study revealed that LIS schools that had contents on digital scholarship had course objectives that were aligned with the 4IR trends. This study further ascertained that other LIS schools were revising their course objectives to suit the 4IR trends in the LIS profession, as they had embarked on the recurriculation process. Among other aspects of the 4IR trends, the study revealed that LIS schools' objectives were about to include digital scholarship, exposure to technology, 4IR content, more relevance in the job market and include more integrated learning for students in digital scholarship. The study found that in future. LIS schools' courses would be informed by recent developments in research and inclusion of the relevant AI and IoT in the LIS curriculum, as it was the trend brought by 4IR.

Sinclair (2014) advises all LIS schools to update their contents to be in line with the needs of the current industrial revolution. Therefore, it was pertinent to uncover whether LIS schools had changed their objectives to demonstrate the needs of the job market. In the same vein, Raju (2017a) encourages the infusion of digital scholarship-related contents into the LIS curriculum, as this was the trend in most academic libraries in South Africa. Deloitte (2018) reported on preparing tomorrow's workforce for the 4IR by stating that, globally, companies were struggling to fill the job vacancies relating to the 4IR, which casted the future in doubt as far as education was concerned. The move of most LIS schools towards recurriculation, as indicated in this study, was a strategy to ensure that the assertion made by Deloitte (2018) was avoided and graduates were employable in the 4IR job market.

Muthu, Sivaraman and Singh (2015) suggest that LIS schools should consider that their objectives should be in line with the computer science or IT disciplines, as these disciplines have made significant contributions towards the 4IR. Mbagwu, Okoye and Anyanwu (2018) state that upon graduating, LIS graduates must be able to search, discover and use knowledge acquired effectively in the 4IR. These findings were confirmed by this study as it was discovered that LIS schools course objectives must be revised to be in line with the needs of the job market. The aspects of digital scholarship identified in the section above were in line with the findings by Mulligan (2016), Wexelbaum (2016), Lippincott (2017) and Joseph (2019) who indicate that the use of ICTs, infusion of the AI and IoT technologies, alignment of the

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courses with the job market and exposure to technology, should be reflected in the LIS course objectives and outcomes.

5.3.3   Digital scholarship contents to be incorporated in the LIS curriculum

The study established that practitioners desired that content on digital scholarship should be included in the LIS curriculum. Participants' wish for digital scholarship content to be included in the LIS schools' curriculum on digital scholarship consisted of digitisation, digital curatorship, RDM, metadata standards, copyright-related contents, technological enablers in LIS, OA, OERs and understanding the applications of the POPI Act and PAIA as contents to be incorporated into the LIS curriculum. These contents were digital scholarship driven at the time of the study and librarians felt that they should be part of digital scholarship education to produce a quality digital scholarship librarian.

Similar to the findings of this study, Yadav (2018) and Ayinde and Kirkwood (2020) considered RDM, user experience testing, assessment, digital library development, embedded librarianship, digital scholarship or humanities, web design and archives as new focuses of the LIS schools. In addition to that, 3D modelling and printing, database development, making digital collections, digital exhibits, digitisation of analogue materials, GIS and mapping, textual mining, and modelling and analysis have been identified by Mulligan (2016) and Joseph (2019) as important units to be included in the digital scholarship education in LIS schools.

Evidently, most of these units are not from the traditional LIS profession by origin, they mainly originated from IT and computer science. Therefore, Blake, Gallimore and Radford (2018) encourage LIS academics to partner with these fields and develop short learning programmes for already practising librarians to redevelop or refresh their skills.

Comparing findings from this study with other studies as far as the wish list for digital scholarship was concerned, it was evident that there were units that were cited in the study, yet not available in the literature due to the fact that they were emerging in nature. For instance, the POPI Act had been recently (2021) approved in South Africa to protect the personal information of the citizens, consequently, participants felt that this should be taught in LIS schools as it forms part of digital scholarship.

Nonetheless, most of the contents identified in the literature were confirmed by the findings of this study. The implication was that LIS schools in South Africa were expected to include these digital scholarship contents in the LIS curriculum as per the expectations of the practising librarians.

5.3.4   Stakeholders consulted for digital scholarship curriculum development

This study discovered that a combination of practitioners and academics played a crucial role in curriculum development for digital scholarship. It was found by the current study that collaboration and consultation of both parts in curriculum development were vital. It was mentioned by participants that it was important to consult interdisciplinary fields such as computer science, IT, humanities, software engineering and data science when developing digital scholarship education. Moreover, the study revealed that LIS practitioners, LIS schools' current students, SAQA, DHET, quality assurance committees and LIS professional bodies, such as LIASA, were considered to be the essential parties in digital scholarship education. Additionally, benchmarking with national and international sister LIS schools was also hailed in this study as an important strategy to consider when developing digital scholarship education.

Wolf (2007) identifies HoDs, lecturers, employed graduates (alumni) and employers of graduates as important stakeholders to be included in the process of curriculum development. The findings of the current study were supported by Wolf (2007) by indicating that articulating these stakeholders was vital in the process of curriculum development. Nevertheless, digital scholarship collaboration with other disciplines, for instance, IT and computer science, was considered a cardinal exercise. The collaboration with STEM fields was also pointed out by Joseph (2019) as a necessary step for LIS schools' academics to consider when developing content on digital scholarship. This was based on the fact that most of the digital scholarship activities emanated from the STEM fields.

Coupled with collaboration with the STEM fields, Wolski and Richardson (2014) also appreciate the beauty of digital scholarship, as it was highlighted that electronic networks permit different scholars to communicate and collaborate. Collaboration between scholars ensures that, globally, perspectives and challenges are tackled on time by the relevant stakeholders. Furthermore, it was emphasised that the collaboration among scholars in sister

LIS schools could assist in benchmarking with the LIS schools that already had sustainability and relevant digital scholarship content (Wolski & Richardson 2014). Although the initiative to collaborate with sister LIS schools was praised in this study, Virkus (2012) criticises this strategy as it may bring problems if institutions who were entering into a collaboration agreement had resources that were not complementary. As in collaboration, both collaborating institutions should benefit from the process.

On the other hand, King (2018) supports the idea of collaboration among digital scholarship librarians, digital humanists and LIS academics. King (2018) asserts that digital scholarship librarians and digital humanists have advanced skills on digital scholarship; therefore, academics in LIS schools would learn a lot from this collaboration, especially on the practical aspect of digital scholarship. The findings of this study confirmed the assertions of King (2018) and further suggested that LIS schools could gain skills and knowledge from this partnership.

5.3.5   Gaps and redundancies in the LIS curriculum

As an emerging area, it was expected that digital scholarship content in LIS education would have gaps and redundancies. The study realised that only one LIS school among those interviewed felt that their curriculum had no gaps or redundancies. The study divulged that there were no practical aspects for digital scholarship in LIS schools and there was a shortage of African epistemologies as far as this area was concerned. It was also evident that LIS schools lacked content on digital scholarship or others repeated content on digital scholarship at different levels of digital scholarship qualifications.

Mahlatse, Pienaar and Van Deventer (2018) indicate that only a few LIS schools that offered a solid curriculum with digital scholarship content. This confirmed the findings of this study, as only one LIS school indicated that there were no gaps and redundancies in their curriculum. Along the same lines, Raju (2015) and Wood and Evans (2018) express that LIS schools in South Africa were struggling to offer digital scholarship education. The implication was that the lack of contents for digital scholarship in the LIS curriculum resulted in poorly trained librarians who were unemployable in the digital environment (Harris-Pierce & Liu 2012).

The study further revealed that there were challenges as far as the practical component of digital scholarship was concerned, as it was lacking in the LIS curriculum. Ocholla and Bothma (2007)

indicate that most LIS schools lacked proper infrastructure to support the technological aspect of the LIS curriculum. The current study confirmed the findings by Ocholla and Bothma (2007) as it discovered that there were gaps in the curriculum regarding digital scholarship due to a lack of infrastructure supporting digital scholarship.

It was also disclosed by this study that there were redundancies in the curriculum, as content on digital scholarship was offered at different levels as units in different modules. It was expressed that the same contents would be found in the second and the third-year module, which presented repetitions in the LIS curriculum. This was perhaps as a result of uncertainties or unawareness among lecturers as far as coverage of digital scholarship was concerned (Lippincott 2017). Lippincott (2017) specifically points out that the necessary tools, hardware, software and funding were lacking to secure relevant infrastructure used to support the teaching of digital scholarship. African epistemologies were identified as another missing aspect regarding digital scholarship, as participants noted that LIS schools tended to focus more on the Western epistemologies when developing digital scholarship content in the LIS curriculum.

5.3.6 Opportunities presented by digital scholarship in the LIS profession

They study pointed out that several opportunities were presented by the advent of digital scholarship education in the LIS profession. The study revealed that marketability, employability, understanding the digital environment and its issues, managing various digital artefacts, facilitating interdisciplinarity and collaboration, and producing MOOCs and OERs were deemed to key opportunities presented by digital scholarship in the LIS profession. The study further discovered that there were various job and business opportunities that could be achieved by incorporating digital scholarship content into the LIS education.

Longmereier and Murphy (2021) report that digital scholarship education brought about opportunities to the LIS profession, as the expertise in this area permitted researchers to deepen their knowledge and collaborate with other disciplines. Infusion of digital scholarship into the LIS curriculum created employment opportunities to the emerging job positions in research libraries (Longmereier & Murphy 2021). Hensley and Bell (2017) agree with the findings of this study that digital scholarship education created the opportunities for upcoming librarians to grow technological expertise such as using laser cutters, VR headsets, high-end scanners, visualisation and video walls.

Along the same lines as the findings of this study, Uzwyshn (2020) acknowledges that digital scholarship education in the LIS curriculum presented the opportunity to produce MOOCs and OERs. Digital scholarship education equipped librarians with the opportunities to understand web development, project management, metadata schemas, GIS specialisation, RDM, and data science specialisation (Craft 2018). The current study also confirmed the afore-mentioned findings.

5.4 PERCEPTIONS OF LIS EMPLOYERS ON LIS GRADUATES

Perceptions of employers as far as employing digital scholarship librarians was concerned were then sought from employers in both academic and research council libraries in South Africa. Soundararajan, Rivikumar and Aro-Gordon (2020) mention that perceptions of employers were important as they would inform the strengths and weaknesses of the curriculum and aid in the identification of solutions towards weaknesses.

Three sub-themes emerged from this theme: expectations of employers regarding digital scholarship, LIS schools offering digital scholarship education and challenges encountered when employing digital scholarship librarians.

5.4.1 Expectations of employers regarding digital scholarship competencies

The study indicated that employers of digital scholarship librarians expected that they must possess knowledge, skills and competencies in digital scholarship-related activities. It was revealed that graduates should be in a position to navigate digital scholarship activities at a basic level. The study further found that LIS graduates should be able to identify the knowledge gaps and understand the OA. The study also ascertained that, among other expectations of employers from digital scholarship, graduates had to understand RDM and the digital publication ecosystem, and they strongly expected LIS schools to incorporate digital scholarship content through all the levels of the four-year LIS degree.

Ayinde and Kirkwood (2020) state that as scholarship was changing, institutions were expected to reshape the skills sets. This applied to the findings of this study, as digital scholarship has emerged and changed most of the ways in which activities were conducted in the library.

Echoing the findings of this study, King (2018) states that the roles of a traditional librarian had evolved and this called for a change in the skills sets and training of future librarians in LIS schools. King (2018) also suggests that digital scholarship librarians must understand the data life cycle management, metadata, RDM, digitisation, digital curatorship and GIS applications in the LIS profession. These findings were in line those of the current study.

Most participants in this study anticipated digital scholarship to be incorporated into all the levels of the four-year BLIS degree rather than having a qualification on digital scholarship. The study further discovered the concurrence among participants that LIS schools should not compromise the core values of librarianship at the expense of technology. This was supported by Hirsh et al. (2015) by stating that the iSchools resulted in most LIS schools having prioritised technology at the expense of the core values of library science. Along the same lines, the participants of this study cautioned against this trend.

5.4.2   LIS schools offering solid digital scholarship education

As it was suggested in the literature that benchmarking with sister LIS schools was considered a crucial aspect of curriculum development concerning digital scholarship education (Wolski & Richardson 2014), this section assists in identifying LIS schools that had a solid digital scholarship focus. The study revealed that there were only three LIS schools that had a solid curriculum with digital scholarship content, which were UCT, UP and UJ.

These findings were similar to those of Mahlatse, Pienaar and Van Deventer (2018) when they say that there were a few LIS schools in South Africa that offer digital scholarship education. It was further revealed that there were only two LIS schools that had qualifications on digital scholarship (Mahlatse, Pienaar & Van Deventer 2018). The current study did not agree with Mahlatse, Pienaar and Van Deventer (2018) in the sense that participants identified UJ as one of the LIS schools that offered digital scholarship. Wood and Evans (2018) also underscore that South African LIS schools were struggling to offer the digital scholarship skills and knowledge needed in the digital environment. The implication was that LIS schools without digital scholarship content could collaborate and benchmark with the LIS schools that had content on digital scholarship. Raju (2015) suggests that LIS schools need to update their curriculum to include digital scholarship content. This study discovered that other LIS schools were already revising their curriculum to include digital scholarship content.

Mahlatse, Pienaar and Van Deventer (2018) state that a degree in data science was offered at the Sol Plaatje University and no LIS school was offering content on this aspect of digital scholarship. This was supported by Tu and Xu (2018) who state that most digital scholarship contents emanated from computer science and IT. Therefore, the assertion that there were few LIS schools teaching digital scholarship may be the result of a lack of expertise among LIS academics. This may change in future, as the study discovered that LIS schools were in the process of recurriculating to include digital scholarship content. Koehl et al. (2019) propose that even librarians already practising need to be taught digital scholarship as the demand from the job market was increasing as far as digital scholarship was concerned, yet the skill set was lacking.

5.4.3   Challenges encountered when employing digital scholarship librarians

The study exposed various challenges that were encountered when employing a digital scholarship librarian in academic and special research council libraries. A limited pool of candidates to choose from, a lack of experience among candidates and unawareness among candidates about digital scholarship were identified as major challenges encountered when employing a digital scholarship librarian. The study discovered that these challenges resulted in the employment of the candidates outside the LIS field as students from LIS schools were mostly unfit for digital scholarship job positions.

Koehl et al. (2019) suggest that there was a lack of skill in digital scholarship. Ridge (2018) agrees that there was a very small pool of candidates from which to select digital scholarship librarians, as there were few LIS schools that taught digital scholarship, especially in South Africa (Mahlatse, Pienaar & Van Deventer 2018; Wood & Evans 2018). Craft (2018) agrees with the current study in that candidates lacked digital scholarship vacancies in terms of relevant skills and experience. Ridge (2018) also cite that there was a lack of basic understanding of digital scholarship among librarians, which was linked to the employment of people from rival disciplines (Raju 2015).

The current study confirmed the findings by Harris-Pierce and Liu (2012), Raju (2015), and Ayinde and Kirkwood (2020) that LIS employers would prefer a candidate from other disciplines when it comes to employing a digital scholarship librarian. Harris-Pierce and Liu

(2012) point out that the failure of the LIS schools to provide the necessary skills on digital scholarship led to ICT specialists and software engineers showcasing in the job market and displacing LIS professionals had been displaced. This was confirmed by this study, as most of participants indicated that candidates from IT-related disciplines were more knowledgeable as far as digital scholarship was concerned than their LIS counterparts. The challenges experienced by employers of digital scholarship were mainly associated with the curriculum that did not cover digital scholarship, which results in librarians being unemployable due to a lack of relevant skills and competencies.

5.5   DIGITAL SCHOLARSHIP KNOWLEDGE, SKILLS AND COMPETENCIES

Institutions should reshape and reskill their workforce as scholarship changes and library roles evolve (Lewis et al. 2012). Most library roles changed due to the dawn of the 4IR, which meant that knowledge, skills and competencies of librarians changed, and new units were created in academic or research libraries (Wexelbaum 2016). In exploring knowledge, skills and competencies of digital scholarship in LIS schools, subheadings were categorised as digital scholarship units and activities in the library, requirements of digital scholarship librarians and skills development training available for digital scholarship librarians. Furthermore, challenges experienced by digital scholarship librarians and suggestions to improve the LIS education are discussed in the subheadings below.

5.5.1   Digital scholarship units and activities

Units and activities were identified by participants concurrently and the researcher had to separate the two during the analysis phase for coherence purposes. The study showed that digital scholarship units in the library consisted of a digital curation unit, RDM unit, IR unit, digital research services unit, digital publishing platform unit, metadata unit and advocacy for OA unit.

The study revealed that the activities performed by digital scholarship librarians were uploading theses and dissertations to the IRs, digitising and curating research data, metadata-related activities, management of e-journals and performing digital research activities. Additionally, it was discovered that digital scholarship libraries conducted RDM activities and advocated for OA activities in the library.

King (2018) indicates that the opportunities brought to the LIS profession, specifically the digital scholarship librarianship, were mainly drawn from both digital humanities and digital librarianship. The units and activities identified by this study were also identified as the ones executed in the digital humanities centres. Digital scholarship units or sections were identified by Heimburger and Ruiz (2012) and Uzwyshn (2020) as a digital ecosystem, which included OA platforms, digital archives and databases, digital repository space services, big data and copyright issues. Table 2 of this study clearly set out the roles of a digital scholarship librarian. Based on this study, the duties or roles evident in the literature were either units or combined as one unit in the library.

The current study identified the metadata section as one of the digital scholarship sections in academic libraries. This was in line with the findings of Raju (2017b) about the growing need of metadata librarians to organise digital information in academic libraries in South Africa. Sinclair (2014), and Wolski and Richardson (2014) echo that in an era of visualisation, analytics, big data and new forms of online publishing, central spaces could facilitate knowledge creation and transfer by connecting people, data, and technology in a shared collaborative space.

Furthermore, units in which librarians and their directors provided informed activities that were performed by digital scholarship librarians in both academic and research council libraries. These activities were provided in this section. Participants of the study revealed that these units of digital scholarship need to be collided into one centre in the library with various units, as they were interrelated. The centre would be called the digital scholarship centre.

5.5.2 Requirements of a digital scholarship librarian

The study revealed that digital scholarship positions in libraries required a minimum of a Bachelor's degree in Information Science, a minimum of three years' experience in an academic library, knowledge in digital scholarship and technical skills from applying candidates. The study further identified knowledge that was required for digital scholarship as job positions, among others, RDM, digitisation, IR, metadata, scholarly communication, bibliometrics, webometrics and OA. This study also identified various skills that were required

for one to be a digital scholarship librarian as computer literacy, interpersonal skills and communication skills.

King (2018) states that for one to be a digital scholarship librarian, a qualification in a librarianship-related field is necessary. The current study revealed that a degree in LIS was required for one to be a digital scholarship librarian in South Africa and the contents of the degree should include digital scholarship. Nonetheless, this was a challenge as Mahlatse, Pienaar and Van Deventer (2018) indicate that few LIS schools had digital scholarship content, and some other LIS schools, as postulated by Wood and Evans (2018), were struggling to offer digital scholarship. This led to the limited pool of candidates with relevant experience and qualifications for digital scholarship positions.

In terms of knowledge, as indicated in this study, numerous scholars shared that, in most cases, digital scholarship centres require skills, particularly in web development, project management, metadata schemas, GIS specialisation, digitisation specialisation, RDM, intellectual property, and OA textual and numeric data and data specialisation (Lippincott 2017; Craft 2018; Uzwyshyn 2020). These findings were in line with those of Miller (2017) and Tu and Xu (2018), as the study revealed that knowledge of HTML, metadata and repository architecture, and scholarly communication was key knowledge required in digital scholarship spaces.

The current study found different transferable skills (Raju 2014) which were in line with studies such as those of Ayinde and Kirkwood (2020) and Carter (2016). Advanced computer literacy, communication skills, searching and retrieval skills, managerial and leadership skills, and reference service skills were important for someone to prosper in the digital scholarship section in the library.

5.5.3   Skills development training available for digital scholarship librarians

The study reported that librarians were exposed to various skills development trainings and capacity building workshops. These capacity building trainings were research visibility training, collaboration and on-the-job training, other training workshops (webinars and face to face), short learning courses, formal qualifications and external training offered by the university's research office.

In support of the findings of this study, Laal, Laal and Aliramaei (2014) encourage continuing education; they cite that this kind of education provides skills and knowledge in a digital changing environment. Formal and informal education in the form of lifelong learning should be offered by LIS schools based on digital scholarship to equip LIS professionals to be in line with the trends in the LIS profession (Laal, Laal & Aliramaei 2014; Shongwe 2014). The assertions made by these authors were relevant to the findings of this study, as librarians felt that it was the duty of LIS schools to provide refresher or formal courses on digital scholarship. On-the-job training and collaboration among librarians were also cited as the best capacity-building strategies that librarians could use for gaining skills and knowledge on digital scholarship. Tu and Xu (2018), Ayinde and Kirkwood (2020) state that most academic libraries invited either internal or external facilitators for digital scholarship to train their librarians in digital scholarship duties such as RDM, digitisation and IR.

Tu and Xu (2018) agree that short learning programmes are vital to develop digital scholarship skills and knowledge. These authors further emphasise that the NLSA came up with short learning courses to support digital scholarship librarians and librarians enrolled in these courses for skills development. These training opportunities were identified in this study as beneficial for capacitating digital scholarship librarians with skills and knowledge.

5.5.4 Challenges experienced by digital scholarship librarians

Various challenges were experienced by digital scholarship librarians, which included a lack of technical skills among librarians, fearing technology, reluctance to learn emerging skills and knowledge and a lack of awareness among funding bodies. The challenges experienced by employers of academic libraries and special research councils employing candidates from IT-related fields instead of LIS professionals were also cited by digital scholarship librarians.

The challenges identified in all sections of this study by either library practitioners or academic staff from LIS schools acknowledged resources in a form of skills and funds as key barriers they faced as far as digital scholarship was concerned. Education and training of LIS graduates on digital scholarship was viewed as a challenge by librarians which was in line with Raju (2017a) and Wood and Evans (2018). Ayinde and Kirkowood (2020) noted that technical skills

were lacking among LIS professions as a result LIS employers would consider LIS counterparts relevant for a digital scholarship position (Mathews & Pardue 2009; Raju 2015).

In consensus with this study, Ayinde and Kirkwood (2020) posit that universities were not aware of digital scholarship activities, which makes it hard to fund projects that were digital scholarship inclined. As noted by Bunnet (2013), LIS professionals were, in most cases, reluctant to keep abreast of the changes taking place in the LIS profession. This study also discovered that librarians were reluctant to learn new skills and knowledge. This reluctance could be blamed on the LIS education and the failure to update the contents of digital scholarship, as noted by Muthu, Sivaraman and Singh (2015), as lecturers lacked skills in this area. Muthu, Sivaraman and Singh (2015) further clarify that a lack of skills and knowledge on digital scholarship results in librarians fearing technology and despising their duties.

Librarians expressed their concerns as far as competition for digital scholarship positions were concerned. They indicated that these positions were highly contested, as it was unclear to the librarians what encompasses digital scholarship (Lippincott 2017); consequently, there would be candidates from IT-related fields or history contesting for digital scholarship positions, leading to poor confidence among librarians (Kaur 2015).

5.5.5   Suggestions to improve LIS education on digital scholarship

Digital scholarship librarians suggested anticipated solutions that could assist in improving LIS education and training as far as digital scholarship content was concerned. They were trusted with this duty as they worked with digital scholarship activities on daily basis. The study indicated consultancy with practitioners as a key strategy in improving digital scholarship content in the LIS curriculum. Extending the practical component of courses related to digital scholarship, conducting more research on digital scholarship and attending conferences and workshops relating to digital scholarship were identified as pivotal for gaining knowledge and skills to be incorporated into the LIS curriculum.

Wolf (2007) suggests that academics need to consult practitioners when developing the curriculum, as library practitioners were in a better position to know which important contents should be included in the curriculum. The current study's findings confirmed Wolf's (2007) findings who recommended that LIS academics should consult library practitioners on digital

scholarship to produce ideal graduates with relevant skills and knowledge required in a digital environment.

Ocholla and Ocholla (2014) accuse LIS schools for lacking a practical component in their curriculum. This was echoed by McCullough (2014) when noting that infrastructure was required to ensure that digital scholarship contents were demonstrated to student librarians. Craft (2018) also states that there must be funding to employ qualified lecturers and buy new infrastructure to support digital scholarship teaching. On the other hand, the current study identified that awareness among stakeholders was crucial to ensure that everyone was aware of digital scholarship, and Hensley and Bell (2017) echo these findings. Awareness was perceived as the key to smooth facilitation of the process of acquiring infrastructure and limited the reluctance from the funding bodies to fund digital scholarship requirements for teaching in LIS schools.

Wolski and Richardson (2014) highlight that it was paramount for LIS professionals to collaborate with relevant fields that facilitated knowledge and skills transfer. The current study revealed that LIS professionals had to collaborate with fields that were advanced as far as digital scholarship was concerned. Along the same lines, participants from the library also suggested that LIS schools that were working on recurriculation or planning to recurriculate should partner with sister LIS schools to gain an understanding of the processes of developing curricula inclusive of digital scholarship content.

5.6 DEVELOPMENT OR REDEVELOPMENT OF THE LIS SCHOOLS CURRICULA STRUCTURE

Regarding the framework for curriculum development, Wolf (2007) suggests that upon completion of analysis of the curriculum and identification of the hindrances affecting the curriculum, it becomes apparent to revise or develop the curriculum afresh. It was important for this study to discuss the challenges that academics faced when incorporating digital scholarship into the LIS curriculum with a view to identifying strategies to overcome these challenges. In most cases, the challenges arising from the curriculum part usually impact negatively on the digital scholarship-related jobs; therefore, the study identified these challenges. Strategies to overcome the later challenges were also explored. The study concluded by identifying models or processes the academics were using in curriculum

development in LIS schools in South Africa. The following aspects of this section were further discussed in the sub-themes:

5.6.1 Challenges of incorporating digital scholarship content in the LIS schools' curriculum

The study identified various challenges that were affecting the incorporation of digital scholarship into the LIS curriculum, which included a lack of resources, for instance, skills and funding from the academics' side, reluctance from academics to engage digital scholarship, lack of awareness from academics and being informed by Euro-centric perspectives as major challenges hindering the infusion of digital scholarship content into the LIS curriculum. In addition to that, there were also a lack of research on digital scholarship and academics working in silos, in a sense that they were avoiding collaboration with interdisciplinary fields or other sister LIS schools.

The challenges experienced by academics in incorporating digital scholarship were almost similar those experienced by librarians. However, the difference was that the ones from academics were about teaching and learning while the ones shared by librarians were about practising digital scholarship in libraries. Ocholla and Bothma (2007) and Kaur (2015) elaborate that there was a lack of resources in most LIS schools that supported the teaching of digital scholarship, and this made it difficult for LIS schools' academics to infuse advanced digital scholarship content. Moreover, Muthu, Sivaraman and Singh (2015) note that lecturers lacked capacity, skills and knowledge and it became a challenge for LIS schools to incorporate digital scholarship, as there were no experts in digital scholarship in most LIS schools. Wexelbaum (2016) suggests that skills sets should be developed on digital scholarship to support teaching and learning.

Si et al. (2013) affirm that the institutions specialising in digital scholarship were mostly in the North America and Europe, especially in the USA and the United Kingdom. This resulted in most LIS schools in the third world copying and using Euro-centric perspectives rather than using African-motivated contents. This was also discovered in this study as participants indicated that examples used were the Western examples and there were no African scenarios as far as digital scholarship was concerned.

The study also revealed that LIS academics were hesitant regarding acquiring digital skills and knowledge on digital scholarship. Malhan (2011) states that it was difficult for LIS schools to meet the demands of the job market as the job market constantly changes and academics would be reluctant to acquire the new skills and knowledge.

Lewis et al. (2015) state that limited research had been done on digital scholarship globally; this study noted the same in South Africa. It was further revealed that a lack of research hindered the process of developing curriculum around digital scholarship in LIS schools, as there was insufficient literature on this area.

5.6.2 Overcoming challenges presented by the structuring of digital scholarship content

Based on the challenges identified in structuring or infusing digital scholarship, academics were able to provide suggestions to overcome the challenges they experienced when incorporating digital scholarship content into the LIS curriculum. Among others, the study acknowledged awareness sessions for digital scholarship, training in the form of workshops, seminars, conferences and short learning courses, and acquiring facilities for digital scholarship teaching as key solutions to the challenges identified. Moreover, openness to African perspectives, increasing research on digital scholarship and collaborating with other LIS schools and other related fields that were advanced in digital scholarship were revealed as solutions that could curb the afore-mentioned challenges.

The strategies suggested by librarians on improving LIS education on digital scholarship were also identified by academics as important to implement in LIS schools. As cautioned by Hensley and Bell (2017), regarding awareness among university stakeholders, the current study also proposed that awareness sessions must be conducted among LIS professionals on digital scholarship. It was further revealed that academics should conduct more research into digital scholarship in South Africa to have sufficient research for curriculum development on digital scholarship. These findings were similar to those of Lewis et al. (2015) in the sense there was a lack of research and LIS academics were encouraged to conduct research into digital scholarship. As discussed in section 5.5.5 of this study, academics also suggested that collaboration was important to improve the offerings of LIS schools as far as digital scholarship was concerned.

5.6.3 Challenges arising from digital scholarship related jobs

Challenges arising from the increase of digital scholarship-related positions in libraries across the librarian profession in South African were sought. The study stated challenges such as a lack of librarians with relevant qualifications, few candidates with the necessary skills and failure of LIS schools to teach digital scholarship as major challenges that arose from digital scholarship-related jobs. Additionally, there was a blurred line between information technologist, computer scientists, software engineers, data scientists and librarians, which made it difficult to decide who to employ for a digital scholarship role in the library. Finding the right person for the job was the most cited problem as expressed in section 5.4.3. It was also revealed that financial constraints to purchase the correct infrastructure and adapting to the fast changes by librarians were also cited as challenges arising from the digital scholarship-related positions in most academic and special research council libraries. Copyright issues were also mentioned as challenges facing digital scholarship-related jobs.

The challenges that arose from digital scholarship librarians were almost similar to the ones that were identified here; however, the ones identified here were from jobs relating to digital scholarship in general. Skills were identified as the major challenges faced by individuals working in digitally related fields. Wexelbaum (2016) and Wood and Evans (2018) state that librarians working in libraries need refresher courses or training in digital scholarship sections, as most LIS schools in South Africa had no content on digital scholarship. As noted by Mahlatse, Pienaar and Van Deventer (2018), there were only two LIS schools that offered qualifications in digital scholarship. As indicated in section 5.5.4, participants pointed out that there was an ongoing trend of employing candidates from other fields that were digital scholarship related. Kaur (2015) supports the fact that libraries would prefer to employ IT specialists and software engineers, as they felt that librarians were not fit for digital scholarship-related positions.

Alemneh, Hartman and Hastings (2005) warn that LIS digital scholarship sections should not implement digital scholarship activities and continue to use the old infrastructure as this hindered the efficiency and effectiveness of the digital scholarship functions. More precisely, these authors postulate that architectural complexity may have a significant impact on internal efficiency or effectiveness, preservation, provenance and intra- and/or inter-object interoperability issues. These findings were in line with the findings of this study, as digital

scholarship librarians indicated that infrastructure in their libraries was a challenge. Seibert, Miles and Gauther (2019) maintain that the other challenge affecting the execution and operation of digital scholarship services in libraries was the issue of ownership. The authors state that digital scholarship librarians were faced with questions of how to protect their own works as well as others with a responsible attribution and usage, sometimes involving a formal agreement. These findings were confirmed by the current study as digital scholarship works such as OERs and MOOCs were hard to protect from copyright-related issues.

5.6.4   Strategies of overcoming digital scholarship-related jobs

This study provided solutions to the challenges narrated by librarians on the rise of positions on digital scholarship. Recurriculation was recommended by library practitioners as the process that LIS schools had to embark on to ensure that qualifications and content on digital scholarship were available. Refresher courses for already working librarians were supposed to be offered by LIS schools to encourage continuous education. Funding had to be obtained and facilities purchased to ensure that the practical component was properly taught by LIS schools. Likewise, as mentioned earlier, collaboration of LIS professionals in general for skills and knowledge transfer was highly considered as helpful by people working in digital scholarship sections in libraries. Furthermore, the use of copyright laws was also recommended to mark the ownership of digital scholarship resources.

Raju (2015) proposes that LIS schools need to revise their curriculum to meet the needs of the job market, which was in line with the findings of this study. Mahlatse, Pienaar and Van Deventer (2018) further suggest that qualifications on digital scholarship should be offered by LIS schools to close the gap of few LIS schools offering qualifications with content on digital scholarship. The current study noted that a lack of LIS schools offering digital scholarship resulted in the challenge noted above of few candidates relevant for digital scholarship positions. Hence, LIS schools should offer content on digital scholarship and when they do so, there would be enough LIS graduates to work in digital scholarship-related positions. Laal, Laal and Aliramaei (2014) propose that LIS schools should offer short learning courses for LIS professionals to upgrade their skills and knowledge.

Wexelbaum (2016) expresses that academic libraries should purchase purposeful facilities that support digital scholarship. As indicated by Alemneh, Hartman and Hastings (2005), libraries

relied on outdated technological facilities instead of acquiring new infrastructure for the new roles of digital scholarship that would improve the efficiency and effectiveness of digital scholarship services.

Seibert, Miles, and Gauther (2019) highlight that the challenges faced by digital scholarship librarians and partners in content creation could be curbed if new frameworks of copyright laws were used to protect ownership of digital scholarship resources. They further indicate that awareness sessions on how to avoid copyright and licencing violations should be offered to consumers of digital scholarship content in libraries to ensure fair use and fair dealing of information. These findings were in line with the findings of this study.

5.6.5   Models used for structuring digital scholarship content

The study ascertained that LIS schools' academics were not using any model or framework to incorporate digital scholarship into the LIS curriculum. It was evident that academics were rather following processes when developing the curriculum with digital scholarship, through using themes emanating from their course objectives. The LIASA standards on digital scholarship were also used as key themes for curriculum development. The study found that LIS schools' academics were consulting with relevant stakeholders when infusing digital scholarship content into the LIS curriculum.

Participants emphasised that they were not using any models to develop a curriculum on digital scholarship. Wolf (2007) goes straight to the point that using a model or framework for curriculum development guides academics in the steps involved. Other participants indicated that they relied on the themes published by Raju (2017a) and the LIASA standards for developing digital scholarship content. In the same vein, Muthu, Sivaraman and Singh (2015) state that course objectives were also used as basis of curriculum development in most LIS schools. The majority of authors cited consultation with relevant stakeholders involved in digital scholarship activities (Kaur 2015; Lippincott 2017) and the current study revealed that this was the strategy adopted by many academics in curriculum development.

Lastly, the study exposed that academics followed no framework to develop the LIS curriculum on digital scholarship in South Africa. Instead, LIS professionals relied on processes and

expertise of the practitioners and researchers to gain insight into digital scholarship; hence, the urgency of this study.

5.7   SUMMARY OF CHAPTER FIVE

This chapter interprets and discusses the findings that were presented in Chapter Four. Triangulation of the results from both interviews and course outlines were given meaning in this section. As part of interpretations, the findings from the reviewed literature contributed to this section of the study through conforming or rebuffing the findings of the current study. Furthermore, viewpoints of four types of participants, as indicated in Chapter Three of this study, were triangulated. This chapter takes the same approach used in Chapter Four of the using main themes deriving from objectives of the study to interpret and discuss the findings of this study. These main themes included library and information science curriculum, incorporation of digital scholarship content, perceptions of LIS employers on LIS graduates, digital scholarship knowledge, skills and competencies, and development or redevelopment of the LIS curriculum structure. Sub-headings assisted in discussing the findings of this study and the discussions were based on the problem of the study and the conceptual framework underpinning the study. Digital scholarship is an emerging concept in the LIS profession, yet gaining momentum as it is fuelled by the 4IR technological changes. There is limited in South Africa that deals with this concept. Limited literature is available on the LIS curriculum on digital scholarship, globally and in South Africa. This hindered robust discussions on the concepts being investigated. The following chapter (Chapter Six) summarises and gives conclusions based on the findings of the study. A proposed curriculum development framework on digital scholarship is provided and recommendations are delineated.

CHAPTER SIX
SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

6.1   INTRODUCTION

The previous chapter interpreted and discussed the findings of this study based on the research objectives. This chapter provides the summary, conclusions and recommendations in line with the objectives of the study, considering the findings and the literature reviewed. As mentioned by Leedy and Ormrod (2010), and Creswell and Guetterman (2018), the concluding chapter aims to gather dissimilar threads of the research so that general conclusions are made from the research. Similarly, this chapter aims to unite all the facets of this study into a conclusion. Alternatively, the conclusion section gathers all the different activities that have been accomplished in different phases of the study into a precise and concise message based on the aim of the study.

The summary of the findings of this study is delineated in this chapter. Thereafter, the chapter presents the conclusions of the study based on the findings, as directed by the study's objectives. This chapter also provides recommendations based on each objective of the study. The study further proposes a framework for developing a curriculum that is inclusive of digital scholarship content in the LIS curriculum. It is hoped that, when recurriculation processes take place, such a framework would assist LIS schools' academics with embedding digital scholarship into the LIS curriculum. The chapter concludes by suggesting future research as a follow-up to the current study, and the implications of the research for the curriculum, policy and practice are also outlined.

6.2   SUMMARY OF THE FINDINGS

As mentioned in section 6.1, this section presents the summary of the findings of this study based on the objectives delineated in Chapter One. The findings were presented, interpreted and discussed in Chapters Four and Five of the study. The study collected data from LIS schools' academics and directors of libraries and digital scholarship librarians in both academic and special research council libraries using semi-structured interviews. Lastly, course outlines from LIS schools and the reviewed literature were used to triangulate the findings of this study, to give more meaning. The findings are summarised below.

6.2.1   Library and information science curricula

This section provides the summary of the findings based on the above theme that presented, interpreted and discussed the findings in the previous chapters. Overall, this main theme had 10 subthemes that were used to unpack it properly. In this objective, understanding of digital scholarship was sought from all participants. LIS professionals referred to digital scholarship as the use of digital tools and platforms for scholarly communication regarding research and teaching and learning among the academic communities. Moreover, digital scholarship was acknowledged as the use of digital technologies for the promotion and advocacy of OA and collaboration activities in the library environment, which included electronic publishing, publishing scholarship, like OA journals or electronic journals and OERs and MOOCs.

This study discovered that there were three LIS schools that were teaching digital scholarship in their curriculum. Other LIS schools were already recurriculating their curriculum to include digital scholarship. The study revealed that digital scholarship was taught at a postgraduate level and not at an undergraduate level. Furthermore, the study pointed out that digital scholarship contents in LIS schools focused on ICTs, digital curatorship, scholarly communication, technologies as enablers of digital scholarship, metadata standards, digitisation, managing IRs, bibliometrics and webometrics, OA, data librarian, RDM, copyright issues and digital publishing processes. Additionally, it was expressed that troubleshooting, multimedia, networks and networking were also part of digital scholarship. The strategies used to include digital scholarship contents were conducting research using the existing literature on digital scholarship to identify desirable contents on digital scholarship and using course objectives as themes for digital scholarship content identification in the LIS curriculum. The study also revealed that participants were consulting relevant stakeholders in identifying desirable contents on digital scholarship.

Based on the importance of teaching digital scholarship, it was discovered that teaching digital scholarship in the LIS curriculum was to assist the LIS schools to remain relevant in the dynamic information society. It was also discovered that LIS schools were moving with the times and preparing students for the digital world as they offered digital scholarship to prepare students for the ever-changing digital environment and for marketability purposes in the 4IR world. The study also sought training interventions for academics on digital scholarship to

remain relevant and revealed that both external and internal training interventions to train LIS academics in digital scholarship-related skills and knowledge were important. The study reported that formal LIS education programmes or qualifications, vocational courses, short learning courses, seminars or workshops, conferences and on-the-job training were crucial for imparting digital scholarship skills and knowledge among academics. It was revealed that LIS academics must embark on continuous education for lifelong learners in general.

Based on the infrastructure, the study identified technological infrastructure, which included hardware and software as necessary to be used as facilities for teaching digital scholarship. The study further elaborated that computer laboratories, high-speed laptops and stable connectivity, open source or subscription software, access to online metadata standard resources such as RDA, web Dewey, innovative hubs, 3D scanners, and having websites that host journals were requirements for the LIS schools to teach digital scholarship. One participant indicated that their infrastructure was relevant for teaching digital scholarship while the rest indicated that it was not relevant and cited outdatedness as the major issue.

The study sought to find out whether LIS schools were promoting digital scholarship, and participants felt that some LIS schools were promoting digital scholarship and others were not. The study pointed out that LIS schools that had contents on digital scholarship were marketing their programmes via formal qualifications at a postgraduate level. Evidently, LIS schools that had no contents on digital scholarship had nothing to promote regarding digital scholarship. The study further suggested that LIS schools publicised their digital scholarship education via workshops, conferences and endorsing them through LIS professional bodies such as LIASA.

When questioned about teaching methods and modes used for digital scholarship, the study revealed student-centred and collaborative learning approaches as key approaches that were used in LIS schools. The study discovered that prior to Covid-19, lecturers in other LIS schools were teaching on a face-to-face basis in the computer laboratories, some have adopted a blended learning mode and some were teaching through a distance learning mode. Nevertheless, due to the Covid-19 pandemic, all universities moved their teaching to be completely online through LMS. Microsoft Teams and Zoom were cited as communication channels frequently used for teaching and learning during the Covid-19 pandemic. Experience of teaching digital scholarship was sought, and the study shared that programmes with digital scholarship were attracting more students due to the new trends, compared to their pervious

programmes or current programmes where LIS schools had not recurriculated. A lack of the practical aspect in the digital scholarship-related courses was also quoted as a component affecting the understanding of digital scholarship, and students were unaware of digital scholarship contents in the LIS curriculum.

6.2.2   Incorporation of digital scholarship content in the in the LIS schools' curriculum

A summary of the findings based on this theme, divided into six subthemes that were used to present, interpret and discuss the findings, is provided below. The purpose of this theme was to gather the perceptions of the participants on digital scholarship incorporation into the LIS curriculum.

The study discovered that digital scholarship contents were evident in the LIS schools' curricula, mostly at a postgraduate level. It was stated that these contents were infused from basic level to advanced level, depending on whether it was a unit in a course or a course itself, or the qualification was about digital scholarship. This study further pointed out that, in most cases, digital scholarship contents displayed more theory and there were no practical units demonstrated in the courses.

The study ascertained that LIS schools that had contents on digital scholarship had course objectives that were aligned to the 4IR trends. Other LIS schools indicated that they were revising their course objectives to suit the 4IR trends in the LIS profession as they had embarked on the recurriculation process. Among other aspects of the 4IR trends, the study revealed that LIS schools' objectives were about to include digital scholarship, exposure to technology, 4IR content, more relevance with the job market and include more integrated learning for students on digital scholarship. The study further found that LIS schools' courses in future would be informed by recent developments in research and inclusion of the relevant AI and IoT in the LIS curriculum as it was the trend brought by the 4IR.

Moreover, the study established from the practitioners that digital scholarship contents to be included in the LIS schools' curricula consisted of digitisation, digital curatorship, RDM, metadata standards, copyright-related contents, technological enablers in LIS, OA, OERs and understanding the applications of POPI Act and PAIA. These contents were digital scholarship

driven at the time of the study and librarians felt that they should be part of digital scholarship education to produce a quality digital scholarship librarian.

This study discovered that a combination of practitioners and academics played a crucial role in curriculum development regarding digital scholarship. It was revealed that collaboration and consultation of both parties in curriculum development were vital. Among other parts identified by participants were that interdisciplinary fields such as computer science, IT, humanities, software engineering, data science were paramount to consult when developing digital scholarship education. Furthermore, the study found that the LIS schools' current students, SAQA, DHET, quality assurance committees and LIS professional bodies, for instance, and LIASA were considered to be the pivotal parties on digital scholarship education. Additionally, benchmarking with national and international sister LIS schools were also praised in this study as important when developing digital scholarship education.

The study came upon only one LIS school from among those that participated that felt that their curriculum had no gaps or redundancies. The study revealed that there were no practical aspects for digital scholarship in LIS schools and there was a shortage of African epistemologies as far as this area was concerned. It was also evident that LIS schools lacked content on digital scholarship or others repeated content on digital scholarship at different levels of digital scholarship qualifications. The study established that there were challenges as far as the practical component of digital scholarship was concerned, as it was lacking in the LIS curriculum. It was also exposed that there were redundancies in the curriculum, as content on digital scholarship was offered at different levels as units in the different courses. It was expressed that same contents would be found at the different levels of the qualification, which presented repetitions in the LIS curriculum.

They study ascertained that marketability, employability, understanding the digital environment and its issues, managing various digital artefacts, facilitating interdisciplinary and collaboration, and producing MOOCs and OERs were deemed key opportunities presented by digital scholarship in the LIS profession. Lastly, the study discovered that there were various job and business opportunities that could be achieved by incorporating digital scholarship content into LIS education.

6.2.3 Perceptions of LIS employers on LIS graduates

Perceptions of employers of LIS graduates were sought from the directors of library services. These perceptions were categorised into three subthemes and the summary of the key findings was included.

The study suggested that employers of digital scholarship librarians expected that they must possess knowledge, skills and competencies on digital scholarship-related activities. It was revealed that graduates were expected to be able to navigate digital scholarship activities at a basic level. The study further found that LIS graduates were expected to be able to identify the knowledge gaps and understand OA. Among other expectations of employers of digital scholarship, it was revealed that graduates should understand RDM, digital publication ecosystem and it was strongly expected from LIS schools to incorporate digital scholarship content at all levels of the four-year LIS degree. The study discovered that there were only three LIS schools that had a solid curriculum with digital scholarship content, which were UCT, UP and UJ as having pieces and facets of digital scholarship in the curriculum.

Challenges faced by employers of digital scholarship were also identified. The study identified a limited pool of candidates to choose from, a lack of experience among candidates and unawareness among candidates about digital scholarship as major challenges encountered when employing a digital scholarship librarian. The study discovered that these challenges resulted in the employment of the candidates outside the LIS field as students from LIS schools were mostly unfit for digital scholarship jobs.

6.2.4 Digital scholarship knowledge, skills and competences

The current section summarises key findings as far as knowledge, skills and competencies are concerned. Similar to other themes, the key findings are presented based on the subthemes used to present the findings in the preceding chapters. Six subthemes were used to present, interpret and discuss the findings of the study.

The study showed that digital scholarship units in the library comprised a digital curation unit, RDM unit, IR unit, digital research services unit, digital publishing platform unit, metadata unit and advocacy for OA unit. The study further revealed that the activities performed by digital scholarship librarians were uploading theses and dissertations to the IRs, digitising and

curating research data, performing metadata-related activities, managing e-journals and performing digital research activities. Additionally, it was discovered that digital scholarship librarians conducted RDM activities and advocated for OA activities in the library.

Based on the requirements for a digital scholarship, the study established that digital scholarship positions in libraries required a minimum of a Bachelor's degree in Information Science, a minimum of three years' experience in an academic library, knowledge in digital scholarship and technical skills from applying candidates. The study further identified knowledge that was required for digital scholarship job positions, which were, among others, RDM, digitisation, IR, metadata, scholarly communication, bibliometrics and OA. The study determined various skills and competencies that were required for one to become a digital scholarship librarian as computer literacy, interpersonal skills and communication skills.

Education and training interventions were sought from LIS practitioners that could equip digital scholarship librarians with relevant skills and knowledge. It was reported that librarians were exposed to various skills development trainings and capacity-building workshops, which included research visibility training, collaboration and on-the-job training, training workshops (webinars and face to face), short learning courses, formal qualifications and external training offered by the university's research office.

Based on the challenges they experienced, participants identified a lack of technical skills among librarians, fearing technology, reluctance to learn emerging skills and knowledge and awareness among funding bodies. The challenges experienced by employers of academic librarians and special research councils employing candidates from IT-related fields instead of LIS professionals were also cited by digital scholarship librarians. The challenges identified in all sections of this study by either library practitioners or academic staff from the LIS schools indicated resources in the form of skills and funds as key barriers they faced as far as digital scholarship was concerned.

Participants also provided solutions that could assist in overcoming curriculum development challenges in LIS schools, as librarians worked with digital scholarship activities on a daily basis. It was suggested that consultancy with practitioners was a crucial strategy in improving digital scholarship content in the LIS curriculum. Extending the practical component of courses related to digital scholarship, conducting more research into digital scholarship and attending

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conferences and workshops relating to digital scholarship were identified as pivotal for gaining knowledge and skills to be incorporated into the LIS curriculum. Lastly, adding relevant digital scholarship content in the LIS curriculum and adding short learning courses in LIS schools were identified as important for the LIS schools to include.

6.2.5 Development or redevelopment of the LIS schools' curriculum structure

The theme on the development or redevelopment of the LIS schools' curriculum structure to find what were challenges as far as incorporating digital scholarship was concerned in LIS schools identified a lack of resources, for instance, skills and funding from the academics' side, reluctance from academics to in engage digital scholarship, a lack of awareness from academics and being informed by Euro-centric perspectives as major challenges hindering the infusion of digital scholarship content into the LIS curriculum. In addition to that, there was also a lack of research on digital scholarship and academics working in silos, in a sense that they avoided collaboration with interdisciplinary fields or other sister LIS schools.

Relating to strategies to overcome the challenges provided above, the study acknowledged awareness sessions for digital scholarship, training in the form of workshops, seminars, conferences and short learning courses and acquiring facilities for digital scholarship teaching as key solutions. Moreover, openness to African perspectives, increasing research into digital scholarship and collaborating with other LIS schools and other related fields that were advanced in digital scholarship were revealed as solutions that could curb the afore-mentioned challenges.

Challenges arising from the digital scholarship-related jobs were sought and it was stated that the challenges such as a lack of librarians with relevant qualifications, few candidates with the necessary skills and failure of LIS schools to teach digital scholarship were said to be major challenges in this regard. Additionally, there was a blurred line between information technologists, computer scientists, software engineers, data scientists and librarians making it hard to decide who to employ for a digital scholarship position in the library. Finding the right person for the job was the most-cited problem. It was also revealed that financial constraints to purchase the correct infrastructure and librarians adapting to the fast changes were also quoted as challenges that came out of the digital scholarship-related positions in most academic and

special research council libraries. Copyright issues were also named as challenges facing digital scholarship-related jobs.

Based on the provided challenges, suggestions were also provided. Recurriculation was recommended by library practitioners as the process that LIS schools had to embark on to ensure that qualifications on digital scholarship were available. Refresher courses for already working librarians should be offered by LIS schools to encourage continuous education. Funding was supposed to be made available to purchase facilities to ensure that the practical component was properly taught by the LIS schools. Likewise, as mentioned earlier, collaboration of LIS professionals in general for skills and knowledge transfer was highly considered as helpful by people working in digital scholarship sections in libraries. Furthermore, the use of copyright laws was also recommended to mark the ownership of digital scholarship resources.

Finally, models that were used for digital scholarship content development were sought, and it became evident that academics were following processes when developing the curriculum with digital scholarship, through using themes emanating from their course objectives. The LIASA standards on digital scholarship were also used as main themes for curriculum development. The study also found that LIS schools' academics were consulting with relevant stakeholders when infusing digital scholarship content into the LIS curriculum.

6.3   CONCLUSION ABOUT THE OBJECTIVES OF THE STUDY

The purpose of the study was to explore education and training of LIS professionals on digital scholarship in South Africa. The study aimed to develop a framework to be used by the LIS schools when developing or revising content on digital scholarship in the LIS curriculum. The envisaged assumption of the study was that such a framework will assist LIS schools in facilitating the curriculum development process to be inclusive of digital scholarship. The proposed framework is presented and discussed in section 6.5 of this chapter. The study clearly indicated that there were few LIS schools offering digital scholarship in South Africa and this resulted in digital scholarship jobs taken by candidates from related fields, for instance the STEM. Therefore, LIS schools should revise or re-develop their curriculum to include digital scholarship content to remain relevant in the job market. The following objectives were used to guide the conclusions of this study:

- Library and information science curriculum

- Incorporation of digital scholarship content in the in the LIS schools' curriculum

- Perceptions of LIS employers on LIS graduates

- Digital scholarship knowledge, skills and competences

- Development or redevelopment of the LIS schools' curriculum structure

6.3.1 Library and information science curriculum

It is clear from the study that digital scholarship was the use of digital tools for scholarly communication purposes on teaching and learning and research among academic communities. Based on the result of the study, it is concluded that all the participants understood digital scholarship as a concept. Despite understanding the concept, the study established that there were three LIS schools teaching digital scholarship-related contents in South Africa. There were other LIS schools that claimed that they taught digital scholarship; yet, upon triangulating the interview findings and course outline, the outcomes differed. There were also LIS schools that admitted that they did not offer digital scholarship-related contents, but they were already recurriculating their curriculum to include digital scholarship. Conclusions can be drawn that LIS schools were willing to remain relevant in the job market, yet some were not ready to review their curriculum to be in line with the needs of the job market. This was based on the fact that some participants indicated during the interviews they had content on digital scholarship while the course outlines indicated otherwise.

As per the findings of the study and the literature reviewed, digital scholarship focused on ICTs, digital curatorship, scholarly communication, technologies as the enablers of digital scholarship, metadata standards, digitisation, bibliometrics, managing IRs, OA, data librarian, RDM, copyright issues and digital publishing processes, troubleshooting, multimedia, networks and networking as key areas taught in LIS schools. These contents were only evident in few LIS schools at postgraduate level, meaning that other LIS schools had none of these contents in their curricula. Therefore, other LIS schools still need to recurriculate and add these contents in their curriculum to remain relevant in the job market.

Digital scholarship education requires a proper infrastructure and capacity to impact knowledge and skills to the students being trained. The study discovered that LIS schools lacked

technological infrastructure and there was a lack of capacity of teaching digital scholarship among the teaching staff members. Out of ten LIS schools' participants in the study, only one was confident that they had a proper infrastructure in their LIS school. This indicated that LIS schools were not ready to offer digital scholarship. Failure of LIS schools to provide proper infrastructure, relevant skills and knowledge results in poor rendering of digital scholarship content. Some LIS schools' academics further indicated that there were skills development training in place on digital scholarship; however, there seemed to be a lack of funds to attend such. Therefore, it is concluded that resources are vital for the teaching of digital scholarship since they assist in demonstrating the practical component of the theoretical content. Hence, failure to provide relevant infrastructure can result in poorly trained LIS graduates.

6.3.2   Incorporation of digital scholarship content in the LIS schools' curriculum

The study findings displayed that the infusion of digital scholarship content in the LIS curriculum was from the basic level to the advanced level, depending on whether it was a course on its own, a unit in the course or the whole qualification was digital scholarship driven. Although participants indicated different levels of infusion of digital scholarship in the curriculum, generally, it was seen that there were no practical components in the courses and too much theory. Consequently, it was clear that LIS schools that had content on digital scholarship infused it at various levels and lacked the practical component on the concept, making it difficult for students to grasp.

The study claimed that the course objectives of LIS schools that offered digital scholarship were aligned with the 4IR trends and for those that had no content on digital scholarship, the course objectives were not aligned, but they were recurriculating for alignment purposes. These findings demonstrated that LIS schools realised that their content was no longer relevant for the emerging job market; hence, the recurriculation that started taking place in most LIS schools. It was also revealed that from the practitioners' wish list, LIS schools had to include digitisation, digital curatorship, RDM, metadata standards, copyright-related contents, technological enablers in LIS, OA, OERs, and understanding the applications of the POPI Act and PAIA as key digital scholarship content. Inclusion of these content units would ensure that what is practiced in digital scholarship sections in the library is included in the LIS curriculum. Relevance of the LIS graduates as far as digital scholarship positions are concerned would be unquestionable if these are to be included in the curriculum.

Considering the stakeholders that must be consulted in curriculum development in LIS schools specifically for digital scholarship, the study reported that both LIS practitioners and academics were important. As digital scholarship is an interdisciplinary concept, other fields such as those in the technologically driven industry must be consulted when developing digital scholarship content. In addition to that, it was stated that LIS schools should consult LIS schools' current students, SAQA, DHET, quality assurance committees and LIS professional bodies such as LIASA. It could be concluded that when developing the curriculum in LIS schools, it should include digital scholarship. All the relevant stakeholders must be consulted to ensure that units of the courses are in line with the job market.

Gaps and redundancies were identified in the LIS curriculum as far as digital scholarship was concerned. A lack of practical or field work was a major gap identified by the LIS schools that had content on digital scholarship. LIS schools that had no content on digital scholarship indicated that there was a gap in their curriculum that they were planning to review. Hence, the assumption was that upon completion of the recurriculation, the gaps would be minimal or there would be no gaps. Failure of the LIS schools to bridge these gaps could result in their graduates lacking imperative knowledge and skills on digital scholarship that are required in the job market. Based on redundancies, the study revealed that there were repetitions of contents at different levels in LIS schools that offered qualifications that were digital scholarship driven. This was a result of lecturers working in silos instead of adopting a collaborative approach and repeating what was already offered at a different level of study.

The opportunities of having contents on digital scholarship were identified in the study, including marketability, employability, understanding the digital environment and its issues, managing various digital artefacts, facilitating interdisciplinarity and collaboration, producing MOOCs and OERs, and business opportunities. The conclusion that can be drawn from the findings is that the inclusion of digital scholarship on the LIS curriculum is inevitable as it brings a great number of opportunities to the LIS profession. Failure of LIS schools to include digital scholarship content in their curriculum deprives future librarians of such opportunities brought by the 4IR in the LIS profession.

6.3.3 Perceptions of LIS employers on LIS graduates

Ultimately, it was discovered from this study that LIS employers expected LIS graduates to have knowledge, skills and competencies on digital scholarship. Although, this was the expectation, it was noted that few LIS schools had content on digital scholarship in South Africa. The institutions were UCT, UP and UJ, as disclosed by the participants. As a result, there was a limited number of LIS graduates that could fit into digital scholarship positions in academic and special research council libraries in South Africa. Most employers indicated that they had no confidence in LIS schools' graduates as most of them demonstrated no understanding of digital scholarship units within the library, as compared to their IT and computer science counterparts.

It was clear from the study that employers of LIS graduates preferred to employ candidates from other related fields instead of LIS schools' graduates when it comes to digital scholarship positions. This is a call for the LIS schools to question their curriculum and properly channel it towards the requirements of the employer. Failure to do so will exacerbate the notion of employing candidates from other fields for positions of LIS professionals.

6.3.4 Digital scholarship knowledge, skills and competencies

As the job market changes, new units and activities emerge in the library environment due to the 4IR trends. The study revealed that digital scholarship units in the library included the digital curation unit, RDM unit, IR unit, digital research services unit, digital publishing platform unit, metadata unit and advocacy for OA unit. These units were mainly in academic and research council libraries. They informed the activities performed by digital scholarship librarians, which included uploading of theses and dissertations to the IRs, digitising and curating research data, performing metadata-related activities, managing e-journals and performing digital research activities, conducting RDM activities and advocating for digital scholarship activities.

The inferences drawn from the study findings were that digital scholarship units and activities needed special knowledge and skills that were not covered by most LIS schools. Hence, the call from the literature and this study revealed that LIS schools should revise their curriculum to meet the needs of the academic libraries. The study further articulated on the requirement

for digital scholarship positions are a Bachelor's degree in Information Science, a minimum of three years' experience in an academic library and knowledge in digital scholarship, coupled with technical skills. Special knowledge of digital scholarship was in line with the units and activities outlined above in this section. The skills required for digital scholarship included computer literacy, interpersonal skills and communication skills. It was concluded that disciplinary knowledge, coupled with soft skills, is a key requirement for the success of a digital scholarship unit.

This study indicated training interventions for digital scholarship librarians as the most important. Training interventions identified were based on the fact that most librarians working in digital scholarship units were trained prior to the dawn of the digital scholarship job positions. Therefore, they had to do refresher courses to remain relevant in their responsible positions. Both formal and informal training interventions were deemed important in knowledge and skills provision for already practising librarians on digital scholarship.

The study reported the challenges experienced by librarians in relation to digital scholarship positions, as a lack of technical skills among librarians, fearing technology, reluctance to learn emerging skills, and knowledge and awareness among funding bodies. The challenges experienced by employers of academic libraries and special research councils employing candidates from IT-related fields instead of LIS professionals were also revealed by digital scholarship librarians. Based on these findings, it was inferred that these challenges were mostly based on individual capabilities and willingness to understand digital scholarship; hence, they indicated that training interventions were also available. LIS practitioners revealed the strategies that were supposed to be employed to prosper against these challenges.

The study discovered that consultancy with practitioners, extending the practical component of courses related to digital scholarship, conducting more research into digital scholarship, and attending conferences and workshops on digital scholarship were identified as pivotal for gaining knowledge and skills to be incorporated into the LIS curriculum. Furthermore, adding relevant digital scholarship content in the LIS curriculum and LIS schools adding short learning courses and, most of all, encouraging digital scholarship librarians to be lifelong learners, were also indicated as of paramount importance. The study concluded that both LIS schools academics and LIS practitioners involved in digital scholarship have equal responsibilities as far this area is concerned. The LIS schools' responsibility was providing relevant education on

digital scholarship both formal qualifications and short learning courses and LIS professionals were supposed to attend courses on digital scholarship to ensure relevancy in the job activities.

6.3.5 Development or redevelopment of the LIS schools' curriculum structure

The study identified numerous challenges that were hindering the development of the curriculum in most LIS schools as far as digital scholarship was concerned. The digital scholarship expertise and funding to employ qualified workforce and purchase the correct infrastructure, reluctance to engage in digital scholarship, the lack of awareness and being informed by Euro-centric perspectives were among the major challenges impeding the infusion of digital scholarship content into the LIS curriculum. The study claimed that academics failed to use a collaborative approach in developing the curriculum. These challenges were hindrances to the inclusion of digital scholarship in the LIS curriculum, and the assumption is that LIS schools should be able to collaborate and benchmark with other sister LIS schools or relevant fields on digital scholarship and digital scholarship content to be in line with the needs of the job market. Failure to include digital scholarship results in a lack of candidates for digital scholarship positions and preference of candidates from IT or computer science over the LIS professionals for digital scholarship job positions.

The study further discovered the solutions that could be used to overcome the challenges as far as incorporating digital scholarship into the LIS curriculum was concerned. Awareness sessions for digital scholarship, different types of trainings, openness to African perspectives, increasing research on digital scholarship, and collaborating with other LIS schools and other related fields that were advanced in the area of digital scholarship were key solutions in limiting the challenges. The implication is that, should these solutions be implemented by the LIS schools, a curriculum inclusive of digital scholarship can be achieved by most LIS schools.

By looking at the findings of this study, it was concluded that there were no models that were used by LIS schools in the development of a curriculum that included digital scholarship, as most of the academics relied on themes and course objectives when developing a curriculum. Hence, the emergence of this study to propose a framework that could assist LIS schools to incorporate digital scholarship content in the LIS curriculum.

6.4   RECOMMENDATIONS OF THE STUDY

The recommendations of the study emanated from the findings and the conclusions of the study as informed by the objectives outlined in Chapter One. These recommendations are important for LIS schools in South Africa, HoDs as well as for the lecturers teaching digital scholarship. The recommendations are also applicable to the LIS practitioners, directors of library services and the digital scholarship librarians. The study recommends the following:

6.4.1   Library and information science curriculum

This section provides recommendations as far as the LIS curriculum is concerned on digital scholarship. As per the findings that most LIS schools had no contents on digital scholarship, there was only qualification at postgraduate level. It is recommended that LIS schools should include content focusing on digital scholarship in the undergraduate LIS qualifications to ensure that librarians at entry level are equipped with digital scholarship knowledge, skills and competencies. The study also discovered that LIS schools had no relevant infrastructure to use in teaching digital scholarship content; therefore, it is recommended that LIS schools should procure the relevant infrastructure that will be used for demonstrating digital scholarship related contents for future librarians.

Furthermore, the current study noted that there was a lack of expertise and awareness among academics regarding digital scholarship, as a result, the study recommends the need to offer skills development training for academics to be well equipped with relevant knowledge and skills within the area. It is also recommended that academics should conduct research in the area of digital scholarship and attend seminars and conferences on this field to understand the emerging trends in the LIS profession as far as digital scholarship is concerned. Ensuring that LIS schools have the relevant workforce this will ensure that LIS schools' graduates across and within the country exit the universities with the required knowledge and skills to meet the demanding needs of the job market.

6.4.2   Incorporation of digital scholarship content in the LIS schools' curriculum

It was clear from the study that the infusion of digital scholarship in the LIS curriculum was done from basic level to advanced level depending on whether it is a unit in a course or a course

on its own. Although this was the case, there was generally a lack of a practical component in LIS schools, LIS schools should consider expanding the practical component in the curriculum. This could be achieved by placing LIS students in digital scholarship or humanities section, this will reinforce their leaning and understanding of digital scholarship. In addition to that, LIS schools at an undergraduate level must ensure that course objectives are aligned with the current trends of the 4IR in the LIS profession. Key contents on digital scholarship should be included in the LIS curriculum. The study recommends that LIS schools should consult relevant stakeholders when developing the LIS curriculum on digital scholarship such as LIS practitioners working in digital scholarship units, related fields like IT, information systems, computer science and software engineering and others. In short, all relevant stakeholders with a knowledgeable in curriculum development and digital scholarship must be consulted when developing the LIS curriculum with a view to including digital scholarship.

The study concluded that there was a lack of African epistemologies as far as digital scholarship education was concerned; therefore, LIS academics are encouraged to be open and transparent to African scholarship in order to ensure that digital scholarship includes African views. There were also redundancies pointed out in the study, one of which was that there is a tendency to repeat the same contents at different levels of study in the same qualification. To curb these redundancies identified, academics should take on a collaborative approach when developing the curriculum for different levels of study to avoid the repetition of the same content across the qualifications.

LIS professionals revealed several opportunities that were brought by the incorporation of digital scholarship education in the LIS profession. Nonetheless, they indicated that most LIS schools lagged behind as far as digital scholarship education was concerned. Moreover, they emphasised that the LIS curriculum should be reciprocal to the LIS sector needs. The study recommends that LIS schools should do more research on digital scholarship to ensure that content on digital scholarship is evident in the LIS curriculum to achieve the opportunities brought by the emergence of digital scholarship.

6.4.3   Perceptions of LIS employers on LIS graduates

This section provides recommendations as far as employers of digital scholarship librarians in both academic and special research council libraries are concerned. The findings of the study

indicated that for LIS graduates to be employed in digital scholarship sections, they must possess knowledge, skills and competencies in digital scholarship. These expectations are mainly from LIS schools, as they are the primary trainers of librarians in the country. Therefore, it is expected that the existing outcomes of LIS qualifications should carry the required knowledge, skills and competencies on digital scholarship.

The study indicated that there were only three LIS schools that offered digital scholarship education in South Africa. In accordance with these findings, it is recommended that other LIS schools in the country must recurriculate and include the digital scholarship content in their curriculum to increase the scope of the pool of the candidates applying for digital scholarship jobs. As a result of a lack of the candidates that are fit for digital scholarship job positions, employers of LIS graduates preferred to employ candidates from other IT-related fields instead of LIS professionals. Therefore, it is an urgency for the LIS schools to include digital scholarship content in the LIS curriculum. It is also recommended that the LIS employers should employ LIS graduates in digital scholarship positions, despite the fact that they lacked relevant knowledge and skills. On-the-job training can be adopted to ensure skills transfer.

6.4.4 Digital scholarship knowledge, skills and competencies

This section focuses on recommending the knowledge, skills and competencies required for digital scholarship. It also taps into the suggestions that LIS schools can use to improve their curriculum from both academics' and practitioners' perspectives. Digital scholarship units and activities performed in both academic and research council libraries informed the knowledge, skills and competencies required for a digital scholarship librarian. In line with the findings of the study, LIS schools' curriculum should be informed by the units and activities of digital scholarship to produce graduates with relevant skills. Moreover, LIS schools should be able to provide disciplinary knowledge and soft skills to the LIS graduates as these sets of skills are deemed relevant for digital scholarship positions.

It was evident that a minimum of three years' experience and a bachelor's degree with relevant contents on digital scholarship in LIS were required. It is recommended that LIS schools that have no content on digital scholarship, should recurriculate and embed digital scholarship. The other recommendation was that these LIS schools should consider expanding their practical

component to ensure that students are equipped with the expertise to conduct digital scholarship activities.

Challenges that were encountered by already practising librarians in digital scholarship units such as fear of technology by librarians, lack of technical skills, unawareness of digital scholarship among librarians were identified. It is recommended that training workshops and seminars should be offered to librarians to help them understand digital scholarship. It is recommended by this study that LIS schools should provide short learning courses on digital scholarship to equip already practising librarians with knowledge and skills on digital scholarship. Besides interventions by the LIS schools and employers of LIS graduates, librarians are encouraged to be lifelong learners.

6.4.5   Development and redevelopment of the LIS schools' curricula structure

This section recommends education-related solutions that can be used when developing a digital scholarship inclusive curriculum by LIS schools. Based on the challenges experienced by academics when developing digital scholarship courses, it was recommended that LIS schools should provide the necessary resources in terms of manpower and infrastructure as far as digital scholarship is concerned. This will facilitate the skills transfer from lecturers to students as proper equipment will be in place.

The study discovered that no framework or model was used when developing the LIS curriculum, inclusive of digital scholarship. The main aim was to explore education and training of LIS professionals in digital scholarship in South Africa with the view to developing a framework that could be used to embed digital scholarship into the LIS curriculum.

6.6   PROPOSED   FRAMEWORK   FOR   DIGITAL   SCHOLARSHIP INCORPORATION

This section presents a proposed framework for the incorporation of digital scholarship into the LIS curriculum. A framework consists of digital scholarship as a concept, internal stakeholders, external stakeholders, and the relevant infrastructure and resources. The LIS curriculum, which includes digital scholarship, needs digital scholarship lecturers to ensure that they conduct research on the emerging trends. Consultation with both internal and external

stakeholders is vital to ensure that all the curriculum-related protocols are observed. These constructs are discussed in detail in this section. See Figure 18 on page 225 for a framework:
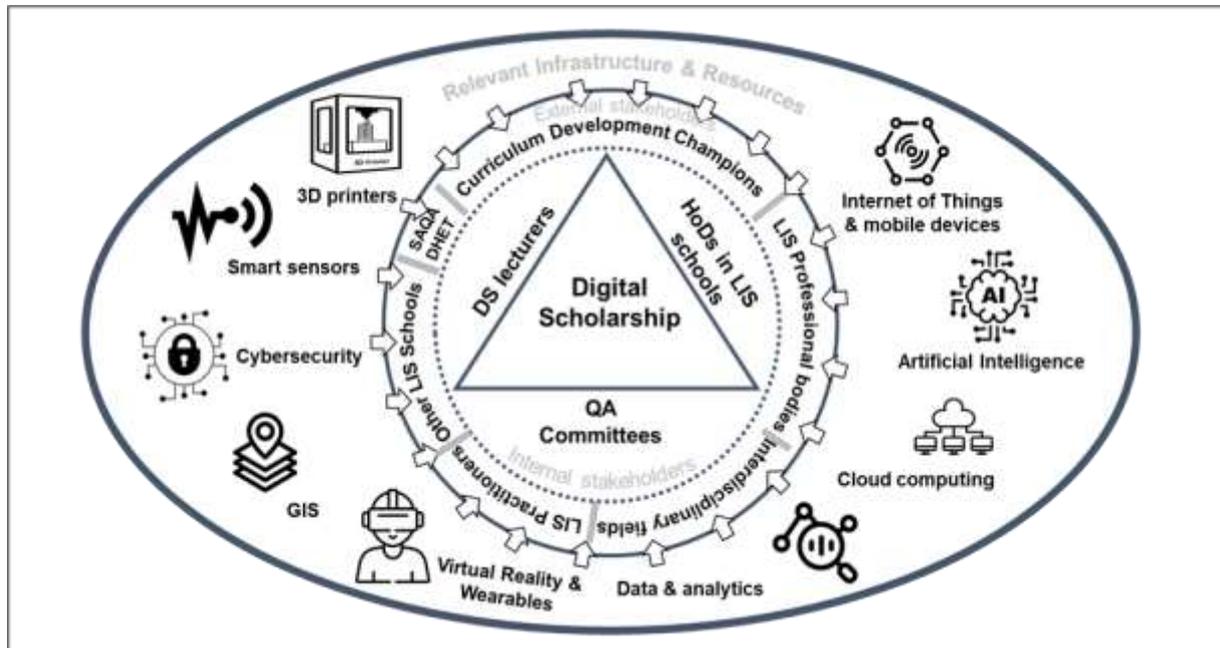
Figure 18: Proposed curriculum development framework on digital scholarship

Based on the findings of this study, a framework that can be followed when developing digital scholarship content in the LIS curriculum. Internal stakeholders consisting of digital scholarship lecturers, HoDs of LIS schools and quality assurance (QA) committees must work together in developing a sound digital scholarship content in the LIS curriculum. Lecturers as content experts must ensure that relevant research on digital scholarship is used to inform the curriculum. The digital scholarship course objectives and themes from the literature can be used to structure the curriculum. HoDs of the LIS schools were expected to oversee the process of curriculum development and provide support in terms of funding for training workshops and procurement, where it is required. Quality assurance committees are mainly charged with the duty to ensure quality in the digital scholarship study materials developed by lecturers. Policies on curriculum development should be followed to ensure that a sound and relevant curriculum on digital scholarship is developed.

A collaborative approach is expected between internal and external stakeholders. Internal stakeholders should consult external stakeholders in the process of curriculum development. This study established that external stakeholders included LIS practitioners, LIS professional

bodies such as LIASA, interdisciplinary fields, other LIS schools, SAQA and the DHET, and curriculum development champions in the university. LIS practitioners consist of digital scholarship librarians and directors of library services. These stakeholders perform digital scholarship activities on a daily basis and some also employ digital scholarship librarians. Therefore, they are aware of the trends in the library environment; hence, they should be consulted. Curriculum development champions in the university understand the process of developing the curriculum from its infancy stage to maturity; consequently, LIS academics should consider involving them in the process of curriculum development. This will ensure that a dynamic curriculum is developed that allows insertion of the new changes from the job market.

LIS professional bodies, for instance LIASA, should be consulted, as it was discovered that LIASA had a special group of LIS professionals interested in digital scholarship, so they would be able give guidance on the requirements of digital scholarship. Digital scholarship emanates from the interdisciplinary background, for instance IT, IS, computer science and software engineering were some of the fields that specialise in this area. Therefore, LIS academics must consult these fields when developing the curriculum to include digital scholarship. Benchmarking with other LIS schools that have advanced content on digital scholarship either national or international is also very important.

SAQA and the DHET in South Africa are considered key in endorsing curriculum development. Therefore, after developing the relevant curriculum on digital scholarship, LIS schools should submit it to SAQA and the DHET for endorsement and approval.

It is very important to consider procuring relevant infrastructure and resources when planning to teach digital scholarship content in the LIS curriculum. In the case of this study, the 4IR resources and infrastructure were cited as significant. LIS schools should procure resources that support the teaching of digital scholarship characterised by the IoT, AI, smart sensors, smart mobile devices, VR and wearables, data analytics, cybersecurity and cloud computing. These facilities would ensure that students understand the practical component of digital scholarship. These technological infrastructures will assist LIS students to understand the practicality of digital scholarship and prepare them for the job market.

For instance, IoT is used by most libraries for automation or optimising use of space and AI is used in the LIS profession to improve optical character recognition of text. Virtual reality and wearables are mostly used in the gaming section in the library and sometimes can used for conferencing purposes. 3D printers are used for arts and modelling in the library. Cloud computing has gained momentum in the LIS profession as a storage that can be accessed anywhere, and cybersecurity assist in ensuring preventative measures in the data or information stored in the cloud. GIS in libraries is mostly used to assess facility usage and the impact of library services in the university or community. Smart sensors generate relevant information for instance historical data for decision making, improve lighting and set reminders and alerts on renewals, maintenance and repairs. Adhering to this framework could result in LIS schools producing graduates with knowledge, skills and competencies on digital scholarship activities.

6.7   IMPLICATIONS OF THE STUDY

Leedy and Ormrod (2010) state that for research findings to be useful, they must be connected to the larger picture relating to what people already know about the topic in question. The findings of this study are expected to influence the LIS curriculum development with the view to improving practice in the LIS profession. As it stands, there is an outcry in the LIS job market that LIS schools produce poorly trained graduates when it comes to digital scholarship. It was recommended by previous studies that the curriculum should be recurriculated to include digital scholarship; however, there is no procedure or framework evident in the literature that would indicate how to embark on this recurriculation process. The implication is that should LIS schools follow the framework and the recommendations made in this study, LIS graduates would be sufficiently competent to perform digital scholarship activities. Lastly, the findings of this study will inform employers of the LIS graduates about which skills and knowledge to look for when employing the digital scholarship librarians and which training support they require. This study chiefly achieved the purpose as it proposed a framework that could be used by LIS schools in integrating digital scholarship into their curricula.

Failure to integrate digital scholarship into the LIS curriculum could results to LIS education being rendered irrelevantly to the job markets, resulting to high risk of unemployment of LIS graduates.

6.8   SUGGESTIONS FOR FURTHER RESEARCH

The study focused on the training and education of LIS professionals on digital scholarship in South Africa and makes suggestions for the future research in the area of digital scholarship in South Africa. The current study used a qualitative approach and triangulated the data collection tools. Although the results were yielded and the purpose of the study was achieved through this approach. Nonetheless in view of the limitations of the study and gaps of the study, future research may use a mixed methods approach to explore digital scholarship education in South Africa. Students enrolled LIS schools will have to be included in the quantitative phase to map the understanding of this concept among students before interviewing the academics.

Alternatively, a study that looks into skills and development opportunities and issues for academics in LIS schools on digital scholarship will have to be explored. This suggestion is based on the fact that most participants indicated that LIS schools lacked capacity in terms of offering digital scholarship training. In addition to that, since this study suggests a framework for the inclusion of digital scholarship in the LIS curriculum, it is proposed that a study be done that traces whether LIS schools have incorporated digital scholarship in their curriculum and how advanced the contents on digital scholarship are.

While conducting the literature review, there were gaps and limitation as far as the digital scholarship publications are concerned in Africa as a continent. Studies on digital scholarship education and training in LIS schools should be conducted and more frameworks around digital scholarship must be developed.

REFERENCES

Adams, JL & Gunn, KB. 2013. Keeping up with… digital humanities. *Keeping Up With.* Available at: http://www.ala.org/acrl/publications/keeping_up_with/digital_humanities (accessed 21 February 2020).

Ali, N & Bakhshi, SI. 2013. *Problems and prospects of LIS education in India with special reference to distance mode.* Available at: https://mafiadoc.com/problems-and-prospects-of-lis-education-in-india-bibliotheksportal_598fd5521723ddcc692f177f.html (accessed 7 February 20202).

Alemneh, DG, Hartman, CN & Hastings, SK. 2005. Meeting the demands of digital scholarship: challenges and opportunities. *Proceedings of the American Society for Information Science and Technology* 42 (1): 1-4.

Ahmed, V, Opoku, A & Aziz, Z (eds). 2016. *Research methodology in the built environment: a selection of case studies*. New York: Routledge.

Anney, VN. 2014. Ensuring the quality of the findings of qualitative research: looking at trustworthiness criteria. *Journal of Emerging Trends in Educational Research and Policy Studies* 5 (2): 272-281.

Asubiaro, TV & Badmus, MB. 2020. Collaboration clusters, interdisciplinarity, scope and subject classification of library and information science research from Africa: an analysis of Web of Science publications from 1996 to 2015. *Journal of Librarianship and Information Science* 00 (0): 1-17. https://doi.org/10.1177/0961000620907958.

Ayinde, L & Kirkwood, H. 2020. Rethinking the roles and skills of information professionals in the 4th industrial revolution. *Business Information Review* 37(4): 142-153.

Ballinger, C. 2008. Research justification. In LM Given (ed), *The SAGE encyclopedia of qualitative research methods.* Thousand Oaks, US: SAGE Publications: 913-914.

Banerjee, A & Chaudhury, S. 2010. Statistics without tears: populations and samples. *Industrial Psychiatry Journal* 19 (1): 60-65.

Baxter, P & Jack, S. 2008. Qualitative case study methodology: study design and implementation for novice researchers' qualitative case study methodology. *Study Design and Implementation* 13 (4): 544-559.

Bayne, S & Ross, J. 2014. *The pedagogy of the Massive Open Online Course (MOOC): the UK view. Available at: http://www.heacademy.ac.uk/resources/detail/elt/the_pedagogy_of_the_MOOC_UK_vi ew (accessed 15 July 2020).*

Beck, SE & Manual, K. 2008. *Practical research methods for librarians and information professionals.* New York: Neal- Schuman Publishers.

Beerkens, E. 2004. *Global opportunities and institutional embeddedness*: Higher Education Consortia in Europe and Southeast Asia. Enschede: CHEPS.

Blake, M, Gallimore, V & Radford, K. 2018. Space, scholarship and skills: building library strategy on new and emerging needs of the academic community. *Liber Quarterly* 21: 1-15.

Blaike, N. 2010. *Designing social sciences research*: *the logic anticipation*. 2nd ed. Cambridge: Polity Press.

Blaike, N & Priest, J. 2019. *Designing social research: the logic of anticipation*. 3rd ed. Cambridge: Polity Press.

Blankenship, DC. 2010. *Applied research and evaluation methods in recreation*. United States: Human Kinetics.

Blaxter, L, Hughes, C & Tight, M. 2001. *How to research*. 2nd ed. Philadelphia: Open University Press.

Bonn, M. 2014. Tooling up: scholarly communication education and training. *College & Research Libraries News* 75 (3): 132-135.

Borgman, CL. 2007. *Scholarship in the digital age*. Cambridge: MIT Press.

Borrego, A. 2015. Library and information education in Europe*: an overview. *BiD: textosuniversitaris de biblioteconomia I documentacio* 35 (December). Available at: http://bid.ub.edu/en/35/borrego.htm (accessed 31 January 2019).

Boot, NB & Beile, P. 2005. Scholars before researcher: on the centrality of the dissertation literature review in research preparation. *Educational Researcher* 34 (6): 3-15.

Brancati, D. 2018. *Social scientific research*. Los Angeles: Sage.

Braun, V & Clarke, V. 2006. Using thematic analysis in psychology. *Qualitative Research in Psychology* 3(2): 77-101.

Braun V, & Clarke V. 2012. Thematic analysis, in *APA handbook of research methods in psychology* edited by H Cooper, 2 (Research designs). Washington (DC): American Psychological Association: 57-91.

Braun, V & Clarke, V. 2019. Reflecting on reflective thematic analysis. *Qualitative Research in Sport, Exercise and Health* 11 (4): 589-597.

Bret, C, Phillip, E, & Kathy, R. 2015. *Digital humanities: librarian survey results.* Gale, Cencage learning and American library magazine. Available at: http://americanlibraries magazine.org/wp-content/uploads/2016/01/digital-humanities-faculty.pdf (accessed 9 March 2021).

Brink, H, Van der Walt, C & van Rensburg, G. 2012. *Fundamental of research methodology for healthcare professionals.* 3rd ed. Claremont: Juta & Company Ltd.

Bryman, A. 2007. Barriers to integrating quantitative and qualitative research. *Journal of Mixed Methods Research* 1(1): 8-22.

Bryman, A. 2012. *Social research methods*. 4th ed. New York: Oxford University Press.

Buchanan, DA & Bryman, A. 2007. Contextualizing methods choice in organizational research. *SAGE recommendation* 10 (3): 483-501.

Buchanan, S .2013. Accessioning the digital humanities. *Digital Humanities Quarterly* 4(1): 1-11. Available at: http://digitalhumanities.org:8080/dhq/vol/4/1/000084/000084.htm (accessed 12 March 2021).

Burnett, P. 2013. *Challenges and problems of library and information science education in selected African countries: creative commons attribution 3.0*. Available at: http://creative commons.org/licenses/by/3.0/ (accessed 31 January 2019).

Burton S. 2019. Future skills for the LIS profession. *Online Searcher* 43 (2): 42-45. Available at: https://www.infotoday.com/OnlineSearcher/Articles/Features/Future-Skills-for-the-LISProfession-130296.shtml (accessed 15 January 2021).

Carter, D. 2016. Demonstrating a commercial mindset: the 2016 business information survey. *Business Information Review* 33 (1): 9-18.

Chadwick, BA, Bahr, HM & Albrecht, SL. 1984. *Social science research methods.* New Jersey: Prentice-Hall.

Charmaz, K. 1995. Between positivism and postmodernism: implications for methods. *Studies in Symbolic Interaction* 17 (2): 43-72.

Chaturvedi, S, Purohit, S & Verma, M. 2021. Effective teaching practices for success during Covid-19 pandemic: towards phygital learning. *Frontiers in Education* 6 (646557): 1-10.

Chisita, C. 2009. *Future librarians in southern Africa: case of Zimbabwe*. IFLA Online. Available at: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.150.8609&rep= rep1&type=pdf (accessed 16 August 2018).

Choi, Y & Rasmussen, E. 2009. What qualifications and skills are important for digital librarian positions in academic libraries? a job advertisement analysis. *The Journal of Academic Librarianship* 35 (5): 457-467.

Clarke, G & Lunt, I. 2014. The concept of 'originality' in the PhD: how is it interpreted by examiners? *Assessment & Evaluation in Higher Education* 39 (7): 803-820.

Cloete, LM. 2005. The education and training of cataloguing students in South Africa through distance learning. *Cataloguing & ClassificationQuarterly* 41 (4): 53-69.

Cohen, L, Manion, L & Morrison, K. 2000. *Research methods in education*. 5th ed. New York: Rougledge/Falmer.

Cohen, L, Manion, L & Morrison, K. 2011. *Research methods in education*. London: Routledge

Cohen, L, Manion, L & Morrison, K. 2018. *Research methods in education*. 8th ed. New York: Routledge.

Collier, P. 2005. The Collier-Hoeffler model of civil war onset and the case study project research design, in *Understanding civil war: Evidence and analysis* edited by P Collier & N Sambanis, 1 (Africa). Washington, DC: World Bank 1-33.

Collins, L. 2017. *Library digital heritage and humanities collections (DHHC)*. Tampa, FL: University of South Florida.

Commonwealth of Learning. 2020. *Sustainable development and education in the Fourth Industrial Revolution (4IR)*. Available at: http://creativecommons.org/licenses/by-sa/4.0 (accessed 17 October 2021).

Connaway, LS. 2015. *The library in the life of the user: engaging with people where they live and learn*. Dublin, OH: OCLC Online Computer Library Center, Inc.

Connaway, LS & Radford, ML. 2017. *Research methods in libraries and information science*. 6th ed. Santa Barbara: Libraries Unlimited.

Council on Library and Information Resources & Digital Library Federation. 2013. *CLIR/DLF postdoctoral fellowships in data curation for the sciences and social sciences.* Available at: www.clir.org/fellowships/postdoc/applicants/dc-science (accessed 20 August 2019).

Cox, J. 2016. Communicating new library roles to enable digital scholarship: a review article. *New Review of Academic Librarianship* 22 (2-3): 132-147.

Craft, AR. 2018. Digital scholarship planning: a perspective on the CNI-ARL workshop. *Series Review* 44 (1): 64-70

Creswell, JW. 1994. *Research design: qualitative and quantitative approaches.* Thousand Oaks, CA: Sage Publications Inc.

Creswell, JW. 2003. Research design: *qualitative, quantitative, and mixed methods approaches.* 2nd ed. Thousand Oaks, CA: Sage.

Creswell, JW, Plano Clark, VL, Gutmann, ML & Hanson, WE. 2003. Advanced mixed methods research designs. In A Tashakkori & C. Teddlie (eds.), *Handbook of mixed methods in social and behavioural research*. Thousand Oaks, CA: Sage: 209-240.

Creswell, JW. 2009. *Research design*. 3rd ed. Los Angeles: Sage.

Creswell, JW. 2013. *Research design qualitative, quantitative, and mixed method*. 3rd ed. Thousand Oaks, CA: SAGE Publications.

Creswell, JW. 2014. *Research design: qualitative, quantitative and mixed approaches.* 4rd ed. Los Angeles: Sage.

Creswell, JW & Creswell, JD. 2018. *Research design: qualitative, quantitative, and mixed methods approaches*. 5thed. Los Angeles: Sage.

Creswell, JW & Guetterman, TC. 2018. *Education research: planning, conduction, and evaluating quantitative and qualitative research*. 6th ed. New York: Pearson Education, Inc.

Creswell, JW & Zhang W. 2009. The application of mixed method designs to trauma research. *Journal of Traumatic Stress* 22(6): 612-621.

Crow, R. 2002. *The case for institutional repositories: a SPARC position paper*. Washington, DC: Scholarly Publishing and Academic Resources Coalition.

Curry, A. 2000. Canadian LIS education: trends and issues 1. *Education for Information* 18 (4): 325-337.

Dahl, M. 2018. Inside-out library services: challenging the "jacks of all trades but masters of none" librarian syndrome. *Advances in Library Administration and Organization,* 39 (Emerald Publishing Limited): 15-34.

Daniel, PS, & Sam, AG. 2011. *Research methodology*. New Delhi: Gyan Publishing House.

Davies, MB. 2007. *Doing a successful research project using the qualitative and quantitative methods*. London: Palgrave MacMillan.

Deloitte. 2018. *Preparing tomorrow's workforce for the Fourth Industrial Revolution for business: a framewok for action*. Available at: https://www2.deloitte.com/ content/dam/Deloitte/global/Documents/About-Deloitte/gx-preparing-tomorrow-workforce-for-4IR.pdf (accessed 8 Novemver 2021).

Denzin, NK & Lincoln, YS. 2005. Introduction: the discipline and practice of qualitative research, in Denzin, NK & Lincoln, YS (eds.). *The SAGE handbook of qualitative research*. 3rd ed. Thousand Oaks: Sage 1- 32.

Denzin, NK & Lincoln, YS. 2011. *The Sage handbook of qualitative research*. Thousand Oaks: Sage.

Department of Arts & Culture. 2014. *The Library and Information Services (LIS) transformation charter*. Available at: http://www.nlsa.ac.za/Downloads_01/2014_Final_LIS_Transformation_Charter.pdf (accessed 21 August 2018).

Drucker, J, Kim, D, Salehian, I & Bushong, A. 2014. *Introduction to digital humanities: course book: concepts, methods, and tutorials for students and instructors*. UCLA. Available at: http://dh101.humanities.ucla.edu/wp-content/uploads/2014/09/ Introduction ToDigitalHumanities_Textbook.pdf (accessed 20 February 2020).

Du Preez, J. 2019. *The 4th industrial revolution in Africa: the next great frontier*. Available at: https://www.inonafrica.com/2019/06/24/the-4th-industrial-revolution-in-africa-the-next-great-frontier/ (accessed 28 August 2019).

Duncan, I, Miller, A & Jiang, S. 2012. A taxonomy of virtual worlds usage in education. *British Journal of Educational Technology* 43 (6): 949-964.

Economist Intelligence Unit. 2008. *The economist intelligence unit's index of democracy 2008*. Available at: https://graphics.eiu.com/PDF/Democracy%20Index%202008.pdf (accessed 20 April 2019).

Edegbo, WO. 2011. Curriculum development in LIS education in Nigerian universities: Issues and prospects. *Library Philosophy & Practice* 34 (1): 34-54.

Elo, S & Kyngäs, H. 2008. The qualitative content analysis process. *Journal of Advanced Nursing* 62 (1): 107-115.

Erway, R & Schaffner, J. 2014. *Does every research library need a digital humanities center*? Available at: http://digital.library.unt.edu/ark:/67531/metadc272207/m2/1/high _res_d/oclcresearch-digital-humanities-center-2014.pdf (accessed on10 March 2021).

Estlund, K. 2013. *Fisrt steps towards digital scholarship center.* Available at: https://vdocuments.mx/first-steps-toward-a-digital-scholarship-center.html (accessed 24 February 2020).

European Commission. 2014. Report to the European commision on new modes of learning and teaching in higher education. Available at: http://portal3.ipb.pt/images/icm/1.2_2014_modernisation_en.pdf (accessed 10 June 2020)

Ferguson, R, Barzilai, S, Ben-Zvi, D, Chinn, CA, Herodotou, C, Hod, Y, Kali, Y, Kukulska-Hume, A, Kupermintz, H, McAndrew P, Rienties, B, Sagy, O, Scanlon, E, Sharples, M, Weller, M & Whitelock, D. 2017. *Innovative pedagogy 2017*: *Open University innovation report 6.* Milton Keys: The Open University.

Finlay, C, Tsou, A & Sugimoto, C. 2015. Scholarly communication as a core competency: prevalence, activities, and concepts of scholarly communication librarianship as shown through job advertisements. *JLSC publications* 3(1): 12-36.

Finn, JA. 2005. *Getting a PhD: an action plan to help manage your research, your supervisor and your project*. New York: Routledge.

Flick, U. 2009. *An introduction to qualitative research*. 4th ed. London: Sage.

Flick, U. 2014. *An introduction to qualitative research*. 5th ed. London: Sage.

Flick, U. 2015. *Introducing research methodology*. 2nd ed. London: Sage.

Flick, U. 2018. *The Sage handbook: qualitative data collection.* London: Sage.

Gall, MD, Gall, JP & Borg, WR. 2003. *Educational research: an introduction.* 7th ed. Boston, MA: Pearson.

Gerolimos, M. 2009. Skills developed through library and information science education. *Library Review* 58 (7): 527-540.

Getty Research Institute. 2008. *Introduction to metadata*. 2nd ed. Los Angeles: Getty Research Trust.

Goh, P & Sandars, J. 2019. Digital scholarship: rethinking educational in the digital world. *MedEdpublish* 8 (2): doi: https://doi.org/10.15694/mep.2019.000085.1

Gorman, M. 2002. Why teach cataloguing and classification? *Cataloguing & Classification Quarterly* 34 (1-2): 1-13.

Gorman, M. 2004. Authority control in the context of bibliographic control in the electronic environment.*Cataloguing & Classification Quarterly* 38 (3/4): 11-22.

Goulding, C. 2002. *Grounded theory: a practical guide for management, business and market research*. London: Sage.

Grant, MJ & Booth, A. 2009. A typology of reviews: an analysis of 14 review types and associated methodologies. *Health Information and Libraries Journal* 26 (2): 91-108.

Grant, C & Osanloo, A. 2014. Understanding, selecting, and integrating a theoretical framework in dissertation research: creating the blueprint for your "house". *Administrative Issues Journal Education Practice and Research* 4 (2): 12-26.

Green, HE. 2014. Use of theoretical and conceptual frameworks in qualitative research. *Nurse Researcher* 21 (6): 34-38.

Greene, JD & Roberts, W. 2018. From GIS to UAVs: emerging opportunities for drone support services in academic libraries. *Public Services Quarterly* 14 (3): 255-264.

Greener, S. 2008. *Business research methods*. England: Dr. Sue Greener & Ventu Publishing ApS.

Grix, J. 2004. *The foundations of research*. New York, NY: Palgrave Macmillan.

Guba, EG. 1981. Criteria for assessing the trustworthiness of naturalistic inquiries. *Educational Communication and Technology* 29 (2): 75-91.

Gullbekk, E. 2016. Apt information literacy? a case of interdisciplinary scholarly communication. *Journal of Documentation* 72 (4): 716-736.

Gupta, S & Gupta, DK. 1997. Brief communication development of Library and Information Science education in Africa. *International Information & Library. Review* 29 (1): 95-107.

Gustafsson, J. 2017. Single case studies vs. multiple case studies: a comparative study. *Academy of Business, Engineering and Science Halmstad University, Sweden*, 15. Available at: http://www.diva-portal.org/smash/get/diva2:1064378/FULLTEXT01.pdf. (accessed 23 June 2018).

Heimburger, F & Ruiz, E. 2012. Has the Historian's craft gone digital? Some observations from France. *Diacronie* 10(2): 2-24.

Harris-Pierce, RL & Quan, LY. 2012. Is data curation education at library and information science schools in North America adequate? *New Library World* 113(11): 598-613.

Hensley, MK & Bell, SJ. 2017. Digital scholarship as a learning center in the library: building relationships and educational initiatives. *College & Research Libraries* 78(3). Available at: https://crln.acrl.org/index.php/crlnews/article/view/9638/11064 (accessed 16 March 2021).

Henning, E, Van Rensburg, W & Smit, B. 2004. *Finding your way in qualitative research.* Pretoria: Van Schaik Publishers.

Hirsh, S, Simmons, MH, Christensen, P, Sellar, M, Stenström, C, Hagar, C, Bernier, A, Faires, D, Fisher, J & Alman, S. 2015. International perspectives in LIS education: global education, research, and collaboration at the SJSU School of Information. *Journal of Education for Library and Information Science* 56 (1): 27-46.

Hunt, R. 2013. African American leaders in the library profession: little known history. *Black History Bulletin* 76 (1): 14-19.

Jabareen, Y. 2009. Building a conceptual framework: philosophy, definitions, and procedure. *International Journal of Qualitative Methods* 8 (4): 49-62.

Jacobs, AHM. 2016. Using a theoretical framework of institutional culture to analyse an institutional strategy document. *Education as Change* 20 (2): 204-220.

Jariya, AMI. 2015. Comprehensive account of the philosophical underpinning of distinct research methodologies. *EPRA International Journal of Economic and Business Review* 3 (11): 64-76.

Joseph, K. 2019. *Summary notes: review of digital scholarship needs assessments and case examples*. Available at: https://ds-york.pubpub.org/pub/g04y9chj (accessed 5 February 2020).

Johnson, RB & Christensen, L. 2014. *Educational research: quantitative, qualitative and mixed approaches*. 5th ed. Los Angeles: Sage.

International Federation Associations & Institutions (IFLA). 2015. *Annual report 2015: IFLA global voices of libraries.* Available at: https://www.ifla.org/files/assets/hq/annual-reports/2015.pdf (accessed 12 March 2019).

Iqbal, BA & Yadav, A. 2021. Fourth industrial revolution: its role and contribution in employment generation and skills development. *Journal of Global Economy, Trade and International Business* 1(1): 85-96.

Kahn, M, Higgs, R, Davidson, J & Jones, S. 2014. Research data management in South Africa: how we shape up. *Australian Academic and research Libraries* 45 (4): 296-308.

Kajberg, L. 2002. Cross-country partnerships in European library and information science: education at the crossroads. *Library Review* 51 (3/4): 164-170.

Kaur, T. 2015. Challenges and concerns for library and information science (LIS) education in India and South Asia. *Journal of Education for Library and Information Science* 56 (1): 6-16.

Kaushik, V & Walsh, CA. 2019. Pragmatism as a research paradigm and its implications. *Social Sciences* 8 (9): 255. doi: 10.3390/socsci8090255

Keywell, B. 2017. *The fourth industrial revolution is about the empowerment of people, not the rise of the machines.* Available at: https://www.weforum.org/agenda/2017/06/the-fourth-industrial-revolution-is-about-people-not-just-machines/ (accessed 20 November 2019).

Khan, SA & Bhatti, R. 2012. A review of problems and challenges of library profession in developing countries including Pakistan. *Library Philosophy and Practice* (e-journal):

757. Available at: http://digitalcommons.unl.edu/libphilprac/757 (accessed 31 January 2019).

Kiger, ME & Varpio, L. 2020. Thematic analysis of qualitative data: AMME guide no. 131. *Medical Teacher* 42 (8): 846-854.

Kinash, S, Knight, D & McLean, M. 2015. Does digital scholarship through online lectures affect student learning? *Journal of Educational Technology & Society* 18 (2): 129-139.

King, M. 2018. Digital scholarship librarian: what skills and competences are needed to be a collaborative librarian. *International Information & Library Review* 50 (1): 40-46.

Klein, JT. 2010. *Creating interdisciplinary campus cultures: a model for strength and sustainability*. San Francisco, CA: Jossey-Bass.

Koehl, ED, Green, H, Henley, A & Heidenwolf, T. 2019. Empowering librarians to support digital scholarship research: professional development training on text analysis with the HathiTrust. Recasting the Narrative: *The Proceedings of the ACRL 2019 Conference*.

Korstjens, J & Moser, A. 2017. Practical guidance to qualitative research, part 4: trustworthiness and publishing. *European Journal of General Practice* 24 (1): 120-124.

Koya, MU & Gopakumar, V. 2018. Information technology skills required for library professionals in digital era: an introspection. *Information Technology* 8 (1): 43-50.

Kumar, K & Sharma, J. 2010. Library and Information Science education in India historical perspective. *Journal of Library & Information Technology* 30 (5): 3-8.

Kumar, R. 2014. *Research methodology*. 4th ed. New Delhi: Sage.

Laal, M, Laal, A & Aliramaei, A. 2014. Continuing education: lifelong learning. *Procedia-social and behavioural sciences* 116 (2014): 4052-4056.

Land, B, Henderson, D & Weihs, H. 2004. A history of education for library and information studies in Canada. *Ex Libris Association Newsletter,* (Summer): 1-39.

Leavy, P. 2017. *Research design: quantitative, qualitative, mixed methods, arts-based, and community-based participatory research approach*. New York: The Guilford Press.

Leedy, PD & Ormrod, JE. 2010. *Practical research: planning and design.* 9th ed. New Jersey: Pearson.

Leedy, PD & Ormrod, JE. 2013. *Practical research planning and design*. 10th ed. New Jersey:Pearson education Inc., Publishing.

Leedy, PD, Ormrod, JE & Johnson, LR. 2021. *Practical research: planning and design*. 12th ed. Harlow: Pearson Education Limited.

Lekhanya, LM. 2019. *Public outlook on creative methodologies for the 4th industrial revolution in South Africa*. Available at: https://www.abacademies.org/articles/public-outlook-on-creative-methodologies-for-the-4th-industrial-revolution-in-south-africa-8514.html (accessed 15 January 2020).

Lewis, V, Spiro, L, Wang, X & Cawthorne, JE. 2015. *Building expertise to support digital scholarship: a global perspective*. Washington: Council on Library and Information Resources.

Liang, X. 2018. Internet of Things and its applications in libraries: a literature review. *Library Hi Tech* 38 (1): 67-77.

Liang, X & Chen, Y. 2018. Libraries in Internet of Things (IoT) era. *Library Hi Tech* 38 (1): 79-93.

Lincoln, YS & Guba, EG. 1985. *Naturalistic inquiry*. Beverly Hills: Sage

Lincoln, YS, Lynham, SA & Guba, EG. 2011. Paradigmatic controversaries, contradiction, and emerging confluence. In N Denzin & YS Lincoln (eds.), *The Sage handbook of qualitative research.* Thousand Oaks, CA: Sage: 97-128.

Lippincott, SK. 2017. *Digital scholarship at Harvard: current practices, opportunities and way forward*. Available at: https://projects.iq.harvard.edu/files/dsi/files/harvard_ds_final-report_20170627_v2.pdf (accessed 5 February 2020).

Longmeier, MM & Murphy, SA. 2021. Framing outcomes and programming assessments for digital scholarship services. *College & Research Services* 82 (2): 142-157.

Lowe, A. 2001. Methodology, method and meaning in field research: intensive versus extensive research styles in management accounting. *Department of Accounting Working Paper Series,* 71. Hamilton, New Zealand: University of Waikato.

Luce, RE. 2008. *A new value equation challenge: the emergence of eResearch and roles for research libraries*. Available at: http://www.clir.org/pubs/reports/pub142/luce.html (accessed 10 April 2018).

Luo, L, Brancolini, KR & Kennedy, MR. 2017. *Enhancing library and information research skills: a guide for academic librarians*. Santa Barbara: Libraries.

Mack, L. 2010. The philosophical underpinnings of educational research. *Polyglossia* 19 (1): 1-11.

Mahapatra, G. 2006. *LIS education in India: emerging paradigms, challenges and propositions in the digital era*. India: School of Communication & Information, Nanyang Technological University. Available at: http://hdl.handle.net/10150/106109 (accessed 15 February 2020).

Malhan, IV. 2011. Challenges and problems of library and information education in India: an emerging knowledge society and the developing nations of Asia. *Library Philosophy and Practice* (ejournal): 670: doi https://digitalcommons.unl.edu/libphilprac/670.

Maluleka, JR & Onyancha, OB. 2016. Research collaboration among library and information science schools in South Africa (1991 – 2012): an informetrics study. *Mousaion* 34 (3): 36-59.

Manda, PA. 2006. *State of ICTs in LIS curriculum in Tanzania*. Paper presented at the IFLA workshop on integrating ICTs in LIS curriculum in Africa, 21-23 November, Windhoek Namibia**.**

Mann, L. 2019. Information literacy and instruction: making a place for makerspaces in information literacy. *Reference & User Services Quarterly* 58 (2): 82-86.

Mantoya, RD. 2017. Boundary object/ boundary staff supporting digital scholarship in academic libraries. *Journal of Academic Librarianship* 43 (3): 216-223.

Mardiana, H. 2019. Social media in higher education and its effect on global challenge. *Indonesian Journal of Learning and Instruction* 2 (1): 35-46.

Maree, K. 2016. *First steps in research.* 2nd ed. Pretoria: Van Schaik Publishers.

Marr, B. 2018. The 4th industrial revolution is here: are you ready? *Forbes.* Available at: https://www.forbes.com/sites/bernardmarr/2018/08/13/the-4th-industrial-revolution-is-here-are-you-ready/?sh=74a62a8a628b (accessed 10 January 2021).

Masenya, TM & Ngulube, P. 2019. Digital presevation in academic libraries in South Africa in the wake of digital revolution. *South African Journal of Information Management* 21 (1): 1-9. Avalable at: http://www.scielo.org.za/scielo.php?script=sci_arttext&pid= S1560-683X2019000100005 (accessed 10 October 2021).

Mathews, JM & Pardue, H. 2009. The presence of IT skill sets in librarian position announcements. *College & Research Libraries* 70(3): 250-257.

Mahlatse, R, Pienaar, H & Van Deventer, M. 2018. Mobilising a nation: RDM training and education in South Africa. *eResearch conference* 12 (2). Available at: http://www.ijdc.net/article/view/579/507 (accessed 4 March 2020).

Matusiak, KK, Stansbury, M & Barczyk, E. 2014. Educating a new generation of library and information science professionals: a united states perspective. *Przeglad Bibioteczny/Library Review* 82 (2): 189-206.

Mbagwu, FC, Okoye, IB & Anyanwu, IA. 2018. Pedagogy in library and information science programme in Nigeria. *Library Philosophy and Practice*: 1-23. Available at: https://search.ebscohost.com/login.aspx?direct=true&db=lls&AN=133862836&site=eds-live&scope=site (accessed 13 May 2021).

McCullough, H. 2014. Developing digital scholarship services on a shoestring: facilities, events, tools, and projects. *College & Research Libraries* 75 (4): 187-190.

Mertens, DM. 2009. *Transformative research and evaluation*. New York: Guilford

Mhlongo, MA. 2018. *Integration of indigenous knowledge into the services of public libraries in South Africa.* D Ed thesis, University of South Africa, Pretoria.

Miles, MB, Huberman, AM & Saldana, J. 2014. *Qualitative data analysis: a methods sourcebook*. 3rd ed. Thousand Oaks, CA: Sage

Miller, A. 2017. A case study in institutional repository content curation. *Digital Library Perspectives* 33 (1): 63-76.

Minishi-Majanja, MK. 2007. Integration of ICTs in library and information science education in sub-Saharan Africa. *World library and information congress: 73rd IFLA general conference and council* 19-23.

Minishi-Majanja, MK & Ocholla, DN. 2004. Auditing of information and communication technologies in library and information science education in Africa. *Education for Information* 22 (3-4): 187-221.

Miwa, M. 2006. Trends and issues in LIS education in Asia. *Journal of Education for Library and Information Science* 47 (3):167-180.

Mouton, J. 2001. *How to succeed in your master's and PhD studies, a south African guide and resource book*. Pretoria: Van Schaik.

Mulligan, R. 2016. *Supporting digital scholarship, SPEC Kit 350*. Available at: https://publications.arl.org/Supporting-Digital-Scholarship-SPEC-Kit-350/ (accessed 22 February 2020).

Munyoro, P. 2014. *Library and information science education and training in Zimbabwe and the paradigm shift in the information industry*. D.Ed. thesis, University of KwaZulu-Natal, Durban.

Musiker, R. 1986. *Companion to South African libraries*. Craighall: Ad. Donker.

Muthu, M, Sivaraman, MAP & Singh, K. 2015. LIS education: issues and challenges in the present era. *Gyankosh-The Journal of Library and Information Management* 6 (1): 46-60.

Mutula, SM & Tsvakai, M. 2002. Historical perspectives of cataloguing and classification in Africa. *Cataloguing & Classification Quarterly* 35 (1-2): 61-77.

Mutula, SM. 2009. Designing the digital experience: how to use experience design tools and techniques to build websites customers love. *Online Information Review* 33(3): 616-617.

Mutula, SM. 2011. Challenges of postgraduate research: case of developing countries. *South African Journal of Libraries & Information Science* 77(1): 184-190.

Namande, B. 2012. *Digitization of archival records: the Kenya national archives and documentation service experience*. Paper presented at the 2nd International Conference on African Digital Libraries and Archives (ICADLA-2), 14-18 November, University of Witwatersrand, Johannesburg.

National Committees for Research Ethics in Norway. 2006. *Research ethics for social sciences law and humanities*. Available at: https://graduateschool.nd.edu/assets/21765/

guidelinesresearchethicsinthesocialscienceslawhumanities.pdf (accessed 24 August 2018).

Neuman, WL. 2006. *Social research methods: qualitative and quantitative approaches.* 6th ed. Boston: Pearson.

Neuman, WL. 2014. *Social research methods: qualitative and quantitative approaches.* 7th ed. Harlow: Pearson Education Limited.

Ngoepe, MS. 2012. *Fostering a framework to embed the records management function into the auditing process.* D Ed thesis, University of South Africa, Pretoria.

Ngulube, P. 2015a. Qualitative data analysis and interpretation: systematic search for meaning. In ER Mathipa & MT Gumbo (eds.), *Addressing research challenges: making headway for developing researchers.* Noordywk: Mosala-MASEDI Publishers & Booksellers cc: 131-156.

Ngulube, P. 2015b. Trends in research methodological procedures used in knowledge Management Studies (2009-2013). *African Journal of Library, Archives and Information Science* 24 (2): 125-143.

Ngulube, P. 2018. Overcoming the difficulties associated with using conceptual and theoretical frameworks in heritage studies. In P Ngulube (ed.), *Handbook of Research on Heritage Management and Preservation.* Hershey, PA: IGI Global. 1-23.

Ngulube, P. 2020. The movement of mixed methods research and the role of information science professionals. In P Ngulube (ed.), *Handbook of Research on Connecting Research Methods for Information Science Research,* PA: IGI Global 404-455.

Ngulube, P & Ukwoma, SC. 2019. Mapping supervision trends in doctoral research in library and Information science in Nigeria and South Africa: implications for collective learning. *African Journal of Library, Archives and Information Science* 29 (1): 1-16.

Nieuwenhuis, J. 2007. Qualitative research designs and data gathering techniques. In M Mare (ed.), *First steps in research.* Pretoria: Van Schaik Publishers 69-97.

Nonthacumjane, P. 2011. Key skills and competencies of a new generation of LIS professionals. *IFLA journal* 37 (4): 280-288.

Normore, LF. 2013. Here be dragons: a wayfinding approach to teaching cataloguing. *Cataloguing and Classification Quarterly* 50 (2-3): 172-188.

Nowviskie, B. 2013. Skunks in the library: a path for production for scholarly. *R & D. Journal of Library Administration* 53 (1): 53-66.

O'Brien, L. 2010. Innovation and information infrastructure: making sound investments for e-research. ECAR Res. *Bull* 22 (1): 1-12.

Ocholla, DN. 2000. *Review and revision of library and information science curriculum in a South African university and the usage of follow-up study and advertisement scanning methods.* Available at: https://www.researchgate.net/publication/228598711_Review _and_revision_of_library_and_information_science_curriculum_in_a_South_African_ university_and_the_usage_of_follow-up_study_and_advertisement_scanning (accessed 18 April 2018).

Ocholla, DN. 2005. An analysis of the job market in library and information services in South Africa: some thoughts and empirical evidence. Paper presented *9th LIASA annual conference*, 25-30 Seputember, Nelprut, Mpumalanga.

Ocholla, DN & Bothma, T. 2007. Library and information education and training in South Africa. In T. Bothma, P. Underwood & P. Ngulube, *Libraries for the future: progress and development of South African libraries*. Pretoria: LIASA: 149-168.

Ocholla, DN & Ocholla, L. 2014. Cataloguing and classification education (CCE) and training in library and information science/studies departments in South Africa. *South Africa Journal Library Information Science* 80(1): 1-7.

Ocholla, DN, Ocholla, L, Olson, HA, Glover, JR & Guimarães, JA. 2015. Cataloguing and classification education and training in library and information science/studies in South Africa, Brazil and USA. *African Journal Library Archives & Information Science* 25(1): 15-27.

Ocran, TK & Afful-Arthur, P. 2021. The role of digital scholarship in academic libraries, the case of university of cape coast: opportunities and challenges. *Library Hi Tech*. Available at: https://doi.org/10.1108/LHT-09-2020-0238 (accessed 20 June 2021).

Ofulla, AV. 2013. *The secrets of hidden knowledge: how understanding things in the physical realm nurtures life.* Bloomington: Abbott Press.

Ogburn, J. 2012. The movement to change scholarly communication has come a long way: how far might it go? *Journal of Librarianship and Scholarly Communication* 1(1): eP1041. http://dx.doi.org/10.7710/2162-3309.1041.

Onyancha, OB & Minishi-Majanja, MK. 2009. Trends and development of LIS education and training in sub-Saharan Africa. In I Abdullahi & München: K.G. *Global library and information science: a handbook for students and educators,* Saur Verlag (IFLA Publications Series): 108-132.

Orme, V. 2008. You will be…: a study of job advertisements to determine employers' requirements for LIS professionals in the UK in 2007. *Library Review* 57 (8): *619-633*.

Otike, J. 2012. Library and Information Science education in anglophone Africa: past, present and future. *Inkanyiso, Journal of Human & Social Science* 9 (1): 66-74.

Palmer, BI. 1959. Education and training of librarians in the newly developing British commonwealth countries. *Library Trends* 8 (1): 229-242.

Parahoo, K. 2006. *Nursing research: principles, process and issues*. Palgrave Macmillan: Basingstoke.

Partridge, H & Yates, C. 2012. A framework for the education of the information professions in Australia. *Australian Library Journal* 61(2): 14-25.

Partridge, HL & Hallam, GC.2004. The double helix: a personal account of the discovery of the structure of the information professional's DNA, in *ALIA 2004 Biennial Conference: challenging ideas,* edited by J Schmidt. Australia: ALIA: 1-9.

Patton, MQ. 1990. *Qualitative evaluation and research methods*. 2nd ed. Newbury Park: Sage

Patton, MQ. 2002. Qualitative interviewing. *Qualitative research and evaluation Methods* 3 (1): 344-347.

Penprase, BE. 2018. The fourth industrial revolution and higher education. In NW Gleason (ed.), *Higher education in the era of the fourth industrial revolution*. Singapore: Palgrave Macmillan: 207-229.

Perri, 6 & Bellamy, C. 2012. *Principles of methodology: research design in social science.* London: Sage.

Peters, MA. 2017. Technology unemployment: education for the fourth industrial revolution. *Education Philosophy and Theory* 49 (1): 1-6.

Pickard, AJ. 2007. *Research methods information*. London: Facet publishing.

Pienaar, H. 2007. *Digital scholarship & the role of the university library*. Available at: https://repository.up.ac.za/bitstream/handle/2263/4133/UBdigitalscholarship07.pdf?sequence=3 (accessed 10 August 2021).

Pinfield, S, Cox, A & Rutter, S. 2017. *Mapping the future of academic libraries: a report for SCONUL*. Available at: https://sconul.ac.uk/sites/default/files/documents/SCONUL%20Report%20Mapping%20the%20Future%20of%20Academic%20Libraries.pdf (accessed 10 January 2021).

Phillimore, J & Goodson, L (eds). 2004. Progress in qualitative research in tourism: epistemology, ontology and methodology. In J Phillmore & L Goodson (eds.), *Qualitative research in tourism*. London: Routledge: 3-29.

Poetschke, F. 2003. *The research project*. Available at: http://uncontrolled.info/Materialien/Essays/Research%20II.pdf (accessed 20 March 2018).

Poole, AH. 2017. The conceptual ecology of digital humanities. *Journal of Documentation* 73 (1): 91-122.

Pope, C & Mays, N (eds). 2020. *Qualitative research: in health care*. 4th ed. Hoboken: Wiley Blackwell.

Poschin-Young, M, Haines-Young, R, Görg, C, Heink, U, Jax, K & Schleyer, C. 2018. Understanding the role of conceptual frameworks: reading the ecosystem service cascade. *Ecosystem Services* 29 (2018): 428-440.

Powell, RR & Connaway, LS. 2004. *Basic research methods for librarians*. 4th ed. Westport: Libraries Unlimited.

Pugh, DS & Phillips, EM. 2005. *How to get a PhD: handbook for students and their supervisors*. 4th ed. Berkshire: Open University Press.

Raffaghelli, JE. 2017. Exploring the (missed) connections between digital scholarship and faculty development: a conceptual analysis. *International Journal of Educational Technology in Higher Education* 14 (1): 1-20.

Rajasekar, S, Philominathan, P & Chinnathambira, V. 2013. *Research methodology*. Available at: https://arxiv.org/pdf/physics/0601009.pdf (accessed 9 May 2019).

Raju, J. 2003. LIS education and training in South Africa: a historical review. *South African Journal of Libraries and Information Science* 71 (1): 74-84.

Raju, J. 2013. The LIS school in the ICT age: a casualty, or a catalyst for a paradigm shift? – the case of South Africa. *International Journal of Libraries and Information Studies* 63 (3): 250-258.

Raju, J. 2014. Knowledge and skills for the digital era academic library. *Journal of Academic Librarianship* 40 (2): 163-170.

Raju, J. 2015. LIS education in the digital age for an African agenda: library and information services in Africa in the twenty first century. *University of Illinois* 64 (1): 161-177.

Raju, J. 2017a. Information professional or IT professional: the question of the extent of the IT knowledge and skills required by academic librarians in the digital library environment. *Libraries and academy* 17 (4): 739-757.

Raju, J. 2017b. *LIS professional competency index for the higher education sector in South Africa*. Cape Town: University of Cape Town Libraries.

Randolph, JJ. 2009. A guide to writing the dissertation review: practical assessment, research and evaluation. *Practical Assessment, Research, and Evaluation* 14 (13): 1-13.

Rehman, AA & Alharthi, K. 2016. An introduction to research paradigms. *International Journal of Educational Investigations* 3 (8): 51-59.

Rhoades, EA. 2011. Literature reviews. *Volta Reviews* 111 (3): 353-368.

Richards, K. 2003. *Qualitative inquiry in TESOL*. New York, NY: Palgrave Macmillan.

Richards, JC. 2007. *Curriculum development in language teaching*. New York: Longman.

Richardson, JV. 2010. *History of American library science: its origins and early development*. Available at: https://pages.gseis.ucla.edu/faculty/richardson/ALS.pdf (accessed 12 July 2019).

Ridge, M. 2018. *Some challenges and opportunities for digital scholarship in 2018*. Available at: https://blogs.bl.uk/digital-scholarship/2018/04/some-challenges-and-opportunities-for-digital-scholarship-in-2018.html (accessed 2 March 2021).

Ridley, D. 2008. *The literature review: a step-by-step guide for students*. Sheffield University: Sage.

Ridley, D. 2012. *The literature review: a step-by-step guide for students*. 2nd ed. Sheffield University: Sage.

Rieger, OY. 2010. Humanities scholarship in the digital age: the role and influence of information and communication technologies. *ProQuest Dissertations and Theses* (May), 264. Available at: https://libproxy.library.unt.edu/login?url=http://search. proquest.com/docview/745666317?accountid=7113%5Cnhttp://dq4wu5nl3d.search.seri alssolutions.com/?ctx_ver=Z39.88-2004&ctx_enc=info:ofi/enc:UTF-8&rfr_id=info:sid/ ProQuest+Dissertations+&+Theses+Full+Text (accessed 13 November 2019).

Ritchie, J & Lewis, J. 2014. *Qualitative research practice: a guide for social science students & research*. Los Angeles: Sage.

Rosenberg, D. 1999. An overview of education for librarianship in Anglophone Sub-Saharan Africa. In M Wise (ed.), *Education for librarianship and information science in Africa*. Sweden: Uppsala University Library: 22-31.

Rumsey, AS. 2011. *Scholarly communication institute new-model scholarly communication: road map for change*. Available at: http://www.uvasci.org/institutes-2003-2011/ SCI-9-Road-Map-for-Change.pdf (accessed 30 June 2018).

Saunders, M, Lewis, P & Thornhill, A. 2016. *Research methods for business students*. 7th ed. Harlow: Pearson Education Limited.

Scanlon, E. 2017. Concepts and challenges in digital Scholarship. *Frontiers in Digital Humanities* 4 (1): 1-15.

Scanlon, E. 2018. Digital scholarship: identity, interdisciplinarity, and openness. *Frontiers in Digital Humanities* 5 (3):1-6.

Schreibman, S, Siemens, R & Unsworth, J. 2004. The digital humanities and humanities computing: an introduction, in *A companion to digital humanities,* edited by S Schreibman, R Siemens & J. Unsworth. New Jersey: Blackwell Publishing: 288-290. Available
at: http://digitalhumanities.org:3030/companion/view?docId=blackwell/978140510321 3/9781405103213.xml (accessed on 10 March 2021).

Schwab, K. 2016. *The fourth industrial revolution*. Available at: https://professionallearning. education.gov.scot/media/1352/the-fourth-industrial-revolution-what-it-means-and-how-to-respond-world-economic-forum.pdf (accessed 15 August 2019).

Schwab, K. 2018. *Globalization 4.0 – what does it mean? World Economic Forum.* Available at: https://www.weforum.org/agenda/2018/11/globalization-4-what-does-it-mean-howit will-benefit-everyone/ (accessed 12 August 2020).

Sehlapelo, MCAM. 2020. Using grounded theory to develop a framework for an information science society in South Africa. In P Ngulube (ed.), *Handbook of Research on Connecting Research Methods for Information Science Research.* Hershey, PA: IGI Global 160-191.

Seibert, H, Miles, R & Geuther, C. 2019. Navigating 21st-Century digital scholarship: open educational resources (OERs), creative commons, copyright, and library vendor licenses. *The Serials Librarian* 76 (1-4): 103-109.

Seleznyov, S & Czerniawski, G (eds). 2020. *A research approach to curriculum development: a British curriculum forum event report.* London: British Educational Research Association. Available at: https://www.bera.ac.uk/publication/a-researchapproach-to-curriculum-development-a-british-curriculum-forum-event-report (accessed 15 October 2021).

Seuring, S & Gold, S. 2011. Conducting content-analysis based literature reviews in supply chain management. *Supply Chain Management: an International Journal* 17 (5): 544-555.

Sharma, RN. 2005. Development of library and information science education in South Asia with emphasis on India: strengths, problems and suggestions. *Journal of Education for Library and Information Science* 46(1): 77-91.

Shem, M. 2015. Digital library education: global trends and issues. *Journal of Education and Practice* 6 (17): 66-71.

Shenton, AK. 2004. Strategies for ensuring trustworthiness in qualitative research projects. *Education for Information* 22 (2): 63-75.

Shongwe, MM. 2014. The information technology influence on LIS job descriptions in South Africa. *Information Technology Development* 21 (2): 196-204.

Si, L, Zhuang, X, Xing, W & Guo, W. 2013. The cultivation of scientific data specialists: development of LIS education oriented to e-science service requirements. *Library Hi Tech* 31 (4): 700-724.

Silverman, D. 2001. *Interpreting qualitative data: methods for analysing talk, text and interaction*. 2nd ed. London: Sage.

Sinclair, M. 2007. A guide to understanding theoretical and conceptual framework. *Evidence Based Midwifery* 5(2): 39.

Sinclair, B. 2014. *The university library as incubator for digital scholarship*. Available at: https://er.educause.edu/articles/2014/6/the-university-library-as-incubator-for-digital-scholarship (accessed 10 October 2018).

Singh, P. 2003. Library and information science education in India: issues and trends. *Malaysian Journal of Library & information Science* 8 (2): 1-17.

Singh, SR. 2013. *Research methodology*. New Delhi: A P H publishing corporation.

Singleton, RA & Straits, BC. 2010. *Approaches to social research*. 5th ed. New York: Oxford University Press.

Soiferman, LK. 2010. *Compare and contrast inductive and deductive research approaches*. Available at: http://files.eric.ed.gov/fulltext/ED542066.pdf (accessed 20 April 2019).

Soundararajan, G, Ravikumar, A & Aro-Gordon, S. 2020. Employers perception on graduate skill deficiency to suit productivity. *Humanities & Social Sciences Reviews* 8 (3): 1415-1421.

South African Qualification Authority. 2009a. *Postgraduate Diploma in Library and Information Science at the University of KwaZulu-Natal*. Available at: http://regqs.saqa.org.za/viewQualification.php?id=72836 (accessed 15 August 2019).

South African Qualifications Authority. 2009b. *Postgraduate diploma in library and Information science at the university of Cape Town*. Available at: http://regqs.saqa.org.za/viewQualification.php?id=72836 (accessed 15 August 2019).

South African Qualifications Authority. 2009c. *Bachelor of information science at the University of South Africa*. Available at: http://regqs.saqa.org.za/viewQualification.php?id=13981 (accessed 15 August 2019).

South African Qualifications Authority. 2009d. *Bachelor of library and Information cience honours at University of KwaZulu-Natal*. Available at: http://regqs.saqa.org.za/viewQualification.php?id=72836 (accessed 15 August 2019).

South African Qualifications Authority. 2009e. *Bachelor of Library and Information Science Honours at the University of Zululand*. Available at: http://regqs.saqa.org.za/viewQualification.php?id=8769 (accessed 15 August 2019).

South African Qualifications Authority. 2009f. *Bachelor of Arts Information Science at the University Zululand*. Available at: http://regqs.saqa.org.za/viewQualification.php?id=23375 (accessed 15 August 2019).

South African Qualifications Authority. 2009g. *Bachelor of information science honours at the University of Pretoria*. Available at: http://regqs.saqa.org.za/viewQualification.php?id=15882 (accessed 15 August 2019).

South African Qualifications Authority. 2009h. *Bachelor of Information Science in Publishing at the University of Pretoria.* Available at: http://regqs.saqa.org.za/viewQualification.php?id=12133 (accessed 15 August 2019).

South African Qualifications Authority. 2009i. *Bachelor of library and Information Science Honours* at the University of Fort Hare. Available at: http://regqs.saqa.org.za/viewQualification.php?id=17471 (accessed 15 August 2019).

South African Qualifications Authority. 2009j. *Postgraduate Diploma in Library and Information Studies at the University of Western Cape*. Available at: http://regqs.saqa.org.za/viewQualification.php?id=22400. (accessed 15 August 2019).

South African Qualifications Authority. 2009k. *Postgraduate Diploma in Library and Information Science at the University of South Africa*. Available at: http://regqs.saqa.org.za/viewQualification.php?id=15882 (accessed 15 August 2019).

South African Qualifications Authority. 2009l. *Bachelor of Library and Information Studies Honours at the Cape Town*. Available at: http://regqs.saqa.org.za/viewQualification.php?id=96470 (accessed 15 August 2019).

Snyder, H. 2019. Literature review as a research methodology: an overview and guidelines. *Journal of Business Research* 104 (2019): 333-339.

Starman, AB. 2013. The case study as a type of qualitative research. J*ournal of Contemporary Educational Studies* 1 (1): 28-43.

Steele, C. 2014. Scholarly communication, scholarly publishing, and university libraries: plus ça change? *Australian Academic & Research Libraries* 45 (4): 1-21.

Suleman, H & Fox, EA. 2001. *A framework for building open digital libraries D-Lib Magazine*, 7 (12). Available at: www.dlib.org/dlib/december01/suleman/12suleman.html (accessed 20 February 2020).

Swan, A & Brown, S. 2008. *The skills, role and career structure of data scientists and curators: an assessment of current practice and future needs*. Bristol: JISC. Available at: http://www.jisc.ac.uk/publications/reports/2008/dataskillscareersfinalreport.aspx (accessed 20 April 2019).

Tech terms. 2018. *The computer dictionary*. Available at: https://techterms.com/ (accessed 13 March 2018).

Thomas, DR. 2006. A general inductive approach for analysing qualitative evaluation data. *American Journal of Evaluation* 27 (1): 237-246.

Thomas, G. 2011. A typology for the case study in social science following a review of definition, discourse, and structure. *Qualitative Inquiry* 17(6): 511-521.

Tella, A & Okunloye, RW. 2020. Institutional repositories versus learning object repositories: challenges and the way forward for higher educational institutions. In A Thatnnal (ed.), *Encyclopedia of Education and Information Technologies*. Netherland: Springer Nature: 951-967.

Tella, A & Onyancha B. 2020**.** Scholarly publishing experience of postgraduate students in Nigerian Universities. *Accountability in Research Policies and Quality Assurance*. doi: 10.1080/08989621.2020.1843444.

Tinkler, P & Jackson, C. 2004. *The doctoral examination process: A handbook for students, examiners and supervisors.* Maidenhead: Society for Research into Higher Education and Open University Press.

Tsekeris, C. 2019. Surviving and thriving in the Fourth Industrial Revolution: digital skills for education and society. *Homo Virtualis* 2 (1): 34-42.

Tu, Z & Xu, H. 2018. *Digital scholarship skills and librarian training toward digital scholarship services: case studies of academic libraries in China*. Available at: https://www.researchgate.net/publication/324819929_Digital_Scholarship_Skills_and_Librarian_Training_Toward_Digital_Scholarship_Services--Case_Studies_of_Academic_Libraries_in_China (accessed 1 March 2020).

Tzoc, E. 2017. *Digital scholarship: what, why and how*? Available at: https://npsig.wordpress.com/2017/02/06/digital-scholarship/ (accessed 3 March 2019).

Ukwona, SC & Ngulube, P. 2020. Supervision practices in library and information science postgraduate research in Nigeria and South Africa. *African Journal of Library, Archives and Information Science* 30 (2): 127-142.

University of Cape Town. 2016. *UCT LISC offers short course in Research Data Management*. Available at: http://www.lisc.uct.ac.za/news/uct-lisc-offers-short-course-research-data-management-0 (accessed on the 18 February 2020).

University of Melbourne. 2017. *Developing originality: it's all been said before.* Available at: https://services.unimelb.edu.au/__data/assets/pdf_file/0009/471267/Developing_originality_Update_051112.pdf (accessed 20 June 2018).

University of Pretoria. 2017. *Research data management policy*. Available at: https://library.up.ac.za/ld.php?content_id=41390830 (accessed 21 February 2022).

University of South Africa. 2013. *Policy on research ethics*. Available at: http://unisa.ac.za/static/corporate_web/Content/Colleges/CGS/documents/Policy-on-Research-Ethics-rev-appr-Council-20.09.2013.pdf (accessed 5 August 2018).

University of Washington Library. 2021. *About digital scholarship*. Available at: https://www.lib.washington.edu/digitalscholarship (accessed 22 September 2021).

Uzwyshyn, R. 2020. *Open digital research ecosystems: how to build them and why.* Available at: https://content.ebscohost.com/ContentServer.asp?EbscoContent=dGJy MNLr40Sep7Q4y9fwOLCmsEmeqK9Ssai4SbWWxWXS&ContentCustomer=dGJyM PGtsVGxrLdQuePfgeyx9Yvf5ucA&T=P&P=AN&S=R&D=bsu&K=147057444 (accessed on 17 March 2021).

Varpio, L, Paradis, E, Uijtdehaage, S & Young, M. 2020. The distinctions between theory, theoretical framework, and conceptual framework. *Academic Medicine* 95 (7): 989-994.

Verma, MK. 2015. Changing role of library profession in digital environment: a study. *International Journal of Library Science* 3 (2): 97-104.

Virkus, S. 2012. *Challenges of library and information science (LIS) education. Tellinn University, Institute of Information Studies*. Available: http://www.unica-network.eu/sites/default/files/Sirje%20Virkus_0.pdf (accessed 31 January 2019).

Vinopal, J & McCormick, M. 2013. Supporting digital scholarship in research libraries: scalability and sustainability. *Journal of Library Administration* 53 (1): 27-42.

Wallace, D. 2002. Curriculum development in library and information science programs: a design model. *Journal of Education for Library and Information Science* 43 (4): 283-295.

Weller, M. 2011. *The digital scholar, how technology is transforming scholarly practice.* London: Bloomsbury Press.

Wexelbaum, R. 2016. Assessing safe spaces for digital scholarship in the library. *LIBRES: Library & Information Science Research Electronic Journal* 26 (1):14-30.

Wise, S, Henninger, M & Kennan, MA. 2011. Changing trends in LIS job advertisements. *Australian Academic & Research Libraries* 42 (4): 268-295.

Wolf, P. 2007. A model for facilitating curriculum development in higher education: a faculty-driven, data-informed, and educational developer-supported approach. *New Directions for Teaching and Learning* (112): 15-20.

Wolski, M & Richardson, J. 2014. *A model for institutional infrastructure to support digital scholarship.* Available at: http://www.mdpi.com/23046775/2/4/83/htm (accessed 27 June 2017).

Wood, B & Evans, D. 2018. *Librarians' perceptions of artificial intelligence and its potential impact on the profession.* Available at: https://www.researchgate.net/publication/322977069_Librarians%27_Perceptions_of_Artificial_Intelligence_and_Its_Potential_Impact_on_the_Profession (accessed 12 May 2020).

Xing, B & Marwala, T. 2017. Implications of the fourth industrial age for higher education. *The Thinker: for the Thought Leaders* 73(73): 10-15.

Xu, M, David, JM & Kim, SH. 2018. The fourth industrial revolution: opportunities and challenges. *International Journal of Financial Research* 9(2): 90-95.

Yadav, AKS. 2018. *Trends, challenges and opportunities for LIS education: an interview with Carol Tenopir.* Available at: https://libraryconnect.elsevier.com/articles/trends-challenges-and-opportunities-lis-education-interview-carol-tenopir (accessed 21 January 2020).

Yin, RK. 2003. Case study design and methods: study design and implementation. *Journal of Contemporary Educational Studies* 1 (1): 265. doi: 10.1097/FCH.0b013e31822dda9e.

Yin, RK. 2011. *Qualitative research from start to finish*. New York: The Guilford Press.

Yin, RK. 2014. *Case study research: design and methods*. 5th ed. Los Angeles: Sage.

Yin, RK. 2016. *Qualitative research from start to finish*. 2nd ed. New York: The Guilford Press.

Zeithaml, VA, Parasuraman, A & Berry, LL. 1990. *Delivering quality service: balancing customer perceptions and expectations*. New York: Macmillan.

Zeithaml, VA, Berry, LL & Parasuraman, A. 1993. The nature and determinants of customer expectations of service. *Journal of the Academy of Marketing Science* 21 (1): 1-12.

Zohrabi, M. 2008. Research into curriculum components. *Journal of Pan-Pacific Association of Applied Linguistics* 12 (2): 49-69.

Appendix A: Interview Guide LIS schools' Head of Departments

UNISA | university of south africa

INTERVIEW GUIDE- LIS schools' HoDs

Student: Philangani Sibiya

Student number: 63995506

Title: Education and Training of Library and Information Science Professionals on Digital Scholarship in South Africa

The interview schedule will cover the following broad areas:

✓ Demographic information
✓ LIS curriculum
✓ Mapping the LIS curriculum for digital scholarship contents
✓ Re/development of the LIS school's curriculum structure

Section A: Demographic information

1. What is your job title or position in the LIS school?

Senior lecturer		Associate Professor		Professor		Other	

Mention..

2. How long you have been working in this LIS school?

0-5 yrs.	6-10 yrs.	11-15 yrs.	16-20 yrs.	21+ yrs.

3. What is your highest academic qualification?

Diploma		Bachelor		Honours		Masters		PhD		Other	

Mention..

Section B: Analyses of the LIS school's curriculum

4. What do you understand about the term digital scholarship?

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5. Does your institution offer content on digital scholarship? if no, provide reasons as to why it is not offered.

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6. Are there any plans/ (are you already offering) to offer digital scholarship content in your LIS school? Provide the progress if so.

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7. If yes on question 5, when did your LIS school start offering content on digital scholarship and what are your experiences?

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8. What is the rank of the person teaching digital scholarship?

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9. Why is it important to offer digital scholarship in your LIS school?

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10. What are the types of training offered by your LIS school to staff teaching digital scholarship ?

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11. How frequently are these trainings offered to digital scholarship teaching staff?

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12. Which facilities do you use to teach digital scholarship in this LIS school?

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13. Comment on the appropriateness of the infrastructure used for teaching digital scholarship content?

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14. In general, what is the focus of your content with regards to digital scholarship?

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15. What are the expected outcomes of your curriculum with regards to digital scholarship?

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16. How do you structure your curriculum, regarding digital scholarship?

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Section D: Mapping the LIS curriculum for digital scholarship contents

17. Comment on the infusion of digital scholarship content in your curriculum.

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18. In the wake of the 4IR do you think it is necessary to realign the objectives of the course you are currently with the current trends? Justify your answer.

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19. Who are the key stakeholders in curriculum development regrading digital scholarship?

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20. How can LIS schools best train information professionals on digital scholarship?

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21. Comment on any gaps or redundancies presented by your current curriculum.

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22. Comment on any opportunities presented by your current curriculum.

Section F: Re/development of the LIS school's curriculum structure

23. What are the challenges that you have encountered in the incorporation of digital scholarship?

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24. Provide suggestions on how to overcome these challenges.

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25. How do you think digital scholarship can be improved in your respective institution?

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26. Which model do you use to structure your curriculum on digital scholarship?

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27. Provide any other comment on digital scholarship.

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The end

Thank you for your participation

Appendix B: Interview Guide- Digital Scholarship lecturers

UNISA | university of south africa

INTERVIEW GUIDE- Lecturers

Student: Philangani Sibiya

Student number: 63995506

Title: Education and Training of Library and Information Science Professionals on Digital Scholarship in South Africa

The interview schedule will cover the following broad areas:

- ✓ Demographic information
- ✓ LIS curriculum
- ✓ Mapping the LIS curriculum for digital scholarship contents
- ✓ Re/development of the LIS school's curriculum structure

Section A: Demographic information

1. What is your job title in the LIS school?

Jnr lecturer		Lecturer		Snr lecturer		Associate Professor		Professor	

2. How long you have been working in this LIS school?

0-5 yrs.	6-10 yrs.	11-15 yrs.	16-20 yrs.	21+ yrs.

3. What is your highest academic qualification?

Diploma		Bachelor		Honours		Masters		PhD		Other	

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Section B: Analyses of the LIS school's curriculum

4. What do you understand about the term digital scholarship?

5. Comment on the importance of integrating digital scholarship in the LIS curriculum.

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6. How does the LIS curriculum that you offer provide digital scholarship skills and knowledge?

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7. What NQF level is digital scholarship content offered in this LIS school?

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8. What is the duration of teaching digital scholarship in your LIS school?)

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9. How is digital scholarship content offered? As self-standing module(s), units in certain module(s) or infused in other modules.

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10. What teaching methodology are you using to teach your students?

11. What are the expected outcomes of your curriculum with regards to digital scholarship?

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12. What are the key components regarding digital scholarship that you think LIS curriculum should comprise of?

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13. Do you have computer laboratories to teach your students? Explain how they are used, and the software used for teaching.

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14. Explain your methodology in identifying desirable curriculum or content for your students.

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Section D: Mapping the LIS curriculum for digital scholarship contents;

15. Comment on the infusion of digital scholarship contents in your curriculum.

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16. In the wake of the Fourth Industrial Revolution do you think it is necessary to realign the objectives of the course you are currently offering? Explain.

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17. Who are the key stakeholders in curriculum development regrading digital scholarship?

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18. What facilities do you think are relevant for teaching digital scholarship in LIS schools in South Africa?

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19. What can be done to enhance the training of LIS professionals in digital scholarship?

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20. Comment on any gaps or redundancies presented by your current curriculum.

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21. Comment on any opportunities presented by your current curriculum.

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Section E: Re/development of the LIS school's curriculum structure

22. What are the challenges that you have encountered in the incorporation of digital scholarship?

23. Provide suggestions on how to overcome these challenges.

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24. Which model do you use to structure your curriculum with regards to digital scholarship?

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25. Provide any comment on digital scholarship.

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The end

Thank you for your participation

Appendix C- Interview Guide- Directors of Library services

UNISA | university of south africa

INTERVIEW GUIDE: Directors

Student: Philangani Sibiya

Student number: 63995506

Title: Education and Training of Library and Information Science Professionals on Digital Scholarship in South Africa

The interview schedule will cover the following broad areas:

- ✓ Demographic information
- ✓ LIS curriculum
- ✓ Mapping the LIS curriculum for digital scholarship contents
- ✓ Perceptions of LIS employers
- ✓ Knowledge, competencies and skills of the LIS schools' graduates
- ✓ Re/development of the LIS school's curriculum structure

Section A: Demographic information

1. What is your job title or position in this Library?

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2. How long you have been working in this library?

0-5 yrs.	6-10 yrs.	11-15 yrs.	16-20 yrs.	21+ yrs.

3. What is your highest academic qualification?

Diploma		Bachelor		Honours		Masters			PhD		Other	

   Mention...

Section B: Analyses of the LIS school's curriculum

4. What do you understand about the term digital scholarship?

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5. Where and when did you obtain your qualification in LIS?

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6. Justify the importance of offering digital scholarship in the LIS curriculum?

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Section C: Mapping the LIS curriculum for digital scholarship contents.

7. In the wake of the 4IR do you think it is necessary to realign the objectives of the course currently offered by LIS schools?

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8. Who are the key stakeholders in curriculum development regrading digital scholarship?

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9. What facilities do you think are relevant for teaching digital scholarship in LIS schools in South Africa?

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10. How can LIS schools best train information professionals on digital scholarship?

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11. Comment on any gaps or redundancies presented by LIS schools' education on digital scholarship.

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Section D: Perceptions of employers on LIS graduates

12. What are your expectations regarding different LIS schools' education in South Africa as far as digital scholarship is concerned?

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13. Based on your experience as an employer of DS librarians which LIS school do you think provide a solid LIS digital scholarship education?

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14. Justify the answer in question 13.

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15. Comment on any opportunities presented by LIS schools' education on digital scholarship.

16. What challenges have you encountered when you employing a candidate to be a digital scholarship librarian?

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Section E: Knowledge, competencies and skills of the LIS schools' graduates

17. What are the functions of the digital units in your library?

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18. How is your library performing digital scholarship activities?

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19. What are the requirements for one to be employed as a digital scholarship librarian in your organisation?

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20. What are your views about LIS schools in the promotion of digital scholarship education?

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21. What are the types of digital scholarship trainings do you expose your staff to?

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22. What are your suggestions on ways to improve the quality of LIS schools' graduates from South Africa regarding digital scholarship?

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23. How do you think LIS schools should develop a curriculum that is provide digital scholarship skills and knowledge?

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Section F: development of the LIS school's curriculum structure

24. What are the challenges that arise from the digital scholarship job-related position increase?

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25. Provide suggestions on how to overcome these challenges.

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26. Provide any suggestions on how LIS schools could best incorporate digital scholarship.

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Appendix D: Interview Guide- Digital Scholarship librarians

UNISA | university of south africa

INTERVIEW GUIDE-Librarians

Student: Philangani Sibiya

Student number: 63995506

Title: Education and Training of Library and Information Science Professionals on Digital Scholarship in South Africa

The interview schedule will cover the following broad areas:
- ✓ Demographic information
- ✓ LIS curriculum
- ✓ Mapping the LIS curriculum for digital scholarship contents
- ✓ Knowledge, competencies and skills of the LIS schools' graduates
- ✓ Re/development of the LIS school's curriculum structure

Section A: Demographic information

1. What is your job title or position in this Library?

eResource librarian		DS librarian		Digital curator		Other	

Mention the other...

2. How long you have been working in this library?

0-5 yrs.	6-10 yrs.	11-15 yrs.	16-20 yrs.	21+ yrs.

3. What is your highest academic qualification?

Diploma		Bachelor		Honours		Masters	PhD		Other	

Mention the other...

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Section B: Analyses of the LIS school's curriculum

4. Where and when did you obtain your highest qualification in LIS?

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5. Comment on the level of infusion regarding technological developments in LIS curriculum on the LIS school you studied in.

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6. What do you understand about the term digital scholarship?

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7. Justify the importance of offering digital scholarship in the LIS curriculum?

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8. Comment on the quality of LIS education in South Africa regarding current technological developments?

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Section C: Mapping the LIS curriculum for digital scholarship contents

9. In the wake of the 4IR do you think it is necessary to align the objectives of the course offered by LIS schools with the current trends? Justify your answer.

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10. What do you think should be incorporated regarding digital scholarship in LIS school's curriculum in the training of information professionals for the future?

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11. Who are the key stakeholders in curriculum development regrading digital scholarship?

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12. What facilities do you think are relevant for teaching digital scholarship in LIS schools in South Africa?

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13. How could LIS schools best train information professionals on digital scholarship?

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14. Comment on any gaps or redundancies or opportunities presented by the current LIS curriculum.

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Section D: Knowledge, competencies and skills of the LIS schools' graduates;

15. What are the functions of the digital scholarship unit in your library?

16. What digital scholarship activities are you performing in this library?

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17. What are the requirements for one to practise as a digital scholarship librarian?

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18. What are your views about LIS schools in the promotion of digital scholarship?

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19. What challenges have you encountered as a digital scholarship librarian?

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20. What training opportunities are you exposed to, as a digital scholarship librarian in your institution?

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21. Any suggestions as to what should be done to improve the quality of LIS schools' graduates on the area of digital scholarship?

Section E: Re/development of the LIS school's curriculum structure

22. What are the challenges that arise from digital scholarship job-related positions?

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23. Provide suggestions on how to overcome these challenges.

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24. Provide any comment of digital scholarship.

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The end

Thank you for your participation.

Appendix E: Ethical clearance certificate UNISA

UNISA | university of south africa

DEPARTMENT OF INFORMATION SCIENCE ETHICS REVIEW COMMITTEE

2 March 2020

Dear Mr Philangani Thembinkosi Sibiya

DIS Registration #: Rec-02032020

References #: 2020-DIS-0005

Name: PT Sibiya

Student #: 63995506

Decision:

Ethics Approval from 2 March 2020 to 2 March 2024

Researcher(s): Mr Philangani Thembinkosi Sibiya
63995506@mylife.unisa.ac.za
012 429 4600

Supervisor(s): Prof P Ngulube
ngulup@unisa.ac.za
012 429 2832

Education and training of library and information science professionals on digital scholarship in South Africa.

Qualifications: Doctoral Study

Thank you for the application for research ethics clearance by the Unisa Department of Information Science Research Ethics Committee for the above-mentioned research. Ethics approval is granted for five years.

The *low risk application* was reviewed and expedited by the Department of Information Science Research Ethics Committee on 2 March 2020 in compliance with the Unisa Policy on Research Ethics and the Standards Operating Procedure on Research Ethics Risk Assessment. The proposed research may now commence with the provisions that:

1. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy of Research Ethics.

2. Any adverse circumstances arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the Department of Information Science Ethics Review Committee.

3. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.

4. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards the protection of participants' privacy and the confidentiality of the data should be reported to the Committee in writing, accompanied by a progress report.

5. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the field of study. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no. 4 of 2013; Children's Act no. 38 of 2005 and the National Health Act, no. 61 of 2003.

6. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data requires additional ethics clearance.

7. No field work activities may continue after the expiry date of **2 March 2024.** Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

Note:

The reference number **2020-DIS-0005** should be clearly indicated on all forms of communication with the intended research participants, as well as the Committee.

Yours sincerely
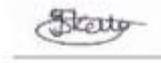
Dr Isabel Schellnack-Kelly
Department of Information Science: Ethics Committee

Appendix F: Letter Seeking Permission to Conduct Research

Mr Philangani Sibiya
Department of Information Science
UNISA
Preller Street
0002
10 June 2020

Dear Sir/Madam

REQUEST FOR PERMISSION TO CONDUCT A RESEARCH STUDY IN THE UNIVERSITY

The above matter refers.

My name is Philangani Thembinkosi Sibiya, a Doctor of Philosophy in Information Science student. I am conducting a study as part of the requirement to attain the qualification. The study is titled: **"Education and training of Library and Information Science professionals on digital scholarship in South Africa"**. The study is conducted under the supervision of Prof P Ngulube (University of South Africa). The study population includes chairpersons of departments, lecturers teaching digital scholarship related modules, directors or supervisors of digital scholarship activities in the library and the librarians performing digital scholarship activities in the library.

Since the registration period, I have made significant progress on the research project and the data collection stage has now reached. This letter's purpose is to request for permission to conduct data collection in your organisation which forms part of the population of the study. The participants of this study will be drawn from the respective department. The study uses Teams and Skype interviews for data collection purposes considering the challenges brought about COVID-19. Semi-structured interviews will be used to collect data from the Head of Department of Knowledge and Information Stewardship department, lecturers teaching digital scholarship related modules, library director and the digital scholarship librarian/s. The appointments will be solely based on the availability of participants and will be secured by the researcher before the commencement of the data collection process to enable the participants to prepare for the interview. As permitted by the flexibility of the choice of data collection tool (semi-structured interviews), the researcher will ask questions and probe depending on the responses of the participant to attain the aim of the study. The meeting will be recorded during the interview process.

Participation is voluntary and informed consent will be received from the participants. A comprehensive written information form regarding the research will be given to participants. In order to ensure that the participant is protected, anonymity will be ensured. The name of the university and the participants will not be written during the reporting of the results phase. Furthermore, responses and records from the participants will be kept strictly confidential.

The researcher hopes that the outcomes of this research will help me to meet the requirements of a Doctor of Philosophy in Information Science qualification, while shedding light on the possible improvements to the LIS curriculum, and informing practices and policy formulation. Upon completion of this study all involved parties will be informed of the outcomes of the study.

Should there be any queries or misunderstanding regarding the study, kindly contact the supervisor Prof P Ngulube: 012 429 2832, ngulup@unisa.ac.za based at UNISA, College of Graduate Studies (Department of Interdisciplinary Research and Graduate Studies).

The research proposal and the ethical clearance documents of the study were submitted to the Higher Degrees Committee at UNISA for approval. The research proposal was approved by the Committee and the ethical clearance certificate was issued.

Attached with the letter is the UNISA ethical clearance certificate. Your approval to conduct this research will be highly appreciated.

Yours faithfully
Philangani Thembinkosi Sibiya (Mr)
Tel: 012 429 4600
Cell: 061 412 6107
Email: sibiypt@unisa.ac.za

Appendix G: Permission letters from concerned LIS schools

University: A

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RESEARCH PERMISSION SUB-COMMITTEE (RPSC) OF THE SENATE RESEARCH, INNOVATION, POSTGRADUATE DEGREES AND COMMERCIALISATION COMMITTEE (SRIPCC)

24 June 2020

Decision: Research Permission
Approval from 24 June 2020 until 31 December 2021.

Ref #: 2020_RPSC_016
Mr. P. T. Sibiya
Student #: 63995506
Staff #: 90378857

Principal Investigator:
Mr. Philangani Thembinkosi Sibiya
Department of Information Science
School of Arts
College of Human Sciences
sibiypt@unisa.ac.za; 012 429 4600, 061 412 6107

Supervisor : Prof Patrick Ngulube

Education and training of Library and Information Science professionals on digital scholarship in South Africa

Your application regarding permission to conduct research involving UNISA employees, students and data in respect of the above study has been received and was considered by the Research Permission Subcommittee (RPSC) of the UNISA Senate, Research, Innovation, Postgraduate Degrees and Commercialisation Committee (SRIPCC) on 18 June 2020.

It is my pleasure to inform you that permission has been granted for the study. You may:

1. Gain access to staff email addresses through the gatekeeping assistance of the supervisor.
2. Contact the following Unisa staff to request their permission to interview them:
   - 1 CoD of the Department of Information Science
   - 1-4 Lecturer/s teaching digital scholarship related modules (Data saturation will determine the sample size)

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- 1 Director of digital scholarship unit at the UNISA library
- 1-4 Librarians that are performing digital scholarship related activities (data saturation will determine the sample size).

3. Gain access to the course outlines or course websites from the Department of Information Science.

You are requested to submit a report of the study to the Research Permission Subcommittee (RPSC@unisa.ac.za) within 3 months of completion of the study.

The personal information made available to the researcher(s)/gatekeeper(s) will only be used for the advancement of this research project as indicated and for the purpose as described in this permission letter. The researcher(s)/gatekeeper(s) must take all appropriate precautionary measures to protect the personal information given to him/her/them in good faith and it must not be passed on to third parties. The dissemination of research instruments through the use of electronic mail should strictly be through blind copying, so as to protect the participants' right of privacy. The researcher hereby indemnifies UNISA from any claim or action arising from or due to the researcher's breach of his/her information protection obligations.

Note:

The reference number **2020_RPSC_016** should be clearly indicated on all forms of communication with the intended research participants and the Research Permission Subcommittee.

We would like to wish you well in your research undertaking.

Kind regards,

Visagie

Dr Retha Visagie – Deputy Chairperson
Email: visagrp@unisa.ac.za, Tel: (012) 429-2478

Prof Lessing Labuschagne – Chairperson
Email: llabus@unisa.ac.za, Tel: (012) 429-6368

University B

February 12, 2021

Mr Philangani Thembinkosi Sibiya
Department of Information Science
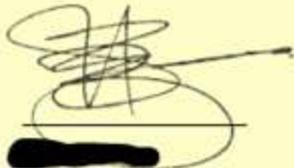University of South Africa
sibiypt@unisa.ac.za

Dear Mr Sibiya

Approval from the Registrar's Office to Conduct Research

In accordance with the ███████████████ Research Ethics Policy and Practice, I hereby grant
permission for Mr PT Sibiya to conduct research relating to his thesis "Education and training of Library
and Information Science professionals on digital scholarship in South Africa".

We look forward to reading the research report.

Sincerely,

University Registrar

University C

Ref. NO.: HUMREC202008-04

Mr. Philangani Thembinkosi Sibiya
Department of Information Science
UNISA
PO BOX 392
UNISA
0003
South Africa

Dear Mr. Philangani Thembinkosi Sibiya

RE: Ethical Clearance for Research Project

We are pleased to inform you that ethical clearance has been granted by an Ethics Review Committee of the Faculty of Humanities for your Doctoral project titled: *Education and Training of Library and Information Science Professionals on Digital Scholarship in South Africa.*

We wish you all the best with your study.

Yours sincerely,

University D

21 October 2020

PT Sibiya

Email: Sibiypt@unisa.ac.za

Dear PT Sibiya,

GATEKEEPER PERMISSION TO CONDUCT RESEARCH

TITLE: EDUCATION AND TRAINING OF LIBRARY AND INFORMATION SCIENCE
PROFESSIONALS ON DIGITAL SCHOLARSHIP IN SOUTH AFRICA

RESEARCHER: PT Sibiya
SUPERVISOR: Prof. P Ngulube
CO-SUPERVISOR: N/A
INSTITUTION: University of South Africa
DEGREE: PhD in Information Science

Kindly be informed that Gatekeeper permission is granted to you to conduct research at the
University of B B entitled: "**Education and Training of Library and Information Science
Professionals on Digital Scholarship in South Africa."**

Kind regards,

University E

7th July 2020
Mr Philangani T. Sibiya
c/o Department of Information Sciences
College of Human Sciences: School of Arts
University of South Africa

Dear Mr Sibiya

PERMISSION TO CONDUCT RESEARCH AT THE UNIVERISTY OF D

Your email correspondence in respect of the above refers. I am pleased to inform you that the Institutional Research and Innovation Committee (IRIC) has granted **Full Permission** for you to conduct your research "Education and training of library and information science professionals on digital scholarship in South Africa" at the *University of D.*

The University of D may impose any other condition it deems appropriate in the circumstances having regard to nature and extent of access to and use of information requested.

We would be grateful if a summary of your key research findings can be submitted to the IRIC on completion of your studies.

Kindest regards.
Yours sincerely

University F

17 June 2020

Mr Philangani Thembinkosi Sibiya
UNISA
Email: Sibiypt@unisa.ac.za

Dear Mr Sibiya

RE: PERMISSION TO CONDUCT RESEARCH

Gatekeeper's permission is hereby granted for you to conduct research at the University of E towards your postgraduate studies, provided Ethical clearance has been obtained. We note the title of your research project is:

"Education and training of Library and Information Science professionals on digital scholarship in South Africa."

It is noted that you will be constituting your sample by conducting interviews with staff members from the E Library (Taking in account the regulations imposed during the lockdown ie restrictions on gatherings, travel, social distancing etc. ZOOM, Skype or telephone interviews recommended).

Please ensure that the following appears on your questionnaire/attached to your notice:
* Ethical clearance approval letter;
* Research title and details of the research, the researcher and the supervisor;
* Consent form is attached to the notice/questionnaire and to be signed by user before he/she fills in questionnaire;
* gatekeepers approval by the Registrar.

You are not authorized to contact staff and students using 'Microsoft Outlook' address book. Identity numbers and email addresses of individuals are not a matter of public record and are protected according to Section 14 of the South African Constitution, as well as the PAIA and POPI Act. For the release of such information over to yourself for research purposes, the University of E will need express consent from the relevant data subjects. Data collected must be treated with due confidentiality and anonymity.

Yours sincerely

University G

Mr Phialangani Sibiya
Department of Information Science
UNISA
Preller Street
Pretoria
0002

11 June 2020

Per email: Sibiypt@unisa.ac.za

Dear Mr Sibiya

**Request to Conduct Research at University of F The study
entitled - "Education and training of Library and Information Science professionals
on digital scholarship in South Africa". "Education and training of Library and
Information Science professionals on digital scholarship in South Africa".**
Your letters to me, refers.

The University of F's Research Ethics Committee (REC) hereby grant approval for you to conduct part of your research at , as per the methodologies stated in your research proposal and in terms of the data collection instruments that you have submitted.

We note also that **University of South Africa (UNISA)**, has issued an ethical clearance certificate and having read the documentation, we accept the documentation.

You may use this letter as authorization when you approach the relevant persons. Please note that the permission is based on the documentation that you have submitted. Should you revise your research instruments, or use additional instruments, you must submit all the changes to the University of **F** Research Ethics Committee (REC).

The REC wishes you well in conducting research.

Yours sincerely

University H

Reference number: HUM014/0721

PT Sibiya
Department: External department
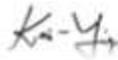
Pretoria

Dear PT Sibiya

This is to notify you that the amendments to your application entitled "Education and training of library and information science professionals on digital scholarship in South Africa", have been approved by the EBIT Ethics Committee.

Approval from the Registrar is required. Once obtained, submit it under Post Approval Submissions

Kind regards

University I

RE: REQUEST FOR PERMISSION TO CONDUCT RESEARCH AT THE UNIVERSITY OF THE ██████████

Name of Researcher	:	Philangani Thembinkosi Sibiya
Research Topic	:	Education and training of Library and Information Science professionals on digital scholarship in South Africa
Date of issue	:	30/05/2020
Reference number	:	██RP300520PTS

This serves as acknowledgement that you have obtained and presented the necessary ethical clearance and your institutional permission required to proceed with the above referenced project.

Approval is granted for you to conduct research at the University of the ██████████ for the period **30 May 2020 to 02 March 2024** (or as determined by the validity of your ethics approval). You are required to engage this office in advance if there is a need to continue with research outside of the stipulated period. The manner in which you conduct your research must be guided by the conditions set out in the annexed agreement: *Conditions to guide research conducted at the University of t*██████████

The University of the ██████████ promotes the generation of new knowledge and supports new research. It also has a responsibility to be sensitive to the rights of the students and staff on campus. This office will require of you to respect the rights of students and staff who do not wish to participate in interviews and/or surveys.

It is also incumbent on you to first furnish this office with a copy of the proposed publication should you wish to reference the University's name, spaces, identity, etc. prior to public dissemination.

Please be at liberty to contact this office should you require any assistance to conduct your research or specifically require access to either staff or student contact information.

Yours sincerely

Appendix H: Research Councils' permission letters

   Research council A

APPROVAL TO CONDUCT RESEARCH USING (deleted) DATA OR EMPLOYEES (Non-employee)

Please complete or mark N/A if not applicable

Details of external party who wish to conduct research				
Name and Surname	●——————————●	**ID/Passport nr**		
Job Title / Employment Status	ICT Governance Specialist	**Level i.e. administrator/management/ executive etc.**	Junior Management	
Entity / Organisation		**Department (if relevant)**	ICT	
If an enrolled student, provide details of studies	Master of Business Administration (MBA)	**Level of studies e.g. Honours, Masters etc.**	Masters	

Motivation (full details of research to be conducted and/or data to be accessed)	
The aim of the study is to assess the link between various task directed management / leadership styles / human resource management and effective change management practices on employee as well as organisational wellness, specifically during these challenging times of Covid-19. The research topic is "The impact of Covid-19 on the perceptions of human resource practices, organisational leadership and job security during Covid-19 in the Public Sector". Please see the attached ethical clearance and permission letter for full details.	Attachment/s provided

Approved by (also attach relevant information obtained regarding the process)				
Designation	**Date**	**Name and Signature**	**Approved / Rejected**	**Comments**
Human Capital Development representative	14/07/2021		Approved	Student must submit mini thesis and fully study report on completion.
BEI representative	14/07/2021		Approved	Research Ethics provisions as per clearance certification should be adhered to strictly
Privacy Office representative	14/07/2021		Approved	Privacy Office will assist with getting explicit consent from data subject before questionnaire is distributed.

Processed by	*Name*	*Signature*	*Date*
Human Capital (e-HR)	Click here to enter text	Click here to enter text	Click here to enter text

SS-F-HR-601 Rev 00 Approval to conduct research_non employee

Page 1 of 3

Research Council B

RE: Request for Data Collection

NM To ● Sibiya, Philangani

Cc

ⓘ You replied to this message on 2021/07/21 10:03.

2021/05/1

Dear Phila

Thank you for your e-mail. Because you will not be collecting data that requires ethical clearance from the ▇▇▇▇, your institutional one will suffice. I am willing to participate in the study. Please send a participant consent form for my signature. You can contact my colleague ▇▇▇▇▇▇▇ the ▇▇▇ E-resources Librarian (copied in this e-mail) for her consent if she wishes to participate in the study.

Good luck!

Appendix I: Informed consent

INFORMED CONSENT FORM

Title of the study: Training and Education of LIS professionals on digital scholarship in South Africa

Degree: Doctor of Philosophy in Information Science

Institution: University of South Africa

Researcher: Mr Philangani T Sibiya (+27 61 4126 107; nselelo93@gmail.com)
Supervisor: Prof Patrick Ngulube (ngulup@unisa.ac.za)

The purpose of this study is to explore the education and training of LIS professionals on digital scholarship in LIS curriculum in South Africa. I humbly request your time to participate in this interview that is guided by questions structured in such a way that your responses will yield data that will address some of my research questions. **The interview will take about 20-30 minutes.** Please note that all responses will be presented anonymously and treated confidentially. Your participation is voluntary and do not feel you are obliged to answer all questions particularly those that make you feel uncomfortable. You have the right to withdraw anytime and nothing will be held against you.

If you have any questions or contribution regarding this research, please feel free to ask me; you are also welcome to contact me or my supervisor.

Confirmation of informed consent to be interviewed:

(Please initial at the end of each line if you agree)

I understand the background of this study and have asked any clarifying questions I

wish _____

I understand I am participating voluntarily and may withdraw at any point_____

I understand that I am not obliged to answer all questions_____

I agree to this interview being recorded _____

I _____ agree to participate in the

Study described above.

Signature _____**Date**_____