Cape Peninsula University of Technology

A framework for the adoption of a Library Information System in selected South African Universities in the Western Cape

By

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DECLARATION

I, the undersigned, hereby declare that the contents of this thesis represent my own unaided work, and that the thesis has not previously been submitted for academic examination towards any qualification. Furthermore, it represents my opinions and not necessarily those of the Cape Peninsula University of Technology.

Signature:  Date: 15 November 2023

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DEDICATION

Through God, all things are possible. With Him, I was reminded of who I am. “We all experience times of testing, which is normal for every human being. But God will be faithful to you. He will screen and filter the severity, nature, and timing of every test or trial you face so that you can bear it. And each test is an opportunity to trust him more, for along with every trial God has provided for you a way of escape that will bring you out of it victoriously.” - 1 Corinthians 10:13 (TPT).

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ABSTRACT

In a high internet and smartphone era, it is interesting to note that there is a low adoption rate of a Library Information System (LIS), which can support and encourage e-learning in South Africa. LIS provides several advantages, including easy access, availability of resources, reduced costs compared to traditional libraries, and improved communication. These advantages are a driving force behind the importance of LIS. Despite all the evidence on the benefits of LIS in higher education, there is a gap in its adoption in higher education in South Africa. The positive relationship between library usage and student achievement is another compelling reason for adopting LIS in higher education.

This research study aimed to investigate the factors that influence the adoption of LIS at selected South African Universities in the Western Cape. The main research question was as follows: What is the appropriate framework for evaluating the adoption of LIS in South African higher education? Three secondary questions are: (a) What are the critical factors for evaluating the adoption of LIS in South African higher education? (b). What are the current patterns and trends for adopting LIS in South African higher education? (c) How do higher education libraries in South Africa encourage the utilisation of their LIS?

A structured questionnaire research survey was conducted as the selected quantitative research methodology. The study was based on a sample size of 170 students from the University of the Western Cape and Cape Peninsula University. The key findings of this research study revealed that the critical factors influencing the adoption of an online library system in the South African higher education sector include task and individual characteristics, such as perceived usefulness, perceived ease of use, attitude towards use, user satisfaction and adoption capacity.

Keywords: Information quality, IS habits, IS usefulness, adoption, library assessment higher education, library information systems

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GLOSSARY

LIST OF ACRONYMS

ACM	Association for Computing Machinery
AFGI	Adjusted goodness of fit
ATU	Attitude Towards Use
AVE	Average Variance Extracted
CFA	Confirmatory factor analysis
CPUT	Cape Peninsula University of Technology
CR	Composite Reliability
CSE	Computer self-efficacy
DLIS	Digital Library Information System
DOI	Theory of Diffusion of Innovations
GFI	Goodness of Fit
ICT	Information and Communication Technologies
IoT	Internet of Things
IS	Information systems
LIS	Library Information System
OPAC	Online Public Library Catalogues
PCLOSE	P value of close fit
PEOU	Perceived Ease of Use
PU	Perceived Usefulness

RMSEA	Root Mean Squared Error of Approximation
SD	Standard deviation
SEM	Structural Equation Model
SRMR	Standardized Root Mean Squared Residual
TAM	Technology Acceptance Model
TLI	Tucker-Lewis index
TPB	Theory of Planned Behaviour
TRA	Theory of reasoned actions
TTF	Task-Technology Fit
TOE	Technology-organization-environment
UTAUT	Unified Theory of Acceptance and Use of Technology
WC	Western Cape

DEFINITONS

Information Quality	Measurement of value of information.
IS Usefulness	Measuring the value of an information system.
Library Analytics	The analysis of library information to make better decisions
Library Assessment	The evolution of a library.

Target Population	The entire population, or set, that will be considered qualified for data analysis.
Sampling	A process of selecting the group for data collection for a research study.
Sample size	Refers to the number of participants or observations included in a study.
Sampling techniques	Statistical approaches used for selecting a representative sample from a population.

CHAPTER 1 INTRODUCTION

1.1 Introduction

Library information systems (LIS) are generally referred to as the use of information and communication technologies (ICT) for transforming libraries to make them keep track of their documents inventory and loans, and member subscriptions and profiles, sometimes for multiple physical locations (Khan & Qutab, 2016; Nunekpeku, 2020; Singeh et al., 2021; Soltani-Nejad et al., 2020). LIS are no longer a simple collection of information resources but have become enablers for the digital community for communication, e-learning and user search (Soltani-Nejad et al., 2020).

LIS has been becoming increasingly popular in the recent decade, exemplified not only in the rapid growth of LIS product and service offerings (Nunekpeku, 2020; Singeh et al., 2021; Soltani-Nejad et al., 2020) but also in the wealth of literature resulting from the active research in this area (Okyere-Kwakye & Nor, 2020; Singeh et al., 2021; Soltani-Nejad et al., 2020). The popularity of LIS is due to its potential benefits to students and higher education at large, especially in facilitating effective learning. These systems offer various advantages in academic settings, including efficient resource management, particularly in streamlining cataloguing, acquisition, and circulation processes; improved access to resources through the provision of advanced search and discovery tools; user engagement and services; data analytics and decision-making through the collection of data on library usage, which can be analysed to make informed decisions regarding resource allocation and collection development; LIS facilitate resource sharing among libraries, promoting collaboration and access to a broader range of materials; and they facilitate remote access to resources, benefiting distance learners and researchers (Landøy et al., 2020; Matthews & Block, 2019; Okyere-Kwakye & Nor, 2020).

LIS offer higher education institutions a major source of competitive advantage and a cost-effective way to disseminate knowledge and information (Mahwasane, 2016). Therefore, governments worldwide actively assist their higher education systems to expand, grow and prosper their LIS by developing various policies and programs to improve effective and efficient teaching and learning (Okyere-Kwakye & Nor, 2020; Strand & Britz, 2018). For example, several policies and initiatives were implemented in South Africa to promote LIS and enhance access to information and knowledge. These

policies and initiatives aim to improve library services, increase digital inclusion, and support education and research (Stilwell, 2016; Strand & Britz, 2018). Key initiatives introduced in South Africa include (a) the South African National Digital Repository (SANDR) aimed at preserving and providing access to South Africa's digital heritage. It plays an important role in archiving digital resources and making them available to researchers and students, (b) the establishment of the National Library and Information Services (NLIS) Strategic Plan whose main emphasis is on modernisation access to digital resources, and capacity building, (c) the e-Skills Institute (e-SI) which focuses on developing digital skills and competencies among library and information professionals in South Africa, enabling them to effectively use LIS technologies, and (d) the Presidential Task Team on Information and Development (2000) which was established to assess the state of information and libraries in South Africa and make recommendations for their development (Aruleba & Jere, 2022; Davis, 2010; Ocholla & Ocholla, 2020). Such government policies and initiatives have created favourable conditions for developing and supporting LIS in South Africa and promoting the adoption of the latest technologies.

1.2 Background to the Research Problem

However, the tremendous potential of LIS for enabling effective learning in South African higher education has not been fully utilised. The majority of LIS functionalities in higher education in South Africa are underutilised. Those students who have adopted LIS have not moved beyond the entry-level adoption (Chisita & Chizoma, 2021; Fakoya-Michael & Fakoya, 2020). Furthermore, research on individual-level factors influencing users' acceptance of LIS is inadequate. Insufficient research on LIS adoption dynamics, specifically in Africa, raises critical questions, particularly when evidence indicates that information systems in developing countries have experienced high rates of failure (Chisita & Chizoma, 2021; Khan et al., 2017; Park et al., 2009). To effectively assist South African higher education institutions in their pursuit of facilitating effective teaching and learning using LIS in today's competitive environment, developing a framework for better understanding the critical determinants for adopting these digital technologies in South African higher education libraries is of practical significance.

There is much research in the literature on the investigation of the adoption of LIS in higher education (Huang et al., 2022; Khan et al., 2017; Vongjaturapat, 2018), leading to the development of various theories and models for understanding the determinants of adopting LIS from different perspectives. Vongjaturapat (2018), for example, extended the task-technology fit for explaining the adoption of LIS in higher education using various ubiquitous technologies, including laptops, mobile phones, iPads and tablets. Moorthy et al. (2019) developed an integrated model for investigating the factors that affect higher education students' behavioural intention to use LIS by combining the Unified Theory of Acceptance and Use of Technology 2 and the Information Systems Success Model. Similarly, Soltani-Nejad et al. (2020) combined the information system success theory, technology acceptance model (TAM), media affinity theory, satisfaction-loyalty theory and engagement theory in their design and development of a model to identify the antecedents and consequences of user satisfaction with digital libraries. Odunola and Tella (2020) investigated the correlation between perceived usefulness and patronage of LIS by university students. However, these studies do not agree on the critical determinants for adopting LIS in higher education.

Digital libraries in South African higher education are systems with unique characteristics in technology adoption including (a) lack of technical expertise among the users (Ocholla & Ocholla, 2020), (b) Lack of ICT infrastructure (Chisita & Chizoma, 2021; Ocholla & Ocholla, 2020), and (c) high levels of inequalities among higher education students (Strand & Britz, 2018; Walker, 2020). These unique characteristics of digital libraries in South Africa warrant a comprehensive framework for understanding the technology adoption in LIS South African higher education. Among the well-established theories and frameworks, the Technology Acceptance Model (TAM), capable of capturing four aspects of a user that influence the adoption of technology, including perceived usefulness, perceived ease of use, behavioural intention, and utilisation, is the most suitable for studying the adoption of technology in SMEs. This is because TAM is the most widely used model for predicting the utilisation of technology (Bere & Rambe, 2016; Park et al., 2009).

1.3 Research Problem

The LIS are a complex collection of digital technologies with unique characteristics in technology adoption, including (a) lack of technical expertise (Ocholla & Ocholla, 2020), (b) inadequacy of capital and organisational planning (Stilwell, 2016), and (c) support to a wide range of users (Zha et al., 2015). These unique characteristics of LIS warrant a comprehensive framework for understanding the technology adoption of LIS in higher education. Among the well-established theories and frameworks, the Technology Acceptance Model (TAM) can capture the user's behavioural intentions to use LIS based on their perceptions. TAM is easy to comprehend yet has demonstrated high predictiveness in many contexts (Chahal & Rani, 2022).

1.4 Motivation to Undertake the Research

The motivation to undertake this research is due to two main reasons. Firstly, there is a lack of rigorous assessment of the adoption of LIS in South Africa, although much literature discusses LIS usage in developing countries (Khan et al., 2017; Odunola & Tella, 2020). As the implementation of digital libraries in South African higher education is mature, understanding the critical factors influencing users to adopt these LIS would benefit South African higher education institutions, government, and citizens (Stilwell, 2016).

Secondly, there is a lack of research in evaluating the adoption of LIS from the perspective of the South African context, although such a study would greatly benefit the South African community in their development and utilisation of LIS. Existing frameworks for evaluating the adoption of LIS are designed to be used in countries where social inequalities are minimal, and service delivery is much better, including Internet access and access to electricity is advanced (Huang et al., 2022). Such frameworks are, therefore, inappropriate for developing countries like South Africa, where most of the citizens are living in poverty. This creates the necessity of developing new frameworks for evaluating the adoption of LIS specifically for South Africa. Developing new frameworks capable of considering the uniqueness of LIS adoption in developing countries can contribute to a better understanding of digital libraries and, therefore, justify the need for this research.

1.5 Research Aim, Objectives, and Research Questions

This study aims to provide a framework for exploring factors that influence the adoption of LIS in selected South African Universities in the Western Cape. Specifically, it aims to (a) investigate the current patterns of the adoption of LIS in South African higher education, (b) identify the critical determinants for the adoption of LIS in South Africa, and (c) develop an effective framework for assisting digital libraries in better understanding utilisation trends of their LIS.

A primary research question has been formulated to fulfil the aim of the research as follows:

What is the appropriate framework for evaluating the adoption of LIS in South African higher education?

To facilitate answering the primary research question above, several secondary research questions have been formulated as follows:

(a) What are the critical factors for evaluating the adoption of LIS in South African higher education?

(b) What are the current patterns and trends for adopting LIS in South African higher education?

(c) *How do higher education libraries in South Africa encourage the utilisation of their LIS?*

1.6 Rationale of the Research

This study explored guidelines for improved adoption of a library information system in the South African university context. The findings of the investigation of adopting a library information system in the context of this study could improve perceived value and fill a gap in the unravelling of adoption challenges. The study supports improved adoption of library information systems and factors that influence the adoption of library information systems in South African universities.

1.7 Research Methodology

The research was initiated due to the motivational factors discussed earlier, such as the lack of assessment of the adoption of LIS in South African universities and insufficient frameworks for assessing LIS adoption in the South African context. This leads to the formulation of the research aims and a set of research questions for fulfilling the aims of the research.

The research questions formulated in this research are largely confirmatory. Thus, quantitative data is needed to answer the research questions adequately. Through the use structured questionnaires data collection was done to gain insight into student belies regarding adoption Cohen (1980). This study made use of the positivist approach as statistics and structured questionnaires were used. of Based on a review of the literature on the concepts of technology adoption and digital libraries, the specific nature of the LIS development in South Africa, and the limitation of the existing LIS evaluation frameworks, a theoretical framework is developed by hypothesising the critical factors for evaluating the adoption of LIS in selected South African Universities in the Western Cape. Using survey data collected in South African higher institutions, the theoretical framework is validated and tested using SEM to answer the confirmatory type of research question. Finally, the quantitative findings are merged to derive the conclusion for answering the research question. Figure 1.1 presents an overview of the approaches to this research.

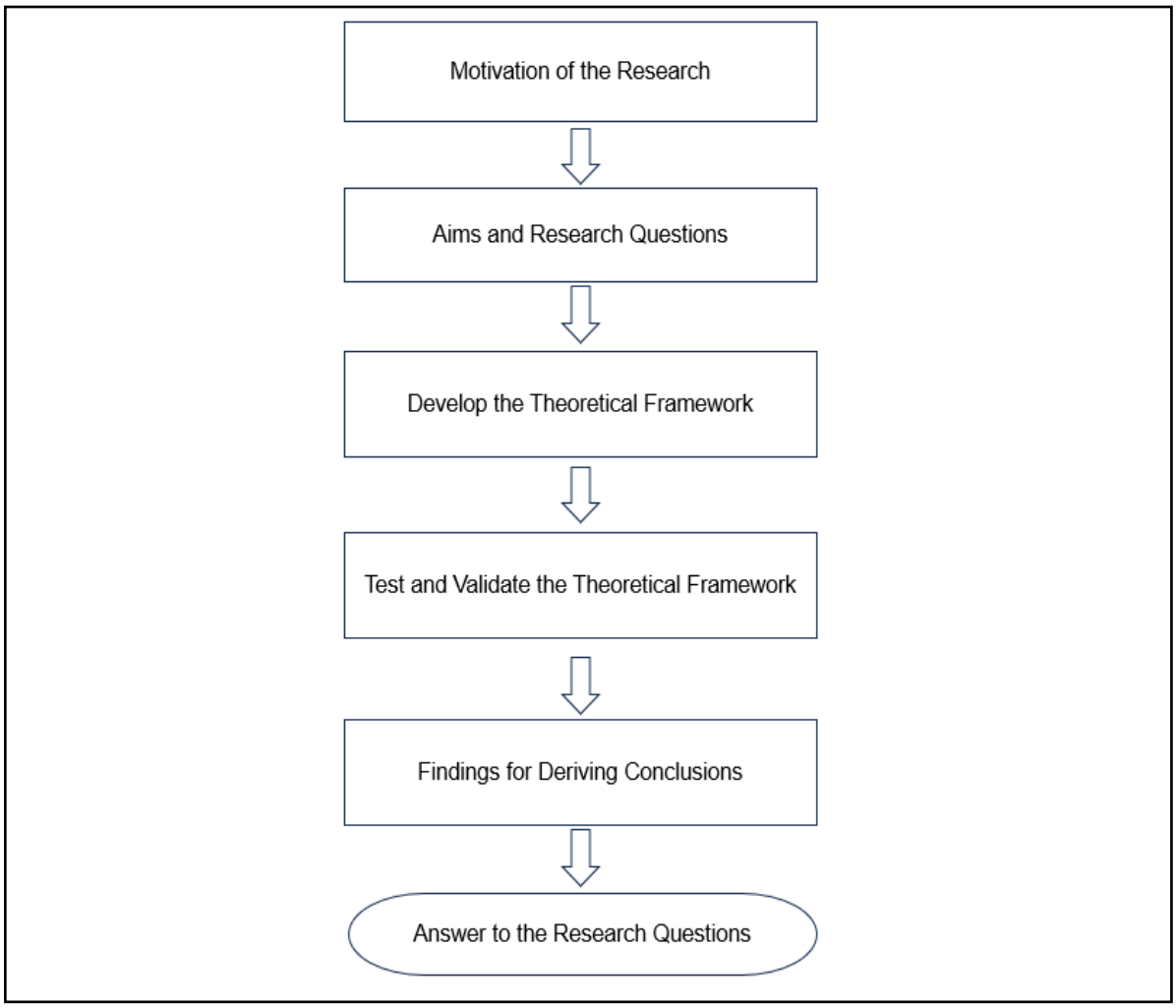

Figure 1.1 The research methodology

1.8 Delimitations of the Research

This research focused on several areas. However, the following have been excluded:

- No evaluation of the library system was undertaken.
- No implementation of a library system occurred.
- Data was collected exclusively from two universities in South Africa.

1.9 Structure of the Thesis

The thesis follows the structure recommended for quantitative methods research (Creswell & Plano Clark, 2011), and it consists of six chapters.

Chapter One is the introductory chapter focusing on the background to the research, the motivation and aims of the research, the research questions, the research methodology and the structure of the thesis.

Chapter Two provides a comprehensive review of the literature on the digital divide in South Africa, the nature of digital libraries in South Africa, existing digital technology adoption evaluation methodologies, and the concept of LIS. The existing methodologies for evaluating the adoption of LIS, their strengths and limitations, and the need for a new theoretical framework for effective evaluation of the adoption of LIS in South African higher education are explicitly discussed in this chapter.

Chapter Three develops a theoretical framework for evaluating the adoption of LIS in South African higher education by addressing the limitations of the existing frameworks for evaluating the adoption of digital libraries in South Africa. The theoretical framework developed in this chapter serves as the foundation for developing the survey instrument for testing and validating the theoretical framework using SEM.

Chapter Four focuses on the research methodology. An overview of different research approaches is presented to select a suitable research methodology. A discussion of the different research methods, including qualitative, quantitative, and mixed methods, is presented to select the most appropriate method for the study. The actual implementation of the research methodology is then discussed by detailing how the quantitative aspects are implemented in this research to answer the research questions adequately.

Chapter Five presents the analysis of quantitative data. It discusses the procedures undertaken to analyse the quantitative data and reports the quantitative study results. The chapter begins by presenting an overview of the data analysis procedures in this research, followed by a presentation of how raw quantitative data was prepared for SEM analysis. The chapter then demonstrates how the data is analysed using confirmatory factor analysis (CFA) and SEM.

Chapter Six presents a new framework for evaluating. It discusses the findings of the research data collection and the implications. The chapter ends with the research conclusion of the research study.

1.10 Chapter Summary

This chapter concludes with the study's introduction, followed by the background of the research problem and sub-problems. The motivation of the research was highlighted. The research aims, objectives and questions were introduced and answered in the final chapter of the research study. The next chapter will expand on the preliminary literature review regarding a framework for exploring factors that influence the adoption of LIS in South African higher education.

CHAPTER 2 LITERATURE REVIEW

2.1 Introduction

This chapter explores the research gap in the adoption of LIS in higher education in South Africa through an extensive review of the related literature to justify the need for this study. The rest of the chapter is organized into five sections to achieve this objective. Section 2.2 presents an overview of LIS. Section 2.3 describes LIS in the South African context, focusing on their technology adoption characteristics. Section 2.4 investigates the adoption of technology in higher education, followed by an extensive literature review on LIS adoption in South African higher education in Section 2.5. Section 2.6 ends the chapter with some concluding remarks.

2.2 An Overview of LIS

Electronic learning (e-learning) has become increasingly popular in recent times (Chisita & Chizoma, 2021; Sanjeev, Khademizadeh, Arumugam, & Tripathi, 2021; Zha, Wang, Yan, Zhang, & Zha, 2015). This is exemplified by a significant increase in e-learning's projected annual growth rate of 19% from 2022 to 2030 due to the market size that is expected to reach USD 32.38 billion by 2030 (Research and Markets.com, 2022; Sanjeev et al., 2021). The popularity of e-learning is attributable to the potential benefits that it can provide to teaching and learning, especially in higher education, including improving student performance, increasing student satisfaction, and lowering costs of accessing learning resources (Khan, Masrek, Mahmood, & Qutab, 2017; Masrek & Gaskin, 2016; Okyere-Kwakye & Nor, 2020; Sanjeev et al., 2021). More recently, the growth of e-learning has been accelerated by the COVID-19 pandemic national lockdowns, which forced many students to pursue their studies from the comfort of their homes (Sanjeev et al., 2021). This resulted in engaging in teaching and learning services and accessing learning resources from home, particularly through the library information systems (LIS) (Adedoyin & Soykan, 2020).

Libraries are a distinct group of establishments with exceptional attributes in adopting technology (Aruleba & Jere, 2022; Bere, 2018). In higher education, library information systems (LIS) play a critical role in improving the effectiveness and efficiency of teaching and learning (de Jager, Nassimbeni, Daniels, & D'Angelo, 2018; Okyere-

Kwakye & Nor, 2020). Several studies provide evidence of correlations between student performance and using LIS (de Jager et al., 2018). Stone and Ramsden (2013) conducted a study in the United Kingdom at eight universities, which confirmed a statistically significant relationship between electronic resource access and student performance. In the United States of America, Soria, Fransen, and Nackerud (2017) conducted a study demonstrating a positive correlation between library use and undergraduate performance.

Similarly, a study in South Africa by de Jager et al. (2018) showed a positive relationship between library use and student achievement. A study conducted in Ghana reveals a statistically significant relationship between the perceived usefulness of LIS and its adoption (Okyere-Kwakye & Nor, 2020). Adopting LIS offers higher education institutions numerous opportunities to compete in local, regional, and global markets.

The potential of LIS in South African higher education systems is underutilized (de Jager et al., 2018; Okyere-Kwakye & Nor, 2020). The South African higher education system has 26 public Universities. All 26 universities implemented LIS. However, these resources are underutilised despite the large investments made during implementation and ongoing maintenance costs (Ocholla & Ocholla, 2020). Some universities in South Africa do not have detailed information on their websites about the use of their LIS, which could be a contributing factor to the poor adoption (Ocholla & Ocholla, 2020). Most higher education students in South Africa are underprepared concerning the use of digital technology due to their social and economic background (de Jager et al., 2018). Such a low adoption rate of LIS in South African higher education is interesting in the presence of (a) the high internet and smartphone penetration rate in South Africa for enabling e-learning activities (Ocholla & Ocholla, 2020) and (b) the continuous support from the South African department of higher education and the individual universities to improve their competitiveness through the adoption of LIS (De Jager et al., 2018). As a result, a better understanding of the adoption of LIS in South African higher education is becoming critical.

It is important to first look at information systems in general to gain more understanding of these digital systems. There are several definitions of information systems (IS), and none has been agreed upon (Paul, 2007). Some of the IS definitions are as follows:

- A system which assembles, stores, processes, and delivers information relevant to an organization (or to society) in such a way that the information is accessible and useful to those who wish to use it, including managers, staff, clients and citizens. An information system is a human activity (social) system which may or may not involve computer systems. (Buckingham et al. (1987, p. 18)

- The IS emerges from the usage of the IT delivery system by users (whose strengths are that they are human beings, not machines). This usage will be made up of two parts: (1) First, the formal processes, which are currently usually assumed to be pre-determinable concerning decisions about what IT to use. (2) Second, the informal processes, which are what the human beings who use the IT and the formal processes create or invent to ensure that useful work is done (Paul, 2007, pp. 194–195).

- Assumed to mean computer-based systems, which are combinations of hardware, software, and telecommunications networks that people build and use to collect, create, and distribute useful information (Jessup & Valacich (2008, p. 567).

- A simple definition might be that an information system is a system in the organization that delivers information and communication services needed by the organization. This can be expanded to describe the system more fully. The information system or management information system of an organization consists of the information technology infrastructure, application systems, and personnel that employ information technology to deliver information and communication services for transaction processing/operations and administration/management of an organization. The system utilizes computer and communications hardware and software, manual procedures, and internal and external repositories of data. The systems apply a combination of automation coming human actions and user-machine interaction (Davis, 2000, p. 67).

Lesk (1997:1) states that library information systems are "organized collections of digital information." Arms (2000:2) views library information systems as a "managed collection of information, with associated services, where the information is stored in digital formats and accessible over a network." LIS can be seen as a useful support tool for the use, creation and search of digitized information ((Borgman, 2002). With the benefits known regarding traditional libraries, LIS is expected to provide additional benefits through new opportunities (Witten 2005).

2.3 LIS in South Africa and Their Development

This section identifies the three categories of South African universities: traditional, universities of technology, and comprehensive.

Traditional universities are defined by their structure, using lecture-based formats (Fenton & Gallant, 2016). Universities of technologies are similar in using materials based on the real world. There are 26 public universities in South Africa and more than 50 higher education training colleges (Department of Higher Education and Training, 2018). The public universities are made up of traditional ones, which account for twelve of the universities: the University of the Free State, University of Cape Town, University of Pretoria, Rhodes University, University of Fort Hare, University of Limpopo, University of Stellenbosch, University of the Western Cape, University of Witwatersrand, Sefako Makgatho Health Sciences University, North-West University and University Of KwaZulu-Natal. The University of Johannesburg, the University of South Africa and the University of Venda comprise the three comprehensive universities. The Cape Peninsula University of Technology, Central University of Technology, Durban University of Technology, Mangosuthu University of Technology, University of Mpumalanga, Sol Plaatje University, Tshwane University of Technology, and the Vaal University of Technology make up the eight universities of technology (Department of Higher Education and Training, 2018).

Although global predictions of technology adoption in higher education were reported for 2007-2015 Horizon Report NMC Horizon Reports, 2007-2015), South Africa would adopt LIS on a different trajectory. South African higher education system and policies were built on the unequal apartheid regime (Worden,1994). From 1994, those educational policies would be revisited for the new South Africa (Laredo, 2007). One of

the challenges faced is access to information communication technologies (ICT) and networks in some areas of South Africa (Broekman, Enslin, & Pendlebury, 2002; Veletsianos, 2010). In early 2000, South Africa focused on building the ICT infrastructure, developing policies regarding ICT and researching practises in higher education(Czerniewicz and Brown 2005). South Africa had to restructure its higher education sector by merging what would be today's 36 higher education institutions to the 26 current institutions based on the traditional, universities of technology and comprehensive universities (Ubogu, 2006). This was to achieve highly increased enrolments and graduation. University libraries would become more valuable with the use of the internet. In early 2004, several libraries started adopting library information systems (http://www.dli2.nsf.gov/). Oyewo and Bello (2014) observed that low adoption was attributed to a lack of guidance on use, slow connectivity, computer illiteracy skills and use of a device such as computers and smartphones. These factors were mostly faced by black communities and lower-income groups (Aitchison & Harley 2006).

2.3.1 Benefits of utilising LIS in South African higher education

Ubogu (2006) stated that one of the advantages of library information systems is that resources are easily accessible from any place at any time. Resources are never out of stock or out on loan as in traditional libraries. Library information systems do not require additional space; therefore, the additional need for space declines (Ubogu, 2006). Costs of technical services are also reduced. Communication and collaboration are strengthened between research communities and educational institutions. Library systems take leadership of being knowledge repositories. LIS contribute to access to lifelong learning for all users. These advantages can be seen for students, library users, librarians, and staff (Association of Research Libraries, 1995).

2.3.2 Strategies employed by universities to promote the adoption of LIS.

Several obstacles in LIS adoption, Due to the lack of understanding of the importance of LIS students, computer literacy, internet connectivity and lack of librarians, were observed in a Pakistan university study by Khan and Ahmed (2013). Igbaria et al. (1997) support the significant effects regarding the usefulness and usability of library information systems due to library assistance. There is a positive relationship between library assistance and perceived usefulness and ease of use of library information systems

(Miller and Khera(2010). Park et al. (2009) state that a strong indicator of perceived use is seen by library assistance.

2.4 Library Systems User Satisfaction

Libraries offer various services utilised by library users and can be seen as products (Kotler et al. 2014). The main purpose of a library is to meet user satisfaction. Library users are important to the library as they are created for library users. Therefore, user satisfaction is of great importance. Library users can be employees, staff, society and university students; the primary user of a university library is seen as the students (Crawford 1991). The library is used for various reasons, such as a reliable criterion for determining library effectiveness, measured by user satisfaction (Thong and Yap, 1996:176). Evans (1972) stated that user satisfaction was one of the six criteria for measuring library effectiveness: accessibility, cost, user satisfaction, response time, cost/benefit ratio and use. Two distinct subgroups emerged from the user satisfaction category: user satisfaction regarding existing services and user needs for services not currently available (Evans, 1972).

2.5 Library information system

This research focuses on the framework for adoption of a university library information system. The research is informed by research done in the manufacturing industry that shows better performance results after adopting a superior information system (Sharma & White, 2020). Nicholson (2004: p.506) synthesized a framework of guidelines that address issues concerning library information systems, suggesting “many library evaluations are driven by problems”. The guidelines that address issues concerning library information systems have ben referred to as the collection development and management by Jonhson (2018: 1). Ajith, Ramanayaka & Weerasooriya (2023) Stated that use of multiple assessment methods must be used when evaluating a library to address the different areas within the library, as a single evaluation method will not be relevant to all the library resources. Bartlett (2015) highlights some of the issues discovered from evaluating a library information system, such as time-consuming factors experienced by librarians, lecturing staff and students, inefficient data collection where access to required information proved to be problematic, and poor cost-effectiveness expressed as a lack of perceived value of services in the library information system.

The issues mentioned above faced by library information systems make the process of utilising library facilities time-consuming and inefficient way of information gathering. There is an urgency for libraries, irrespective of their focus, to demonstrate their value organizationally and economically (Bartlett, 2015). With the advantages of using library information systems, there is a primary investigation of the factors that influence library information systems.

Because automated performance checks for equipment and machinery occur through a self-learning knowledge base (Lee, Lapira, Yang, et al., 2013), inventory and production costs can be reduced using analytics in manufacturing processes (Schermann et al., 2014). It has been argued that when service organisations, such as university libraries, adopt analytics customer-oriented services, improved operational efficiency is often the result (Schermann et al., 2014). However, data collected from an IBM survey reveal that the lack of knowledge regarding the use of analytics technology remains a major challenge (Schermann et al., 2014). Companies often adopt the required analytics skills by using active knowledge sharing in order to gain insight from the experiences of other companies that would have implemented it.

Knowledge sharing, information retrieval, knowledge archival, and knowledge dissemination are known as the factors of a library (Lee et al., (2005:2). Libraries make use of various attributes such as hard copy books, video tapes, computer access, and environments for studying. The digital library consists of online catalogues, online library services circulation and library online databases. However, the importance of the library in higher education is visible. Its economic and organizational value needs to be more evident (Bartlett, 2015). Most students use them for educational and academic purposes (Nagata et al., 2007). Analysing trends in a library, libraries can predict their system performance and effectiveness. The library's performance can be measured by factors such as its impact on teaching, user satisfaction and learning (Bartlett, 2015). By analysing the information regarding the usage of library information systems, the library can make data-driven decisions which can affect economic and pedagogical resources within the library. Understanding the factors that influence the adoption of library information systems, one of the main results is improved outcomes and informed decisions, which are extremely important. Improved outcomes can lower costs, time spent and adoption. With the large amount of information offered in libraries, time is of

great essence because learners can spend a day looking for irrelevant information (Stanford, 2016). Bartlett states the same notion as Stanford (2016) of library institutions proving their value using analytics, stating the use of analytics and metrics can be used to prove their value and efficiency. The COVID-19 epidemic highlights some obstacles stated by Myburgh (2009).

2.5.1 Advantages of library information systems (LIS)

Some advantages of a library information system include accurate and reliable information accessibility at a faster speed while anywhere in the world (Cleveland, 1998). Other advantages also provided by LIS are Multiple access, remote access, 24 hour access and a wider range (Gill and Gill, 2020). Although library information system users can access accurate and reliable information from this system and have faster accessibility to information needs, they still complain. Nicholson (2004:506) synthesized a framework of guidelines that address issues concerning library information systems, suggesting "many library evaluations are driven by problems". Bartlett (2015) highlights some of the issues discovered from evaluating a library information system, such as:

- Time-consuming factors experienced by librarians, lecturing staff and students.
- Inefficient data collection where access to required information proved to be problematic.
- Poor cost-effectiveness expressed as a lack of perceived value of services in library information systems.

This makes the process of utilising library facilities time-consuming and inefficient way of information gathering. There is an urgency for libraries, irrespective of their focus, to demonstrate their value organizationally and economically (Bartlett, 2015). The advantages of the library information system, as well as its value, were seen during the coronavirus pandemic, which began in 2020. As Students had to depend on

2.5.2 COVID-19 Impact on University Libraries

During the early stages of COVID-19, a hard lockdown was imposed on South Africa, in which non-essential businesses were closed to curb the spread of the virus. Covid- 19 had a massive impact on higher education, institutions having to close down and fully become remote (Crawford et al, 2020). Schools and universities were closed in order to

avoid large concentrations of people in confined spaces. With the universities being closed, so were the university libraries, but students could still access the library remotely through the library information system. Most South African universities adopted a fully online program approach intended to ensure that students would be able to complete their studies. However, for some students, this provided challenges not having physical access to the university library. For example, students without laptops and internet access or who could not afford data had to rely on library online services for academic support. As a result, university libraries implemented additional digital services designed to meet the increased student needs during the pandemic. Consequently, during the pandemic, library information services (LIS) were vital in facilitating access to library resources, Libraries were providing massive support to user further highlighting the importance on library information systems (Dube & Jacobs, 2023).

2.6 Conceptualization of Technology Adoption Higher Education

Toica et al. (2005) have developed a conceptual framework for exploring eBusiness adoption in organizations. Grounded on the dimensions of socioeconomic readiness and government involvement, such a framework suggests ten propositions to be tested, including organizational structure, business strategy, organizational culture, and environment. The proposed framework relates to the adoption and performance of m-commerce by organizations. However, it is based mostly on structural factors, assuming that adopting e-business leads to better organisational performance.

Alqatan et al. (2017) have developed a conceptual framework for investigating the critical factors affecting the adoption of e-business in tourism SMEs in Jordan. By integrating TAM with TTF, the proposed framework consists of perceived usefulness, perceived ease of use, and the fit between mobile technologies and tasks. Such a framework, however, focuses on understanding the determinants of m-commerce adoption from the perspective of employees in tourism SMEs.

Zeeshan et al. (2007) present a conceptual framework for understanding the adoption of eBusiness in organizations along the supply chain. The proposed framework comprises ten factors: technological, financial, human resources, customer orientation, innovation orientation, perceived organizational collaboration advantages, top management support, institutional pressure, competitive pressure, and organizational size. Based on these

factors, the study concludes with the hypotheses that need to be empirically tested in future research.

Abrahams (2010) has developed a conceptual framework for identifying and prioritising issues and barriers to adopting instructional technology. The framework consists of identified theoretical factors from empirical data to create structured processes that identify priority issues and barriers to technology adoption.

Ohei and Brink (2019) present a conceptual framework for Web 3.0 and Web 2.0 Technology in higher education institutions. The proposed framework comprises a methodological concept to develop social software for business processes and social presence in higher education. On the other hand, Ajmi et al. (2017) present a conceptual framework of e-learning based on cloud computing adoption in higher education institutions. The proposed framework consists of a model that utilizes e-learning based on cloud computing, using the Fit Viability and Diffusion of Innovation models. Both models factor information on cultural factors.

2.7 Technology Adoption Model in South Africa

The use of technology for teaching and learning has increased in growth in the higher education environment, which has added pressure for institutions to use technology. Although there is a rapid change in technology in South Africa, there are challenges with adopting information and communication technologies in rural areas (Malecki, 2003; Strover, 2003; Velaga et al., 2012). The less privileged, which is the majority of South Africa, emerge from under-resourced backgrounds compared to the privileged minority with digital literacy (De Lange, 2008). The digital divide is seen among the different regions and people in South Africa (Çilan, Bolat & Coşkun, 2009). The greater distances in rural areas and low density have discouraged markets from investing in new technologies in rural areas (Malecki, 2003). The disparities in their access to technology, skills of technology, knowledge of technology and type of usage of technology influenced the digital divide (Lentz & Oden,2001; Van Dijk & Hacker, 2003). Research as shown that Universities that embraced fourth industrial revolution (4IR) in South Africa are highest ranking universities in the country (Hlobo et al., 2022). Research shows the challenges with adoption for 4IR regarding South African universities had to

do with complexity, incompatibility, and digital divide states (Lubinga, Maramura & Masiya, 2023).

2.8 Critical Literature Analysis

Toica et al. (2005), Alqatan et al. (2017), Zeeshan et al. (2007), Ohei and Brink (2019) and Abrahams (2010) all presented conceptual frameworks for organisations adopting various technologies in high education. The use of these conceptual frameworks was to understand the various factors that influenced the adoption of these technologies. It is implied that the adoption of technology requires a framework relating to the adoption of the technology. Covid-19 highlighted some factors of LIS in higher education universities, Nicholson (2004) framework of guidelines that address issues concerning library information systems supported some of the issues participants were still facing during covid-19. The importance of university libraries is clearly stated by de Jager, Nassimbeni, Daniels, & D'Angelo, 2018; Okyere-Kwakye & Nor, 2020, the advantages provided by LIS highlight the importance of understanding the technology adoption of LIS in higher education using a comprehensive framework.

2.9 Chapter Summary

In conclusion, both traditional libraries and LIS play a vital role as knowledge repositories where LIS improves the efficiency and effectiveness of libraries. An organisation's information system has the function of delivering information and communication services that are needed by the organization. An organisation's information system 'consists of the information technology infrastructure, application systems, and personnel that employ information technology to deliver information and communication services for transaction processing/operations and administration/management of an organization. The system utilizes computer and communications hardware and software, manual procedures, and internal and external repositories of data. The systems apply a combination of automation coming human actions and user-machine interaction. Although information systems cannot be defined by one definition, library information systems can and are seen as a managed collection of information with associated services, where the information is stored in digital formats and accessible over a network. The next chapter examines conceptual models and the proposed conceptual model for this current study.

CHAPTER 3 A CONCEPTUAL THEORY

3.1 Introduction

A theory is a well-substantiated explanation of an aspect of the natural world that can incorporate laws, hypotheses and facts (Creswell, 2014). It focuses on providing specific views on the causal relationship between theoretical constructs in a study (Bere & Rambe, 2016). The purpose of using a theory in research is to (a) describe a certain phenomenon, its casual relationships and its boundaries; (b) present an explanation of how, why and when certain things occur; (c) give approximate predictions about what will occur under particular conditions, and (d) provide an explicit prescription for constructing a particular phenomenon (Almukhlifi, 2019; Creswell, 2014). When explaining a theory, a conceptual framework for exploring a specific problem needs to be developed (Almukhlifi, 2019; Bere, 2019).

A conceptual framework aims to identify a set of constructs and their relationships that can be tested using empirical data to better understand a specific phenomenon (Bere, 2019). It can include constructs relevant to any theory to show the integral role of each construct in the phenomenon (Straub et al., 2022; Sukamolson, 2007). A conceptual framework helps to present the logic of how these constructs are related to each other for a better understanding of the cause-and-effect relationships between these constructs (Bere, 2019; Straub et al., 2022). As a result, it is necessary to develop a conceptual framework in this study for investigating the critical determinants for the adoption of online library systems by South African universities. Such a framework provides a basis for developing the questionnaire that helps meet the objectives of the study.

This chapter is organised into four sections. Following the introduction, section 3.2 presents the theoretical foundation of this study for guiding the development of the conceptual framework. Section 3.3 conceptualises the framework focusing on the critical factors for adopting online library systems in the South African higher education sector. Section 3.4 provides some concluding remarks.

3.2 Adoption models

User acceptance and usage behaviour can be examined using various theoretical models for emerging information technologies. These include:

- The theory of planned behaviour (TPB) (Ajzen, 1991).
- The innovation diffusion theory (Brancheau & Wetherbe, 1990).
- The decomposed theory of planned behaviour (Taylor & Todd, 1995).
- The technology acceptance model (TAM) (Davis, Bagozzi & Warshaw, 1989).
- Task technology fit

3.2.1 The theory of planned behaviour

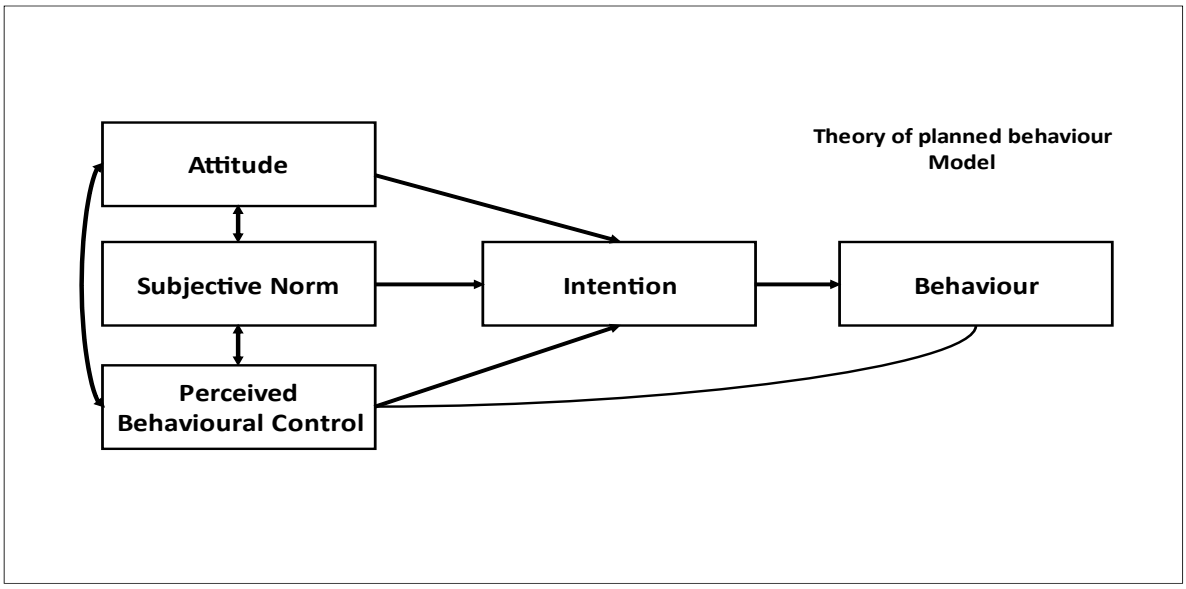

Figure 3.1 The theory of planned behaviour

The theory of planned behaviour helps us understand the intent of using a system based on a range of factors, including attitude, subjective norm and perceived behavioural control. According to Ajzen (1991), the individual's behaviour is largely determined by one's intentions, which in turn are predicted by behavioural attitudes.

According to the theory of planned behaviour (Ajzen, 1991), human behaviour is determined by intentions, which are influenced by attitudes, subjective norms, and perceived behavioural control. At the same time, external factors may also shape human behaviours, irrespective of the intention and depending on the degree to which a behaviour is controlled by the individual and the degree to which perceived behavioural

control is an accurate measure of actual behavioural control. Robinson and Doverspike (2006) applied the Theory of Planned Behavior to individuals' intentions to enrol in either an online version or a traditional classroom version of an experimental psychology class.

3.2.2 The Innovation Diffusion Theory

Diffusion of Innovation (DOI) is a theory that explains how, why, and the rate at which a product, service, or process spreads through a population or social system. This theory describes and explains the pattern and rate at which new ideas, behaviours, technologies, or goods gradually spread through a population over time.

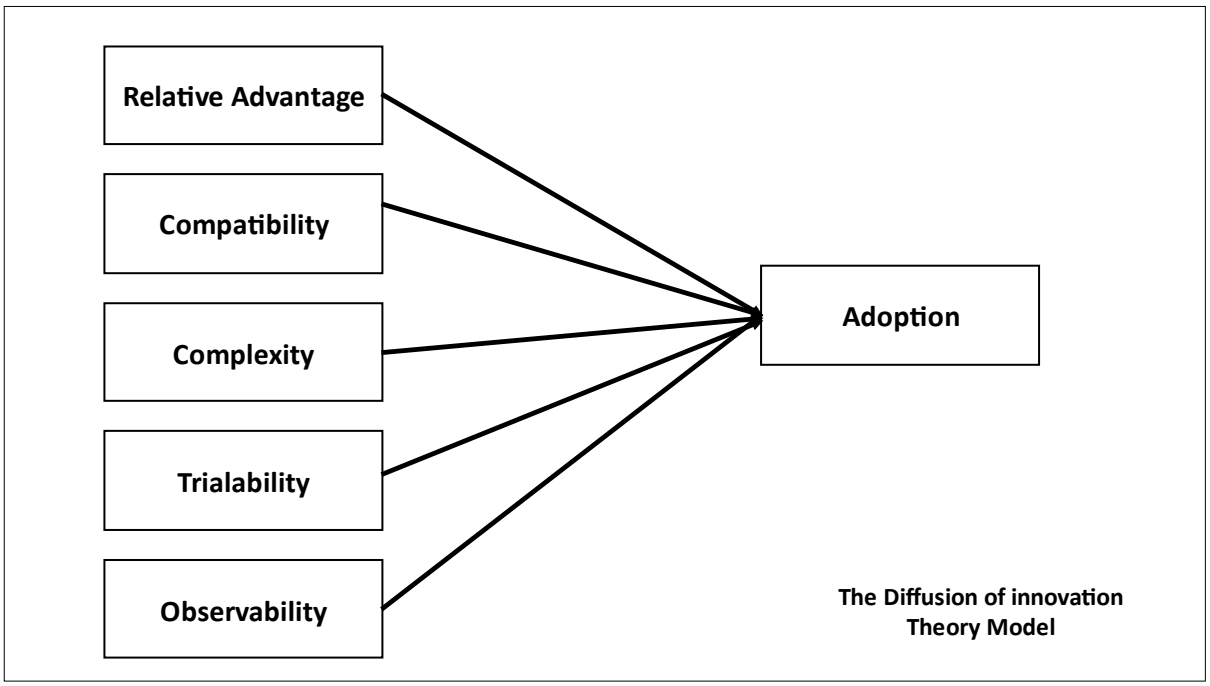

Figure 3.2 The innovation diffusion theory

3.2.3 The decomposed theory of planned behaviour

From the models cited above, TAM emerges as a powerful model that considers technological and process adoption as being determined by the user's behavioural intention. TAM focuses on the causal connections between perceived usefulness, ease of

use, system design features (design choices influence user acceptance), attitude towards using and actual usage behaviour. Perceived usefulness has been observed to be one of the factors noted for adoption and continued usage when looking at behavioural beliefs. Figure 2 explores the factors influencing behavioural beliefs regarding adoption and continued usage (Karahanna, Agarwal and Angst, 2006).

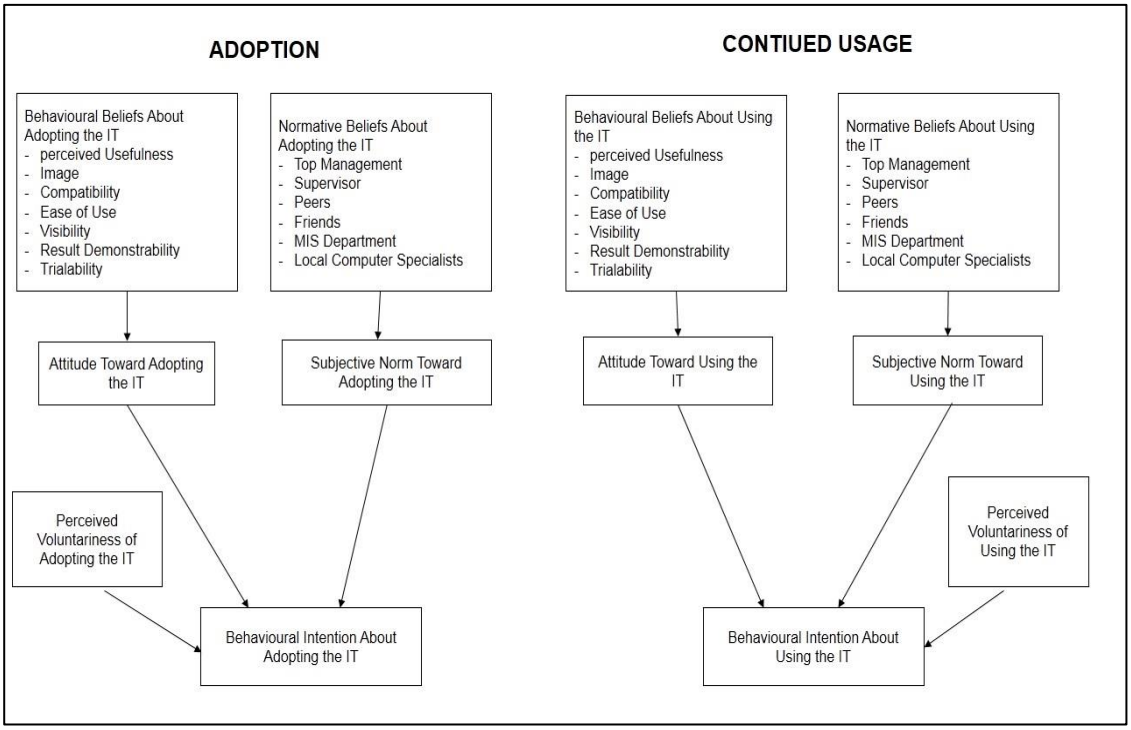

Figure 3.3 Theoretical Models

Source: Adapted from (Karahanna et al., 1999)

Figure 2.3 explores user behavioural intention, generally viewed as the user's attitude towards an innovative system/process and the perceived usefulness of the innovative system/process. According to Bagozzi, Davis, Fre and Warshaw (1992), the main goal of the TAM is to explain the "determinants of computer acceptance" that can explain user behaviour across a wide range of end-user computing technologies and user groups. The usefulness-behavioural intention relationship is grounded on the understanding that inside organisations, people behave in a particular way if they believe that such behaviour

will improve their job performance, over and above the likely positive or negative feelings that may be evoked toward the behaviour.

The reason for selecting TAM is that it consists of two major constructs regarding adopting the technology: PEOU and PU. According to the TAM, the two crucial beliefs important to computer acceptance behaviour are perceived usefulness and perceived ease of use (Davis, 1989). Perceived usefulness (PU) refers to the degree to which potential users consider how their job performance will likely improve after adopting a given system. On the other hand, perceived ease of use (PEOU) is defined as the degree to which a potential user thinks no effort is required to use a given system. The TAM proposes that an individual's behavioural intentions to utilise technology are determined by perceived ease of use and perceived usefulness. “Perceived ease of use” (Morris & Venkatesh, 2000) relates to the level at which a system's use is deemed relatively effort-free. “Perceived usefulness” refers to how people view the way they use technology as being linked to improving abilities. This concept is referred to as (Sun, Zhang & Yu, 2006). Also, the TAM suggests that the two TAM concepts, “perceived ease of use” and “perceived usefulness”, are mutually exclusive. This belief stems from the fact that technology facilitates processes, making it easier to achieve tasks (Morris & Venkatesh, 2000).

Compatibility as a concept is generally attributed to Rogers, who operationalized compatibility as believing that using innovation is influenced by belief systems that stem from social and cultural standpoints. Additionally, previous and current experiences and the needs of those who may adopt innovation are relevant (Karahanna, Agarwal & Angst, 2006). Operationalised compatibility can be explained as the gap between innovative methods and those already used for certain activities. Operationalised compatibility may be defined in four differing ways:

1. Existing ways in which tasks are performed.
2. What is already known, resulting from previous encounters.
3. There are work preferences that define styles of working; and
4. Value systems should be acknowledged.

This study will make use of the TAM in order to gain more insight into behaviour and beliefs toward the adoption of information systems within South African libraries. Using the selected model (TAM), the core factors concerning the adoption of information systems will be investigated in order to explore the research question, as well as looking at other studies of Library analytics where it has proven useful to explore. This literature review culminates in the research objectives and questions set out in section three.

3.3 Theoretical Background

Technology adoption refers to the process of accepting, integrating, and using new technology in society (Oliveira & Martins, 2011). There is a consensus that IT has significant performance enhancement effects on various tasks. These effects will only be fully realised if IT is widely accepted and utilised (Almukhlifi, 2019; Oliveira & Martins, 2011). It is crucial, therefore, to understand the critical determinants for adopting new digital technologies and the theoretical models that have arisen when addressing IT adoption.

Several theories and models have been used to investigate the adoption of various technologies from different perspectives (Almukhlifi, 2019; Bere, 2018; Oliveira & Martins, 2011). Theory of Diffusion of innovations (DOI) (Rogers, 1962), the institutional theory (DiMaggio & Powell, 1983), and the technology-organisation-environment framework (TOE) (Tornatzky & Fleischer, 1990) are leading theories for exploring technology adoption by organisations. A discussion of these theories is provided below.

The DOI was coined by Everett Rogers in 1962. According to Rogers (1962), diffusion is the process through which an innovation is gradually spread among the members of a social system. Therefore, an explanation for how, why, and how quickly new ideas and technologies spread is the diffusion of innovations (Karnowski & Kümpel, 2016; Rogers, 1983, 1962). The theory of DOI argues that the adoption of a new idea is influenced by five key factors: namely, the innovation itself, adopters, communication channels, time, and social structure (Rogers, 1983, 1962). Social capital is a key component of this process. To be self-sustaining, the innovation needs to be universally embraced (Rogers, 1983, 1962).

The theory of DOI helps to explore the influence of the characteristics of a specific technology on the adoption of this technology in organisations (Rogers, 1962). However, it is frequently criticized for disregarding the impact of organizational and environmental factors in different situations on adopting a particular technology (Almukhlifi, 2019; Lee & Cheung, 2004).

Institutional theory posits that organizations operating in the same institutional setting tend to grow more similar due to shared pressures (DiMaggio & Powell, 1983). For example, when new technology or management techniques are incorporated as part of innovation, others are inclined to emulate the practice to avoid making hazardous decisions, resulting in mimetic isomorphism (Cooper et al., 2008). DiMaggio and Powell (1983) identify three kinds of institutional pressures that affect technology adoption, namely, mimetic, coercive, and normative.

The institutional theory claims that adoption decisions involve more than just logic (DiMaggio & Powell, 1983). Understanding organisations as representations of social values and viewing them as a unique social system governed by internal and external institutional logic is crucial for institutional theory (DiMaggio & Powell, 1983; Soares et al., 2021). The company's external environment consists of players in a recognisable institutional camp, including suppliers to consumers, regulatory bodies, and partner organizations (DiMaggio and Powell, 1983).

Innovation decisions are primarily driven by the desire for legitimisation in this institutional context and typically adhere to the rules and values imposed by the entire institutional environment. Therefore, according to institutional theory, the primary force guiding organisational activities, such as the employment of technology, is the demand for legitimisation. For organizations that "intend to survive and prosper in their social environments," legitimacy is critical (Soares et al., 2021). However, the utilisation of the institutional theory is generally criticised for overlooking the effect of various organisational and technological factors on the acceptance and use of a specific technology (Almukhlifi, 2019; Soares et al., 2021).

The technology-organization-environment (TOE) framework explains technology adoption in organisations and describes how the process of adopting and implementing technological innovations is influenced by the technological context, organizational

context, and environmental context (Tornatzky & Fleischer, 1990). The technology aspect focuses on how technological characteristics affect the adoption of technologies in organisations (Awa et al., 2017; Li, 2020b; Tornatzky & Fleischer, 1990). The environmental aspect concerns the existence of external characteristics that force organisations to adopt certain technologies (Awa et al., 2017). These three aspects often include various factors that influence the adoption of technologies in organisations (TOE) (Li, 2020b; Tornatzky & Fleischer, 1990). Although the TOE framework is well-validated in the literature for understanding the adoption of technologies in organisations in various contexts, it has undergone limited theoretical development since its inception (Baker, 2012; Zhu & Kraemer, 2005). This is because the TOE framework is "too generic" and offers a high degree of freedom to vary factors and measures, so there is little need to change the theory (Zhu & Kraemer, 2005). Also, the TOE framework aligns well with other technology adoption theories and does not offer competitive explanations, leading to very restricted opportunities to modify the framework (Baker, 2012).

The adoption theories discussed above are for organizational-level analysis (Almukhlifi, 2019; Awa et al., 2017; Soares et al., 2021). They are inappropriate in exploring the adoption of technologies from the perspective of individuals like students due to their inadequate ability to examine the adoption of technologies by individuals (Almukhlifi, 2019; Bere, 2018). To adequately explore the adoption of technologies from the perspective of individuals, behavioural models such as the theory of reasoned actions (TRA) (Fishbein & Ajzen, 1975), the unified theory of acceptance and use of technology (UTAUT) (Venkatesh et al., 2003), and the technology acceptance model (TAM) (Davis, 1989) should be applied.

The TRA was developed by Martin Fishbein and Icek Ajzen in 1967 through a review and consolidation of the constructs of eight models (theory of reasoned action, technology acceptance model, motivational model, theory of planned behaviour, a combined theory of planned behaviour/technology acceptance model, model of personal computer use, diffusion of innovations theory, and social cognitive theory) that earlier research had employed to explain usage behaviour of new information systems (Bere, 2014; Venkatesh et al., 2003).

TRA explains the relationship between attitudes and behaviours in human action. Generally, it predicts how individuals behave based on their pre-existing attitudes and behavioural intentions. According to Fishbein and Ajzen (1975), an individual's decision to engage in a particular behaviour is influenced by the outcomes an individual expects will result from performing the behaviour.

The main purpose of the TRA is to understand an individual's voluntary behaviour by exploring the fundamental central motivation to act (LaCaille, 2020). TRA states that a person's intention to perform a behaviour is the main predictor of whether or not they perform that behaviour (LaCaille, 2020; Yzer, 2017). Furthermore, the normative aspect explains whether or not the individual will perform the behaviour while the intention to perform a certain behaviour precedes the actual behaviour. Such an intention is referred to as behavioural intention, which results from a belief that performing the behaviour will cause a specific outcome (LaCaille, 2020; Yzer, 2017). Behavioural intention is essential to TRA because they are determined by a person's attitudes and subjective norms. According to Fishbein and Ajzen (1975), stronger intentions lead to an improved effort to perform the behaviour, which also increases the likelihood of the behaviour being performed. The use of TRA to examine the adoption of technologies, however, is often questioned for not considering the ability of an individual to adopt the technology (Almukhlifi, 2019). Also, it is criticised for not providing good indicators of human behaviour.

The UTAUT was created by Venkatesh et al. (2003), and it aims to explain user intentions to use digital technologies and succeeding usage behaviour. The UTAUT presents four major constructs: performance expectancy, effort expectancy, social influence, and facilitating conditions (Bere, 2014; Venkatesh et al., 2003). The facilitating conditions construct directly determines user behaviour, while the remaining three are direct factors for behavioural and adoption intentions. The theory presents gender, age, experience, and voluntariness for moderating the effect of the four key constructs on usage intention and behaviour (Bere, 2014; Venkatesh et al., 2003). The utilisation of the UTUAT for investigating the willingness of individuals to adopt digital technologies is, however, often criticised for its difficulty in generalising the research findings to the study population (Almukhlifi, 2019; Eckhardt et al., 2009; Li, 2020a).

Additionally, the UTAUT can be misleading because it includes frameworks used in other theories using different terminologies (Almukhlifi, 2019; Bagozzi, 2007).

TAM was developed by Davis (1989), and it is an extension of Ajzen and Fishbein's TRA. It replaces a variety of TRA's attitude measures with the two-technology usage measures: ease of use and usefulness. It aims to model how users come to accept and use technology (Bere & Rambe, 2016; Davis, 1989). TAM postulates that when users are confronted with a new technology, several factors influence their decision about how and when to use it (Davis, 1989). The models consist of the following constructs: actual use, behavioural intentions, attitudes towards usage, perceived usefulness, and perceived ease of use (Bere & Rambe, 2016; Davis, 1989). Actual use refers to the end goal where users utilise the systems. Behavioural intentions are a factor that leads users to use digital technologies, and it is driven by an individual's attitude towards the system's usage. Perceived usefulness explains whether or not a user perceives technology as useful for achieving the required outcome, while perceived ease of use suggests that if the technology is easy to use, the barriers are conquered (Bagozzi, 2007; Davis, 1989).

Existing literature highlights specific concerns regarding the suitability of TAM for comprehensively exploring the adoption of specific digital technologies in different contexts. This is due to the limitation of TAM when seeking to understand the adoption of a technology (Almukhlifi, 2019; Giovanis et al., 2012). Almukhlifi (2019) argues that using the original TAM often leads to inconsistent research findings for adopting specific technologies in various contexts. Such concerns suggest that other important constructs influence decisions to adopt technology under different conditions. To overcome the shortcomings of the TAM in investigating the adoption of a specific technology, several studies have extended the TAM by incorporating additional constructs with PEOU and PU for better understating the adoption of technologies in specific situations (Bere & Rambe, 2016; Kamal et al., 2020; Rafique et al., 2018; Sagnier et al., 2020). Bere and Rambe (2016) extend TAM by adding flexible learning consisting of portability, collaboration, cost, and learner control to understand the adoption of mobile learning in higher education. Kamal et al. (2020) extend TAM by adding system quality and habit to understand the adoption of mobile library applications. These studies confirm the ability of TAM to provide a comprehensive view of adopting technology by incorporating additional constructs with PU and PEOU under various circumstances.

3.4 Conceptual Framework

This study explores the critical determinants for adopting digital libraries in South African higher education from students' perspective. To achieve the aim of this study, a conceptual formwork is developed. TAM is used in this study for underpinning the proposed conceptual formwork. This is due to several reasons. Firstly, TAM can provide useful insights into technology adoption from the perspective of students who are the direct users of the digital libraries at their universities (Rafique et al., 2018). Secondly, TAM can be flexibly tailored and adjusted to suit the purposes of digital libraries (Barhoumi, 2016). Thirdly, TAM is reliable and robust in predicting the adoption of digital libraries in higher education (Barhoumi, 2016; Rafique et al., 2018). This shows that TAM enables significant progress in understanding the adoption of specific technologies in higher education (Bere & Rambe, 2016).

This section presents the conceptual framework, as shown in Figure 3.1, for exploring the critical determinants for adopting digital libraries in South African higher education. It includes two categories of factors for extending TAM in this study. The proposed two categories focus on the aspects related to individual library users and technology associated with digital libraries. The technology characteristics include e-library catalogue, e-library database, and e-library circulation. The individual characteristics include social influence and computer self-efficacy.

3.4.1 Technology characteristics

Technology characteristics refer to the factors that influence the adoption and diffusion of different technologies (Fliegel and Kivlin, 1966; Byerlee and de Polanco, 1982; Adesina and Zinnah, 1993; Adesina and Baidu-Forson, 1995). As a result, understanding the factors influencing technology adoption and diffusion for students will give insight into digital library adoption in higher education. In this study, the technology characteristics of students in South African higher education are measured in terms of e-library catalogue, e-library database and e-library circulation.

3.4.1.1 E-Library catalogue

E-Library catalogue refers to the online library catalogue or Online Public Library Catalogue (OPAC), which is an online database of various forms of library resources,

such as audio, text, and video (Kan & Poo, 2005). These are found at any institution, such as university libraries. A library catalogue allows users to search for items a specific library owns. A catalogue includes books, movies, journals, magazines, music scores, government documents, and more. Some of the benefits of E-library catalogues are the boarding knowledge sharing with other institutions compared to the physical resources in the library; they can be accessed anywhere through the institution and accessed by multiple students regularly (Harry, 1999). The following hypothesis has been developed concerning e-library catalogues:

- H1: E-Library catalogues positively influence students' perceived usefulness to adopt digital library information systems.

3.4.1.2 E-Library Database

E-Library databases allow the efficient search for published information such as magazines, journals, and newspaper articles. Library databases can be general (all disciplines) or discipline-specific (e.g. a psychology database). Much like E-library catalogues, databases can be accessed anywhere and anytime via the institutions of which users are a part. There is data security, and they are collaborative. The following hypothesis has been developed concerning e-library databases:

- H2: E-Library databases positively influence students' perceived usefulness to adopt digital library information systems.

3.4.1.3 E-Library circulation

E-Library circulation refers to the resources located in the physical library. This process is done online and consists of library materials being checked in and out, renewal of borrowed materials, reserving, and checking in and out of damaged library materials (Chauhan,2004). This allows libraries to keep track of their library materials as their different methods are used for identification, such as library cards. For university students, the student card is used as the identifier. E-Circulation allows easier checking in and out of materials and increases efficiency as students reserve material before collecting the materials in the library. E-Library circulation has increased reliability. The following hypothesis has been developed concerning e-library circulation:

- H3: E-Library circulation has a perceived usefulness.

3.4.2 Individual characteristics

Individual characteristics refer to the ability of individual students to utilise a digital library system in higher education. They play a significant role in their decision to accept and use digital library systems in higher education (Rafique et al., 2018). Higher education students with different personalities and backgrounds react differently to accepting and using digital library systems (Barhoumi, 2016). As a result, understanding the characteristics of individual students can provide a better understanding of the digital libraries adoption in higher education. In this study, individual characteristics of South African higher education students are measured in terms of computer social influence and self-efficacy.

3.4.2.1 Computer self-efficacy

Computer self-efficacy (CSE) refers to the extent to which students are confident in their ability to use the digital library system (Almukhlifi, 2019). The magnitude of self-efficacy refers to the level of capability required to use public services through e-government (Wangpipatwong et al., 2005b). The strength of self-efficacy is related to the degree of confidence that citizens have in using public services through e-government (Wangpipatwong et al., 2005b). The following hypothesis has been developed concerning Computer Self-Efficacy:

- H6: Computer Self-Efficacy has a perceived usefulness.
- H7: Computer Self-Efficacy has a perceived ease of use.

3.4.2.2 Social Influence

Social Influence is defined as the behaviour or attitude of a person based on another person in their social circle that influences (Raven, 1964). There is a form of dependency from the source of influence, which allows a person to inherit the beliefs or attitude the source has toward the dependent (Raven, 1964). Social influence can be identified in various groups, such as lecturers and students, students amongst one another, people from one household and other users.

The following hypothesis has been developed concerning Social Influence:

- H4: Social influence prompts perceived usefulness.
- H5: Social influence prompts perceived ease of use.

From the above-discussed factors, the following proposed conceptual framework consists of 17 hypotheses. In Chapter 4, the accepted hypotheses are discussed.

- H8: Perceived ease of use has a positive impact on perceived usefulness.
- H9: Perceived usefulness attributes to satisfaction.
- H10: Perceived usefulness influences attitude towards use.
- H11: Perceived ease of use influences attitude towards use.
- H12: Attitude towards use has a positive influence on satisfaction.
- H13: Attitude towards use has a positive impact on adoption.
- H14: Satisfaction is a contributing factor for adoption.
- H15: Perceived ease of use positively influences the use of the e-library catalogue.
- H16: Perceived ease of use positively influences the use of e-library databases.
- H17: Perceived ease of use has a positive influence on the use of e-library circulation.

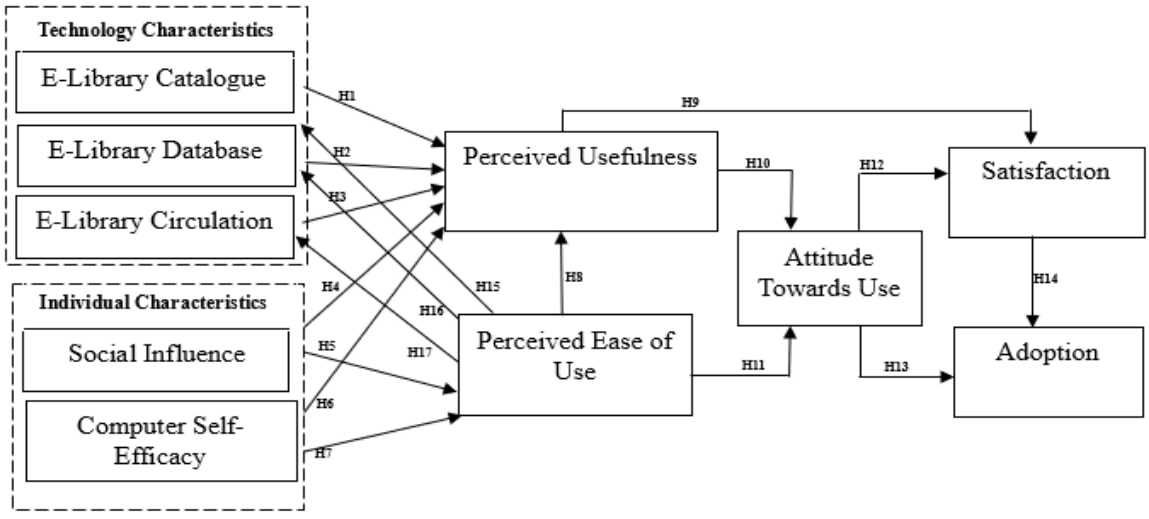

Figure 3.4 Proposed Conceptual Framework

3.5 Chapter Summary

The chapter introduced the theoretical background of conceptual models and a proposed conceptual framework. Informed by the conceptual framework, this study has several hypotheses, which the study's research data collection instrument was formulated based on. The following chapter discusses the research methodology. The issues discussed include the research design and philosophy, the data collection instrument, the ethical considerations, and the research validity and reliability.

CHAPTER 4 RESEARCH DESIGN AND METHODOLOGY

4.1 Introduction

This chapter explains the methodological approaches used in this study and highlights how the research methods are linked to the research objectives. The methodology for this research was designed to gather as much information as possible using quantitative data collection techniques. The researcher was interested in providing a multidimensional view of adopting library information systems in a university library in the Western Cape. This research study was deductive, building a proposed framework influenced by guidelines from literature sources (secondary data) and empirically collected data (primary data). The study used the positivist approach as statistics and structured questionnaires were used to gain insight into student beliefs regarding adopting LIS (Crotty, 1998; Cohen et al., 2000).

4.2 Research Philosophy

Research philosophy is the theories, facts, and alternative ideas gathered for knowledge creation for academic purposes (Holden, Lynch, 2004). The research methods used by scholars differ, and they are informed by their research philosophies. The three dominant research philosophies are positivism, interpretivism and critical realism.

4.2.1 Positivist philosophy

Angen (2000) defines positivism as a paradigm used in a quantitative research approach. He sees it as a reliable methodological approach for measuring validity. According to One et al. (2015), positivist scholars believe that behaviour can be predicted and researchers should be detached from those they are studying in order to avoid biases.

4.2.2 Interpretivist philosophy

Black (2006) states that the interpretivist paradigm is subjective. In this paradigm, the researcher has to make detailed interpretations of data as it can have different meanings depending on people's observations and beliefs. Angen (2000) defines an interpretive paradigm as one associated with a qualitative approach. He argues its legitimacy is questionable as it does not undergo the rigorous methodological criteria measures followed in the positivism paradigm. One et al. (2015) describe an interpretive approach

as a model whereby a researcher tries to understand human experiences and attach meaning to them.

4.2.3 Critical realist philosophy

According to Thomson and Hooker (2006), the critical realist philosophy was first published by Roy Bhaskar in 1975. Prior to the establishment of this philosophy, the positivist philosophy was the dominant philosophy among social scientists. The Realist Theory of Science focuses on reality instead of objective or subjective observations. The realist philosophy is concerned with ontology. It emphasises the connection of statements about the world or being, that is, Ontology, to statements about our knowledge of the world—Epistemology. It argues that social structure reproduction is dependent on human actors or agency. It emphasises the unity of theory and practice. The real basis of powers or liabilities is provided by mechanisms which may be carried out without being evident.

Each research philosophy has three paradigmatic approaches: Ontology, Epistemology and Methodology. Ontology is defined as the nature of reality (Crotty, 1998; Cohen et al., 2000). Ontology refers to "the nature of Science" (Morgan, 1979). The epistemology approach is defined as "The theory of knowledge embedded in the theoretical perspective and thereby in the methodology" (Crotty, 1998). Epistemology refers to "the nature of knowledge". Saunders et al. (2009) stated that epistemology focuses on the knowledge of the study field.

The researcher believes that there is no research philosophy that is better than the other. A research philosophy has to be chosen based on the research aims and objectives. In this study, the researcher adopted an interpretivist approach for the study because of the nature of the phenomenon. Factors which determine the adoption and use of LIS can be subjective, depending on the understanding and preferences of the users.

4.3 Research Design

Qualitative research provides in-depth narratives on the views and thoughts of respondents and is based on "lived experiences" using interviews, observations, and documents (Creswell, 2013). On the other hand, the quantitative research methods approach the experimental inquiry strategy by using a questionnaire (Creswell, 2013). Qualitative research uses an interpretive approach as the opinion and beliefs of

participants are meaningful and give deep insight into respondent's beliefs regarding the (Schwandt, 1994, p. 118).

Quantitative research makes use of numerical data to describe and define the results of an observation Cohen (1980). Creswell (1994) defines it as explaining phenomena through numerical data extracted using mathematically based methods. This study used a quantitative research methods approach. Primary data collection was carried out using the select research instrument of a questionnaire, collecting first-hand data. Secondary data collection will be carried out to identify the critical variables identified in the literature for adopting library information systems.

4.4 Research Method

Data may be collected in various ways. The most widely used qualitative data collection methods include documents, panels (including focus groups), observation (including participant observation), scanning of databases, interviews, and questionnaires (Gill, Stewart, Treasure, & Chadwick, 2008). The most widely used methods for quantitative data collection entail experiments, interviews, sampling, structured interviews, and Likert scales (Bhandari, 2023). This study incorporates both primary data and secondary data. Primary data involves directly collecting data from respondents, while secondary data collection involves the review of pertinent literature sources. Empirical data collection refers to using primary research methods to find out things as opposed to using secondary data sources. The main research objective of this study was achieved via a structured questionnaire research method that was used. Reviewed methods mentioned in (Table 4.1) would not have provided the rich data required.

Table 4.1 Quantitative Data Collection Methods

	Methods	Benefits	Justification	References
Selected Option	Questionnaires	Using structured questions to attain specific information. Larger groups of participants are feasible.	Suited to data collection from students. Supports collection of data regarding structured questionnaires.	(Reja, Manfreda & Hlebec, 2003) (Creswell, 2013)
Reviewed Options	Experiment	Proves or disproves theories; this is widely used in natural sciences.	This research does not use theories and is not in the natural science field.	(Cronin et al., 2007)
	Correlational research	Identifies patterns and trends between two or more variables.	This would normally be used to examine multiple variables; in this case study, we are not assessing multiple variables.	(Cronin et al., 2007)
	Observations	Observing participants' interaction with the system	This would be hard to facilitate and manage as it could discourage students from participating as it would be time-consuming. This could also influence participants' behaviour due to the researcher's presence.	(Harrell & Bradley, 2010)
	Consecutive sampling	Provides scores for the compared variables.	This is widely used in the social and natural sciences.	(Cronin et al., 2007)
	Causal-comparative research	This investigates the reasons behind a change that has already occurred.	This study is not investigating changes to the information system.	(Cronin et al., 2007)

Source: Cronin et al. (2007)

The main research instrument was a survey questionnaire. The option enabled the determination of factors which are crucial to the successful adoption of library information systems. In this way, participants could share feedback on using library information systems.

There are many ways that questionnaires may be designed. In this study, the researcher asked structured questionnaires using a Likert scale from one to seven. The scale values represent the following: 1—Strongly disagree; 2—Disagree; 3—Somewhat disagree; 4—Neither agree nor disagree; 5—Somewhat agree; 6—Agree; 7—Strongly agree (Likert, R 1931). Using the rating scale assigns a value to the statements of the respondents. Scales can be divided into five categories or seven categories; the preferred scale is the 7-category scale, as it is seen as there is optimal reliability (Symonds,1924).

In this study, a questionnaire survey was conducted in English, and all the participating students were located at the university library and residence. A pilot study was carried out to ensure that questions were not ambiguous and well structured.

Before analysis was executed, a data cleaning process was done, questionnaire answers were populated into an Excel spreadsheet, and the questions were coded before the data was entered into statistical software for analysis. Surveys with two answers or blanks were given a variable to represent, not specified, to avoid inaccurate data results. The software used for analysis was Stata Statistical Software, which is useful for quantitative data analysis.

4.5 Unit of Analysis

This study focused on all possible university students from the University of the Western Cape and Cape Peninsula University of Technology. Both universities are in the Western Cape province of South Africa. The unit of analysis in this study is the two types of students, and these are, on the one hand, students who make use of the library information system and, on the other hand, students who do not make use of the library information system.

4.6 Research Case Study

This study focused on university students from the two universities in the Western Cape. It focused on the adoption of the library information systems the two universities provide for their students to use. The research study did not focus on a specific group of students; the questionnaires were distributed in the University of the Western Cape library. At Cape Peninsula University of Technology, the questionnaires were distributed to students who resided in the residence and their social circle from other residences.

4.6.1 Sampling method, size and selected participants

While doing data collection, it is challenging to poll the entire population. Therefore, a representative sample was taken (Devers & Frankel, 2000). However, the question is: how much should be taken as a sample from the whole population? The answer depends on the size of the population and the margin of error.

In this case, the statistical rule of randomness in choosing the respondents will not be applied. In addition, as noted by Teddlie and Yu (2007), snowballing sampling is also identified as chain sampling; this is so because it entails using the help of chosen respondents to find more participants through their networks, ties and contacts. Snowball sampling proved to be convenient, considering that subjects to interview for this study were difficult to find because of limited access and restrictions caused by the coronavirus pandemic lockdown.

The large sample size of 200 participants was selected, and, in this case, the statistical rule of randomness in choosing the respondents was applied, that quantitative research was intended to generalize the findings concerning the university student population. Therefore, the 200-sample size chosen was adequate to interrogate the phenomenon under study. The research collection method had to be revised to continue with the research when restrictions were lifted and the use of printed questionnaires to students through the assistance of the universities. Probability sampling was selected in the end for the research population. Questionnaires were distributed to students who agreed to participate in the research study. The questionnaires were distributed in the University of the Western Cape library. At Cape Peninsula University of Technology, the questionnaires were distributed to students who were in residence and were willing to

participate in the study. Probability sampling includes every item in the population. There are no criteria in the unit of study; although it is time-consuming and has the highest sample error (Brown, 1947), random sampling has the least bias involved (Zikmund, 2002).

After that, the snowballing sampling technique would be used, as noted above. Probability sampling is when participants are selected in relation to their suitability and accessibility (Creswell, 2014). In this case, the statistical rule of randomness in choosing the respondents will not be applied. In addition, as noted by Teddlie and Yu (2007), snowballing sampling is also identified as chain sampling; this is so because it entails using the help of chosen respondents to find more participants through their networks, ties and contacts. Snowball sampling proved to be convenient, considering that subjects to interview for this study were difficult to find because of limited access and restrictions caused by the coronavirus pandemic lockdown.

Five types of sampling fall under the definition of probability sampling: Cluster sampling, multi-stage sampling, Simple random, Stratified random, and System sampling. Cluster sampling is defined as the division of a population using clusters (Wilson, 2010). Multi-stage sampling is referred to as a population that starts as a broad sample and then becomes a narrow sample (Ackoff, 1953). Stratified random is explained as dividing a population by subgroups and then collecting random samples from the subgroups (Ackoff, 1953). System sampling makes use of a systemic method which selects every nth from the population (Ghauri and Gronhaug, 2005). Guest, Bunce and Johnson (2006) propose a quantitative sampling size; for this research, the sample size for data collection was all students, whether interacting with the library information system or not from the two universities in the Western Cape.

The data collection method used student questionnaires and yielded 160 responses. An email was sent to the Research Department of the university to ask for assistance with access to students to give the research questionnaire.

4.7 Data Collection

The data was collected at two institutions in the Western Cape which was identified as the research site. These institutions are the University of the Western Cape and the Cape

Peninsula University of Technology. These were selected because the researcher is a student at Cape Peninsula University of Technology and is acquainted with many people at the University of the Western Cape. Paper questionnaires were handed out to students in the library and student accommodation.

Two hundred (200) questionnaires were initially printed, 20 for the pilot study completed on the first day. One hundred thirty (130) questionnaires were handed out over two weeks to the University of the Western Cape, which were all returned; 50 were handed out to Cape Peninsula University of Technology over one week, and only 40 of the papers were returned. Some students opted to take the papers and return them to the designated person for the area, and others filled out their questionnaires on the spot and handed them back right away.

4.8 Data Preparation

Once the pilot study was returned, the data was put into a Microsoft Excel spreadsheet with just the questions and numbers to see the data output and the intention to create a data set. The pilot study was analysed to see the data collected from the research instrument. The data was added to the main research data and analysed together. Furthermore, to analyse the quality of questions with the variables created for the study. Once all the questionnaires of the primary study research were returned, they were split between the two institutions by indicating which institution the participants were from and starting with UWC as the data was first collected there. The themes were written against the number selected on a scale of 1-7. Answers that were left blank were also left blank in Excel and captured as not specified. In Excel, a data set was generated, cleaned, and checked for errors and irregularities. The data was entered and analysed using the statistical tool Stata statistical software to assist in generating the tables and data presentation.

4.8.1 Data Coding

Data coding "is a process of assigning codes, words, or phrases that identify to which topics or issues portions of the data refer, and organising the data in a way that is useful for further analysis" (Bailey 2007). In this study, the data exported from Excel and imported into Stata was coded and defined, including specifying the variables using the

data editor. In this research, themes were used to identify the topics to address in the questionnaires, and these themes come from the literature review. The themes that emerged from the research are Adoption, Perceived Usefulness, Perceived Ease of Use, Attitude Towards Use, Satisfaction, Self-Efficacy, Social Influence, Online Library Databases and Online Library Catalogues. During the literature review process, when looking at the factors that influence adoption and the functionality that students use digital library information systems at South African universities, the themes mentioned above were selected to address this study and answer the research questions stated in Chapter 4.

4.8.2 Initial data screening

A pilot study is a smaller-scale research study used as a trial run. The use of pilot studies may vary for reasons such as assessing a research instrument, the study's feasibility, and possible points of complication or complex areas. (Polit et al., 2001:467). Pilot studies can be conducted to confirm the appropriate research method: qualitative, quantitative or mixed methods (Tashakkori & Teddlie 1998:47).

The advantages of pilot studies consist of the following:

- minimising risk as there is a better understanding of the content or process required to execute appropriate research instruments
- reviewing the wording or range provided to the respondents
- assessing distribution processes for the required sample size
- providing valuable insights.

Although pilot studies have many advantages, they can not guarantee that the main study will succeed.

A pilot study was conducted to review the data provided from the questions; the data captured from the 20 participants were analysed using the tool endnote. The pilot study aimed to assess if the theme and questions would provide an initial groundwork for the research project. The pilot study assessed the feasibility of the data collected based on the themes and questions asked (Teijlingen & Hundley, 2001). This assisted in the

preparation of the primary research data collection of 200 questionnaires. The pilot study was conducted at one university with 20 questionnaires from University of the Western Cape students.

4.8.3 Analysing missing data

Missing data was treated using the multivariate analysis, which assesses the issues that occur with data sets with missing data. The multivariate analysis focuses on four areas of missing data (Hair et al., 2010).

1. Determine the type of missing data.
2. Determine the extent of missing data.
3. Diagnosing the randomness of the missing data process.
4. Selecting an imputation method.

The first factor looks at identifying the type of missing data that occurred from the data collection. In the case of this study, the missing data that occurred was from nonresponses, and multiple answers. When research questionnaires were returned from students, some questions were left blank; these were identified as the first factor in the multivariate. These were treated as “Did not specify”, as nonresponses could not be ignored, and it was of great importance to still account for those unanswered questions in the research and not change the actual presentation of percentages in the answers. Respondents who selected more than one option instead of one on the scale were also assessed as “Did not specify”, as both answers could not be accepted as it would be a misrepresentation of the results.

Similarly, one could not be selected as the answer as that would not be appropriate as it would not be the respondent’s answer. The next factor looks at the extent of missing data. Is it high enough to action the third step of diagnosing the randomness of the missing data process or low enough to select an imputation method to remedy the missing data? In this research study, the highest number of non-responses for a question was four out of 160 respondents, less than 2.5%. Diagnosing the randomness of the missing data process is investigated through an empirical examination pertaining to missing data patterns. This investigation would be justified using missing completely at random

(MCAR). This study did not warrant diagnosing the randomness as there was no pattern to the missing data. Using the imputation method, the questions with non-responses were less than 2.5% for this research study.

Selecting an imputation method consists of missing at random (MAR) and MCAR. The researcher selects the method based solely on the type of data. Imputation is defined as the process of using other valid values from variables in the study sample to estimate the missing values (Hair et al., 2010). In this study, missing data was not given an estimated value based on other variables, but its value was not specified.

4.8.4 Descriptive statistics and Inferential statistics

The two main types of statistical analysis are descriptive statistics and inferential statistics. Descriptive statistics is used to summarize the data using basic statistics and graphs, including tables. Descriptive statistics are the numerical and graphical techniques for organizing, presenting, and analysing data. The form of descriptive statistics that is used to describe a variable in a sample is dependent on the level of measurement that has been used. Inferential statistics is used when the findings of a sample are used to make inferences about a larger population. Inferential statistics involve the use of statistical tests.

In this study, descriptive statistics and inferential statistics were used. Descriptive statistics was used to understand the data set results from the data collected. In Chapter 5, the results of the data collected will make use of tables to visualize data. The tables have the 7-point Likert scale descriptions and the percentage of the selected point in the 7-point scale. In this study, descriptive statistics was used to compute variables such as the mean, standard deviation, average and other variables that will be discussed farther in Chapter 5 as part of the data analysis. Inferential statistics was used on the proposed conceptual model with the 17 hypotheses to test the validity and reliability of the generalizations made.

4.9 The Research Questions.

Firstly, there was a focus on the demographics of the research participants to gain insight into the participants involved in the study. The demographics were separated into the

pilot and the main studies. The study then focused on the pilot study and the results of the pilot study. The factors of influence in the pilot study were explored in the main study. A pilot study was conducted to see the viability of the research instrument; based on the data, no amendments were required as the instrument proved successful.

4.10 Secondary Data

Secondary data from books, articles, journals, and the internet was related to primary data to answer the research question (Devers & Frankel, 2000). The following databases were consulted to find the literature concerning this research project: SpringerLink, ScienceDirect, Google Scholar, Emerald, and Gartner. A formal, cross-sectional research design has been selected for the study, using other conceptual frameworks to design a proposed conceptual model based on literature.

4.11 Research Validity and Reliability

Validity in a research study is essential as validity is described as the measurement of the intended data to be collected. Ghauri and Gronhaug (2005) explained it as a measurement of the accuracy of a study. Researchers can use criterion validity to measure the correlations of the same variables (Bhattacherjee, 2012:56). The validation criteria are measured by three factors: Divergent validity, Convergent validity, and Predictive validity.

Reliability is the measurement of repeatability through consistent results; reliability is essential to be able to measure if the data collection is repeatable, following the same steps and executing the same results (Carmines and Zeller, 1979). To ensure that the research had validity and reliability, a research instrument was developed to ask all students the same questions and measure them on the same scale to allow the research to be reproducible. The survey questionnaire was completed over a consistent period and was measured for validity using composite reliability. The results of how the questionnaire survey was measured using composite reliability are further discussed in Chapter 5.

4.12 Ethical Considerations

Ethics was upheld throughout the study to remove potential harm to participants. Ethical clearance in line with the CPUT's codes and regulations was applied for. Only after receiving approval for the study from the ethics board was fieldwork commenced. The research participants were issued a consent form and information letter, and the researcher ensured that they were adequately informed of the research aims and the confidentiality of the information they provided. The questionnaires were administered after participants clearly understood the research intent and that participation is voluntary, and they could withdraw throughout the research and consent forms were signed and collected. Respondents' names were not captured in the study due to anonymity considerations but for assignment of data collection with the approval of participants for questionnaires. All the data captured will be stored in a password-protected location only accessible to the researcher and his supervisor. All the gathered data will be conveyed without any adjustments to present a true reflection of the issues under study.

4.13 Informed Consent

All participants were well informed about the research before participating in the questionnaires. Participants will be allowed to ask as many questions as required till they are confident and understand the study and their role in the data collection process. It is of great importance that participants have a clear understanding of the intended research, and this will help to ensure that the data collected is also accurate.

4.14 Chapter Summary

The methodology for this research was designed to gather as much information as possible using quantitative data collection techniques. This was done to provide a multidimensional view of adopting library information systems in a university library in the Western Cape. The methodological approach was inductive and aimed to construct knowledge derived from literature sources (secondary data) and generated from empirically collected data (primary data). The study used the interpretive approach by gathering the respondents' views to get deep insight into students' beliefs regarding adopting LIS.

This chapter has explained the methodological approaches used in this study. As a result of the pilot study, data collection tools and the research design, in general, were improved. Identifying gaps and problems in the research strategy before conducting the main study assisted in reducing the risk of failure during the main study. Finally, the chapter highlighted the ethical issues that the researcher considered to protect the interests of the respondents, research assistants, and the researcher. The next chapter will present the research findings.

CHAPTER 5 DATA ANALYSIS, PRESENTATION AND DISCUSSION

5.1 Introduction

This chapter will first examine how the data was collected for this research study, followed by the data preparation. As the chapter flows, it will examine how factors such as data coding, initial data screening and missing data were handled in this study.

5.2 Socio-Demographic Profile

This research will examine the university students' demographics to gain insight into the research participants. This study will first focus on the demographics of the pilot study and then the demographics of the primary study sample.

5.2.1 Pilot study socio-demographic profile

Table 5.1 shows the pilot study demographic profile of the students who participated. The pilot study was done in one institution where most participants (60%) were female. The faculty representation was mostly the faculty of Dentistry 35%, followed by the faculty of Nature Sciences at 25%. In the pilot study, a few participants were from the Faculty of Economics and Management Science with 5%, with the Faculty of Education and Faculty of Law having a combined percentage of 5%. In terms of the program, the majority were undergraduates, and a minority were master's students (5), with zero participants from the advanced diploma.

Table 5.1 Socio demographics profile of participants in the pilot study

Socio demographics profile		Frequency	Percentage
Gender			
	Female	12	60%
	Male	7	35%
	Did not specify	1	5%
Institutions			
	UWC	20	100%
Faculty			
	Faculty of Economic and Management Science	1	5%
	Faculty of Natural Sciences	5	25%
	Faculty of Education Faculty of Law	1	5%
	Faculty of Community Health Sciences	2	10%
	Faculty of Arts and Humanities	4	20%
	Faculty of Dentistry	7	35%
	Did not specify	0	0%
Program			
	Did not specify	0	0%
	Undergraduate	15	75%
	Advance diploma	0	0%
	Honours	2	10%
	Master	1	5%
	Doctorate	2	10%
Socio demographics profile		**Frequency**	**Percentage**
Gender			
	Female	12	60%
	Male	7	35%
	Did not specify	1	5%
Institutions			
	UWC	20	100%
Faculty			
	Faculty of Economic and Management Science	1	5%
	Faculty of Natural Sciences	5	25%
	Faculty of Education Faculty of Law	1	5%
	Faculty of Community Health Sciences	2	10%
	Faculty of Arts and Humanities	4	20%
	Faculty of Dentistry	7	35%
	Did not specify	0	0%
Program			
	Did not specify	0	0%
	Undergraduate	15	75%
	Advance diploma	0	0%
	Honours	2	10%
	Master	1	5%
	Doctorate	2	10%

5.2.2 Main study socio-demographics profile

Table 5.2 below shows the demographics of the students who participated in the main study. This involved 160 participants, 51.86% female, 46.88% male participants, and 1.25% did not specify their gender. The main research involved two institutions, 25% of them from the Cape Peninsula University of Technology and 75% from the University of The Western Cape. The breakdown of the faculty showed that a majority came from the faculty of Economic and Management Science 40% and a minority from the faculty of Dentistry 1.88%. 1.25% did not specify in which faculty they were. 61.25% of the participants were undergraduates, 3.13% were Doctorate students, and 0.63% did not specify.

Table 5.2 Socio demographics profile of participants in the main study

Socio demographics profile		**Frequency**	**Percentage**
Gender			
	Female	83	51.86%
	Male	75	46.88%
	Did not specify	2	1.25%
Institutions			
	CPUT	40	25%
	UWC	120	75%
Faculty			
	Faculty of Economic and Management Science	64	40.00%
	Faculty of Natural Sciences	39	24.38%
	Faculty of Education Faculty of Law	24	15.00%
	Faculty of Community Health Sciences	16	10.00%
	Faculty of Arts and Humanities	12	7.50%
	Faculty of Dentistry	3	1.88%
	Did not specify	2	1.25%
Program			
	Did not specify	1	0.63%
	Undergraduate	98	61.25%
	Advance diploma	8	5.00%
	Honours	17	10.63%
	Master	31	19.38%
	Doctorate	5	3.13%

5.2.3 Pilot Study

A pilot study is defined as the use of a sample to examine the research protocols selected (Tashakkori & Teddlie 1998: 47). A pilot study was conducted for this research study to see the effectiveness of the research instrument created for the data collection. The pilot study was also executed to prepare for the data collection and reevaluate some of the areas that had gaps and some of the areas that could cause problems. The pilot study was conducted over one day to collect data from 20 University of the Western Cape students. Data analysis was conducted to determine the value of the data research instrument ahead of the actual data collection of the full study.

5.3 Data Analysis

The main study was conducted based on the positive response of the pilot study; no problem areas were identified that required any changes to the research instrument.

When asked about the qualification the participants were currently attending, the breakdown of students' responses was as follows as displayed in Table 5.3: 0.63% did not specify, 61.25% were busy with their undergraduate degree, 5% the Advanced diploma, 10.63% their Honours, 19.38% their Masters' degree and 3.13% of students were busy with their Doctorate degrees. The demographics section of the study pilot and main research were separated, but for the main questions in the study, both were analyzed as one.

Table 5.3 DLIS online library catalogues utilization

Catalogues OLC1	Frequency	Percentage
Did not specify	1	0.63
Strongly disagree	3	1.88
Disagree	5	3.13
Slightly disagree	4	2.50
Neither disagree or agree	16	10.00
Slightly agree	31	19.38
Agree	31	19.38
Strongly agree	69	43.13
Total	160	100.00

The following question was asked to participate in the questionnaire: "Using DLIS enables me to utilize online library catalogues to get the location of textbooks and other library resources." Of the students' responses, 43.13%, the majority strongly agreed with the statement, 1.88% of the minority of students strongly disagreed, and 0.63% did not specify. Looking at whether students disagree or agree on the various scales, the majority of students, 81.89%, agreed that using DLIS enables them to utilize online library catalogues to get the location of textbooks and other library resources.

Table 5.4 DLIS enables one to exploit online library catalogues for quicker access to resources in the library

Catalogues OLC2	Frequency	Percentage
Strongly disagree	5	3.13
Disagree	7	4.38
Slightly disagree	2	1.25
Neither disagree or agree	16	10.00
Slightly agree	23	14.38
Agree	45	28.13
Strongly agree	62	38.75
Total	160	100.00

When asked if DLIS enabled them to exploit online library catalogues for quicker access to resources in the library, the responses of the students were as follows: the majority of students strongly agreed 38.75%, 10% neither disagreed nor agreed with the question, and 3.13% strongly disagreed. Regarding whether students disagree or agree on the various scales, the majority of students, 81.26%, agreed that DLIS enables them to exploit online library catalogues for quicker access to resources in the library.

Table 5.5 DLIS enables one to employ online library catalogues to get general information about the book

Catalogues OLC3	Frequency	Percentage
Strongly disagree	3	1.88
Disagree	4	2.50
Slightly disagree	6	3.75
Neither disagree or agree	25	15.63
Slightly agree	22	13.75
Agree	48	30.00
Strongly agree	52	32.50
Total	160	100.00

DLIS enables one to employ online catalogues to get general information about the book, which was one of the statements asked of participants, with the largest percentage—32.50%—strongly agreeing to this, 1.88% strongly disagreed. 15.63% could neither disagree nor agree with the statement. Looking at whether students disagree or agree on the various scales, the majority of students, 76.25%, agreed that DLIS enables them to employ online catalogues to get general information about the book.

Table 5.6 Are you aware of the different learning resources used to access online library catalogues?

Catalogues OLC4	Frequency	Percentage
Did not specify	1	0.63
Strongly disagree	2	1.25
Disagree	9	5.63
Slightly disagree	9	5.63
Neither disagree or agree	22	13.75
Slightly agree	37	23.13
Agree	34	21.25
Strongly agree	46	28.75
Total	160	100.00

When asked about their awareness of the different learning resources students can access using online library catalogues. 28.75% strongly agree that they were aware of the different learning resources. 13.75% neither disagreed nor agreed. Furthermore, 1.25% strongly disagreed. Looking at whether students disagree or agree on the various scales, the majority of students, 73.13%, agreed to be aware of the different learning resources I can access using online library catalogues.

Table 5.7 Online library catalogues are an essential aspect of DLIS

Catalogues OLC5	Frequency	Percentage
Strongly disagree	2	1.25
Disagree	3	1.88
Slightly disagree	6	3.75
Neither disagree or agree	14	8.75
Slightly agree	19	11.88
Agree	48	30.00
Strongly agree	68	42.50
Total	160	100.00

As many as 42.50% of students strongly agree that online library catalogues are an important aspect of DLIS, and 8.75% neither disagreed nor agreed with the statement. 1.25% of students strongly disagree that online catalogues are an important aspect of DLIS. Looking at whether students disagree or agree on the various scales, the majority of students, 84.38%, agreed with the statement that online library catalogues are an important aspect of DLIS.

Table 5.8 DLIS enables one to utilize online library databases to access online resources effectively

Database OLD1	Frequency	Percentage
Strongly disagree	1	0.63
Disagree	8	5.00
Slightly disagree	5	3.13
Neither disagree or agree	5	3.13
Slightly agree	33	20.63
Agree	50	31.25
Strongly agree	58	36.25
Total	160	100.00

Many students, 36.25%, strongly agree that the DLIS enables them to utilize online library databases to access online resources effectively. Where 0.63% of students strongly disagreed with this. Furthermore, 3.13% of students neither disagree nor agree with DLIS enabling them to utilize online library databases. Looking at whether students disagree or agree on the various scales, the majority of students, 88.13%, agreed with the statement that DLIS enabled them to utilize online library databases to access online resources effectively.

Table 5.9 I am aware of online library databases that apply to my discipline

Database OLD2	Frequency	Percentage
Strongly disagree	6	3.75
Disagree	6	3.75
Slightly disagree	9	5.63
Neither disagree or agree	17	10.63
Slightly agree	37	23.13
Agree	35	21.88
Strongly agree	50	31.25
Total	160	100.00

As many as 31.25% of the students strongly agreed that they were aware of online library databases that applied to their discipline, 10.63% neither disagreed nor agreed to be aware and 3.75%, which very few strongly disagreed. Whether students disagree or agree with the various scales, the majority, 76.26%, agreed with the statement of being aware of online library databases applicable to their discipline.

Table 5.10 I can easily put learning resources on hold using the DLIS

Database OLD3	Frequency	Percentage
Did not specify	2	1.25
Strongly disagree	8	5.00
Disagree	13	8.13
Slightly disagree	9	5.63
Neither disagree or agree	40	25.00
Slightly agree	42	26.25
Agree	25	15.63
Strongly agree	21	13.13
Total	160	100.00

Table 5.10 shows that the majority of students, 26.25%, slightly agree that they can easily put learning resources on hold using the DLIS, followed by 25% who neither disagree nor agree with the statement. 5% strongly disagreed, and 1.25% did not specify. Whether students disagree or agree with the various scales, the majority, 55.01%, agreed with the statement that they can easily put learning resources on hold using the DLIS.

Table 5.11 DLIS enables one to utilize online library databases efficiently

Database OLD4	**Frequency**	**Percentage**
Did not specify	2	1.25
Strongly disagree	3	1.88
Disagree	9	5.63
Slightly disagree	3	1.88
Neither disagree or agree	18	11.25
Slightly agree	41	25.63
Agree	37	23.13
Strongly agree	47	29.38
Total	160	100.00

Almost a third of students, 29.38%, strongly agreed that DLIS enables them to utilize online library databases efficiently. Very few students, 1.25%, did not specify, and 1.88% strongly disagreed. Looking at whether students disagree or agree on the various scales, the majority of students, 78.14%, agreed with the statement that “DLIS enables me to efficiently utilize online library databases”.

Table 5.12 People who are important to me would recommend the use of the DLIS

Social Influence SI1	Frequency	Percentage
Did not specify	4	2.50
Strongly disagree	2	1.25
Disagree	5	3.13
Slightly disagree	3	1.88
Neither disagree or agree	20	12.50
Slightly agree	32	20.00
Agree	35	21.88
Strongly agree	59	36.88
Total	160	100.00

When asked, people who are important to me (i.e., family members, friends, lecturers, and librarians) would recommend using the DLIS. the breakdown of students' responses was as follows: 36.88% strongly agreed that people who were important to them recommended that they use DLIS. 12.50% neither disagreed nor agreed to that, and 1.25% strongly disagreed. Looking at whether students disagree or agree on the various scales, the majority of students, 78.76%, agreed with the statement People who are important to me (i.e., family members, friends, lecturers, and librarians) would recommend using the DLIS.

Table 5.13 The DLIS is currently used by a lot of people

Social Influence SI2	Frequency	Percentage
Did not specify	2	1.25
Strongly disagree	10	6.25
Disagree	7	4.38
Slightly disagree	19	11.88
Neither disagree or agree	41	25.63
Slightly agree	29	18.13
Agree	23	14.38
Strongly agree	29	18.13
Total	160	100.00

Table 5.13 displays students' responses when asked if many people use the DLIS. 25.63% neither disagreed nor agreed, which was the majority of students; 4.38%, which was very few, disagreed, and 1.25% did not specify. Looking at whether students disagree or agree on the various scales, the majority of students, 50.64%, agreed with the statement. Many people currently use the DLIS.

Table 5.14 My institution requires all students to use DLIS

Social Influence SI3	Frequency	Percentage
Did not specify	2	1.25
Strongly disagree	18	11.25
Disagree	14	8.75
Slightly disagree	17	10.63
Neither disagree or agree	34	21.25
Slightly agree	28	17.50
Agree	23	14.38
Strongly agree	24	15.00
Total	160	100.00

When asked if the institution requires all students to use DLIS, the students' responses were as follows. Most students, 21.25%, neither disagreed nor agreed with the question. A few students, 8.75%, disagreed with the question 1.25% did not specify. When looking at whether students disagree or agree with the various scales, it can be seen that 46.88% agreed with the statement My institution requires all students to use DLIS.

Table 5.15 It is my decision to use the DLIS

Social Influence SI4	Frequency	Percentage
Did not specify	3	1.88
Strongly disagree	3	1.88
Disagree	3	1.88
Slightly disagree	2	1.25
Neither disagree or agree	6	3.75
Slightly agree	27	16.88
Agree	30	18.75
Strongly agree	86	53.75
Total	160	100.00

When asked if it was their decision to use DLIS, the majority of students, 53.75%, strongly agreed that it was. A minority of students, 1.88%, said that they strongly disagreed that it was their decision. 3.75% of students neither disagreed nor agreed. In determining whether students disagree or agree with the various scales, the data shows that most—89.38%—agreed with the statement; it is my decision to use DLIS.

Table 5.16 My decision to use DLIS is influenced by other people

Social Influence SI5	Frequency	Percentage
Did not specify	3	1.88
Strongly disagree	28	17.50
Disagree	18	11.25
Slightly disagree	20	12.50
Neither disagree or agree	26	16.25
Slightly agree	18	11.25
Agree	25	15.63
Strongly agree	22	13.75
Total	160	100.00

Table 5.16 above shows that when students were asked if their decision to use DLIS was influenced by other people, the majority, 17.50%, stated that they strongly disagreed, and very few of the students stated that they disagreed or slightly agreed with 11.25% each. 16.25% neither disagreed nor agreed that they were influenced by other people to use the DLIS, and 1.88% did not specify. Looking at whether students disagree or agree on the various scales, the majority of students, 40.63%, agreed with the statement that other people influenced my decision to use DLIS.

Table 5.17 Confidence in accessing learning resources using the DLIS

Self-Efficacy SE1	Frequency	Percentage
Did not specify	1	0.63
Strongly disagree	4	2.50
Disagree	8	5.00
Slightly disagree	6	3.75
Neither disagree or agree	18	11.25
Slightly agree	30	18.75
Agree	39	24.38
Strongly agree	54	33.75
Total	160	100.00

When asked about the students' confidence in accessing learning resources using the DLIS, most strongly agreed with 33.75%, and very few strongly disagreed with 2.50%. 11.25% of respondents neither disagreed nor agreed. Furthermore, 0.63% of the students did not specify. Looking at whether students disagree or agree with the various scales, the majority of students, 76.88%, agreed with the statement of confidence in accessing learning resources using the DLIS.

Table 5.18 I have the necessary skills for using DLIS

Self-Efficacy SE2	Frequency	Percentage
Did not specify	2	1.25
Strongly disagree	6	3.75
Disagree	9	5.63
Slightly disagree	14	8.75
Neither disagree or agree	24	15.00
Slightly agree	35	21.88
Agree	35	21.88
Strongly agree	35	21.88
Total	160	100.00

Table 5.18 shows that the majority of respondents equally agreed, slightly agreed and strongly agreed, with 21.88% each that they have the necessary skills for using DLIS. 3.75% stated they strongly disagreed that they have the necessary skills, and 1.25% of the students did not specify their skill level. Looking at whether students disagree or agree on the various scales, the majority of students, 65.64%, agreed with the statement that I have the necessary skills for using DLIS.

Table 5.19 I feel comfortable when using DLIS

Self-Efficacy SE3	Frequency	Percentage
Did not specify	2	1.25
Strongly disagree	2	1.25
Disagree	9	5.63
Slightly disagree	6	3.75
Neither disagree or agree	19	11.88
Slightly agree	41	25.63
Agree	39	24.38
Strongly agree	42	26.25
Total	160	100.00

When participants were asked if they were comfortable using DLIS, 26.25% of students strongly agreed, and a minority strongly disagreed at 1.25%. While 11.88% could neither disagree nor agree with how comfortable they use DLIS. Whether students disagree or agree with the various scales, the majority of students, 76.26%, agreed with the statement that they were comfortable using DLIS.

Table 5.20 I can help others with using the DLIS

Self-Efficacy SE4	Frequency	Percentage
Did not specify	2	1.25
Strongly disagree	11	6.88
Disagree	13	8.13
Slightly disagree	11	6.88
Neither disagree or agree	15	9.38
Slightly agree	35	21.88
Agree	26	16.25
Strongly agree	47	29.38
Total	160	100.00

Table 5.20, the statement posed to participants was I can help others in using DLIS; 29% of students strongly agreed with the statement, which was the majority on the scale. A minority of students strongly disagreed and slightly disagreed at 6.88% each. 1.25% of students did not specify their answer to the question. Looking at whether students disagree or agree with the various scales, the majority of students, 67.51%, agreed with the statement I can help others in using DLIS.

Table 5.21 DLIS improves efficiency in accessing learning resources

Self-Efficacy SE5	Frequency	Percentage
Did not specify	2	1.25
Strongly disagree	6	3.75
Disagree	16	10.00
Slightly disagree	4	2.50
Neither disagree or agree	22	13.75
Slightly agree	34	21.25
Agree	35	21.88
Strongly agree	41	25.63
Total	160	100.00

When asked about efficiency in accessing learning resources improved by DLIS, students responded with the following: the majority, 25.63%, strongly agreed, 2.50% slightly disagreed, which was the minority of students, and 1.25% of students did not specify their answer. Looking at whether students disagree or agree on the various scales, the majority of students, 68.76%, agreed with the statement that DLIS improved efficiency in accessing learning resources.

Table 5.22 Using DLIS enables me to access learning resources efficiently.

Perceived Usefulness PU1	Frequency	Percentage
Did not specify	3	1.88
Strongly disagree	4	2.50
Disagree	6	3.75
Slightly disagree	4	2.50
Neither disagree or agree	17	10.63
Slightly agree	33	20.63
Agree	37	23.13
Strongly agree	56	35.00
Total	160	100.00

Students' responses to the statement that using DLIS enabled them to access learning resources efficiently. As many as 35% of the students stated that they strongly agreed, strongly disagreed and slightly disagreed, while the minority of responses, 2.50% and 1.88%, did not specify their answers. Looking at whether students disagree or agree on the various scales, the majority of students, 78.76%, agreed with the statement that using DLIS enables me to access learning resources efficiently.

Table 5.23 Using DLIS improves academic performance

Perceived Usefulness PU2	Frequency	Percentage
Did not specify	2	1.25
Strongly disagreed	8	5.00
Disagreed	5	3.13
Slightly disagreed	1	0.63
Neither disagreed or agreed	20	12.50
Slightly agreed	27	16.88
Agreed	42	26.25
Strongly agreed	55	34.38
Total	**160**	**100.00**

To the statement, Using DLIS would improve my academic performance, the majority of students—34.38%—strongly agreed, the minority on the scale said they slightly disagreed, 0.63% of participants, and 1.25% did not specify their answer to the question. Looking at whether students disagree or agree with the various scales, the majority of students, 77.51%, agreed with the statement that using DLIS would improve my academic performance.

Table 5.24 Using DLIS would save me much time searching for learning resources

Perceived Usefulness PU3	Frequency	Percentage
Did not specify	4	2.50
Strongly disagree	2	1.25
Disagree	4	2.50
Slightly disagree	4	2.50
Neither disagree or agree	10	6.25
Slightly agree	35	21.88
Agree	41	25.63
Strongly agree	60	37.50
Total	160	100.00

To the statement posed to participants was that using DLIS would save them much time searching for learning resources, 37.50% of students strongly agreed with the statement, which was the majority on the scale. A minority of students strongly disagreed; 1.25% and 2.50% did not specify their answer to the question. Looking at whether students disagree or agree on the various scales, the majority of students, 85.01%, agreed with the statement that using DLIS would save them much time searching for learning resources.

Table 5.25 Using DLIS enables me to have anytime and anywhere access to learning resources

PerceivedUsefulnessPU4	Frequency	Percentage
Did not specify	4	2.50
Strongly disagree	2	1.25
Disagree	3	1.88
Slightly disagree	1	0.63
Neither disagree or agree	9	5.63
Slightly agree	33	20.63
Agree	38	23.75
Strongly agree	70	43.75
Total	160	100.00

Table 5.25: the majority of respondents strongly agreed, 43.75%, that using DLIS enabled anytime and anywhere access to learning resources. 1.25% of respondents strongly disagreed having the necessary skills, and 2.50% of the students did not specify their skill level. Looking at whether students either disagreed or agreed on the various scales, the majority of students, 88.13%, agreed that using DLIS enabled them to have anytime and access to learning resources.

Table 5.26 Using DLIS allows students to access learning resources beyond the institution's library

Perceived Usefulness PU5	Frequency	Percentage
Did not specify	4	2.50
Strongly disagree	2	1.25
Disagree	6	3.75
Slightly disagree	9	5.63
Neither disagree or agree	11	6.88
Slightly agree	27	16.88
Agree	49	30.63
Strongly agree	52	32.50
Total	160	100.00

When considering the statement, "Using DLIS would allow me access to learning resources beyond my institution's library", students responded with a majority of 32.50% strongly agree, while the minority on the scale said they strongly disagree (1,25%), and 2.50% did not specify their answer to the question. Looking at whether students disagree or agree on the various scales, the majority of students–80.01%–agreed with the statement that using DLIS would allow me access to learning resources beyond my institution's library.

Table 5.27 DLIS would be useful for accessing learning resources

Perceived Usefulness PU6	Frequency	Percentage
Did not specify	4	2.50
Strongly disagree	1	0.63
Disagree	4	2.50
Neither disagree or agree	11	6.88
Slightly agree	26	16.25
Agree	44	27.50
Strongly agree	70	43.75
Total	160	100.00

Students' responses to the statement that using DLIS would be useful for accessing learning resources; the majority of students, 43.75%, stated they strongly agreed and strongly disagreed with the minority of responses at 0.63%. 2.50% did not specify their answers. Looking at whether students disagree or agree with the various scales, 87.5% of students agreed with the statement that using DLIS would be useful for accessing learning resources.

Table 5.28 Learning how to use DLIS would be easy for me

Perceived Ease of Use PEOU1	Frequency	Percentage
Did not specify	4	2.50
Strongly disagree	4	2.50
Disagree	1	0.63
Slightly disagree	3	1.88
Neither disagree or agree	21	13.13
Slightly agree	35	21.88
Agree	44	27.50
Strongly agree	48	30.00
Total	160	100.00

When asked if learning DLIS would be easy for them, most students responded that they strongly agreed (30%), the minority on the scale said they disagreed (0.63% of participants), and 2.50% did not specify their answer to the question. Looking at whether students disagree or agree with the various scales, the majority of students, 79.38%, agreed with the statement that learning how to use DLIS would be easy for me.

Table 5.29 It would be easy for me to find the required learning resources using DLIS

Perceived Ease of Use PEOU2	Frequency	Percentage
Did not specify	4	2.50
Strongly disagree	2	1.25
Disagree	3	1.88
Slightly disagree	4	2.50
Neither disagreed or agree	21	13.13
Slightly agree	29	18.13
Agree	45	28.13
Strongly agree	52	32.50
Total	**160**	**100.00**

Table 5.29 shows that when students were asked if it would be easy for them to find the required learning resources using DLIS, 32.50% stated that they strongly agreed, and very few of the students stated that they strongly disagreed (1.25%). However, 13.13% neither disagreed nor agreed that it would be easy for them to find the required learning resources using DLIS, and 2.50% did not specify. Looking at whether students disagree or agree on the various scales, the majority of students, 78.76%, agreed with the statement, “It would be easy for me to find the required learning resources using DLIS”.

Table 5.30 I find it cumbersome to use DLIS

Perceived Ease of Use PEOU3	Frequency	Percentage
Did not specify	6	3.75
Strongly disagree	18	11.25
Disagree	19	11.88
Slightly disagree	11	6.88
Neither disagree or agree	45	28.13
Slightly agree	27	16.88
Agree	21	13.13
Strongly agree	13	8.13
Total	160	100.00

When asked people I find it cumbersome to use DLIS, the breakdown of students' responses was as follows: the majority, 28.13%, neither disagreed nor agreed that they find it cumbersome to use DLIS. A minority of students slightly disagreed with the statement; 6.88% and 3.75% did not specify. Looking at whether students disagree or agree on the various scales, the majority of students, 38.14%, agreed with the statement that they find it cumbersome to use DLIS.

Table 5.31 My interaction with DLIS is clear and understandable

Perceived Ease of Use PEOU4	Frequency	Percentage
Did not specify	4	2.50
Strongly disagree	3	1.88
Disagree	6	3.75
Slightly disagree	11	6.88
Neither disagree or agree	20	12.50
Slightly agree	40	25.00
Agree	43	26.88
Strongly agree	33	20.63
Total	160	100.00

The majority of students slightly agreed, 29.38%, that my interaction with DLIS is clear and understandable, and 12.50% neither disagreed nor agreed with the statement. Very few students, 1.88% strongly disagreed, and 2.50% did not specify. Looking at whether students disagree or agree on the various scales majority of students, 72.51%, agreed with the statement, "My interaction with DLIS is clear and understandable".

Table 5.32 I need someone to teach me how to use the DLIS for accessing learning resources

Perceived Ease of Use PEOU5	Frequency	Percentage
Did not specify	4	2.50
Strongly disagree	16	10.00
Disagree	26	16.25
Slightly disagree	13	8.13
Neither disagree or agree	22	13.75
Slightly agree	31	19.38
Agree	27	16.88
Strongly agree	21	13.13
Total	160	100.00

Table 5.32 shows the responses to whether they needed someone to teach them how to use the DLIS to access learning resources. The statement posed to participants was if they need someone to teach them how to use the DLIS for accessing learning resources; 19.38% of students slightly agreed with the statement, which was the majority on the scale. A minority of students slightly disagreed, at 8.13%, and 2.50% of students did not specify their answer to the question. Looking at whether students disagree or agree with the various scales, the majority of students, 49.39%, agreed with the statement that they need someone to teach them how to use the DLIS for accessing learning resources.

Table 5.33 Using DLIS would not require much mental effort.

Perceived Ease of Use PEOU6	Frequency	Percentage
Did not specify	3	1.88
Strongly disagree	5	3.13
Disagree	10	6.25
Slightly disagree	14	8.75
Neither disagree or agree	29	18.13
Slightly agree	33	20.63
Agree	42	26.25
Strongly agree	24	15.00
Total	160	100.00

When asked if using DLIS would require much mental effort, 26.25% of students responded that they agreed, the minority on the scale said they strongly disagreed, at 3.13% of participants, and 1.88% did not specify their answer to the question. Looking at whether students disagreed or agreed with the various scales majority of students, 61.88%, agreed with the statement that using DLIS would not require much mental effort.

Table 5.34 Overall, I find it effortless to use DLIS

Perceived Ease of Use PEOU7	Frequency	Percentage
Did not specify	3	1.88
Strongly disagree	15	9.38
Disagree	9	5.63
Slightly disagree	12	7.50
Neither disagree or agree	23	14.38
Slightly agree	47	29.38
Agree	27	16.88
Strongly agree	24	15.00
Total	160	100.00

When asked the statement, "Overall, I find it effortless to use DLIS", 29.38% of the students responded that they slightly agreed, the minority on the scale said they disagreed, 5.63% of participants, and 1.88% did not specify their answer to the question. Looking at whether students disagreed or agreed with the statements, a majority (61.26%) agreed with the statement, "Overall, I find it effortless to use DLIS".

Table 5.35 It would be desirable to use DLIS for accessing learning resources

Attitude Towards Use ATU1	Frequency	Percentage
Did not specify	3	1.88
Strongly disagree	1	0.63
Disagree	3	1.88
Slightly disagree	5	3.13
Neither disagree or agree	11	6.88
Slightly agree	27	16.88
Agree	52	32.50
Strongly agree	58	36.25
Total	160	100.00

In Table 5.35, the statement posed to participants was, "It would be desirable to use DLIS for accessing learning resources". 36.25% of students strongly agreed with the statement, which was the majority on the scale. A minority of students strongly disagreed, 0.63%, while 1.88% of students did not specify their answer to the question. Looking at whether students disagree or agree on the various scales, the majority of students, 85.63%, agreed with the statement, "It would be desirable to use DLIS for accessing learning resources".

Table 5.36 Using DLIS is better than using traditional library systems

Attitude Towards Use ATU2	Frequency	Percentage
Did not specify	3	1.88
Strongly disagree	4	2.50
Disagree	6	3.75
Slightly disagree	4	2.50
Neither disagree or agree	20	12.50
Slightly agree	23	14.38
Agree	25	15.63
Strongly agree	75	46.88
Total	160	100.00

The students ' responses varied when asked if using DLIS was better than traditional library systems. The largest percentage (46.88%) of students strongly agreed, followed by 12.50% who neither disagreed nor agreed that using DLIS was better than using traditional library systems. However, a minority of students slightly disagreed with the statement (2.50%), while 1.88 did not specify. Regarding whether the students disagreed or agreed with the statement, 76.89% agreed with the statement that using DLIS was better than using traditional library systems.

Table 5.37 Would like to access learning resources using DLIS

Attitude Towards Use ATU3	Frequency	Percentage
Did not specify	3	1.88
Strongly disagree	1	0.63
Disagree	3	1.88
Slightly disagree	3	1.88
Neither disagree or agree	9	5.63
Slightly agree	27	16.88
Agree	37	23.13
Strongly agree	77	48.13
Total	160	100.00

Table 5.37 asked participants if they would like to access learning resources using DLIS; 48.13% of students strongly agreed with the statement, which was the majority on the scale. A minority of students strongly disagreed, 0.63% and 1.88% of students did not specify their answer to the question. Looking at whether students disagree or agree on the various scales majority of students, 88.14%, agreed with the statement that they would like to access learning resources using DLIS.

Table 5.38 Using DLIS will be wise

Attitude Towards Use ATU4	Frequency	Percentage
Did not specify	3	1.88
Disagree	3	1.88
Slightly disagree	7	4.38
Neither disagree or agree	6	3.75
Slightly agree	18	11.25
Agree	46	28.75
Strongly agree	77	48.13
Total	160	100.00

When participants were asked if using DLIS would be wise, 48.13% of the students strongly agreed, while a minority strongly disagreed (3.75%), and 1.88% neither disagreed nor agreed that using DLIS would be wise. Similarly, 1.88% did not specify. Looking at whether students disagreed or agreed with the statement, 76.26%, agreed that using DLIS would be wise.

Table 5.39 Satisfaction with the performance of DLIS.

Satisfaction S1	Frequency	Percentage
Did not specify	3	1.88
Strongly disagree	3	1.88
Disagree	3	1.88
Slightly disagree	4	2.50
Neither disagree or agree	21	13.13
Slightly agree	35	21.88
Agree	39	24.38
Strongly agree	52	32.50
Total	160	100.00

When asked if they experienced satisfaction with the performance of DLIS, 32.50% strongly agreed with the statement, while 1.88% strongly disagreed, and another 1.88% did not specify. Looking at whether students disagreed or agreed with the various scales, the majority, 78.76%, agreed that they experienced satisfaction with the performance of DLIS.

Table 5.40 Pleased with the experience of using DLIS

Satisfaction S2	Frequency	Percentage
Did not specify	3	1.88
Strongly disagree	2	1.25
Disagree	5	3.13
Slightly disagree	9	5.63
Neither disagree or agree	20	12.50
Slightly agree	34	21.25
Agree	42	26.25
Strongly agree	45	28.13
Total	160	100.00

When asked if they were pleased with the experience of using DLIS, students responded with the majority (28.13%) strongly agreeing, the minority on the scale said they strongly disagree at 1.25% of participants, and 1.88% did not specify their answer to the question. Looking at whether students disagree or agree on the various scales majority of students, 75.63%, agreed with the statement, "I find it effortless to use DLIS".

Table 5.41 The use of DLIS improves my ability to search for information

Satisfaction S3	Frequency	Percentage
Did not specify	3	1.88
Strongly disagree	2	1.25
Disagree	4	2.50
Slightly disagree	1	0.63
Neither disagree or agree	13	8.13
Slightly agree	40	25.00
Agree	47	29.38
Strongly agree	50	31.25
Total	160	100.00

Table 5.41, the statement posed to participants was if using DLIS improves my ability to search information; 31.25% of students strongly agreed with the statement, which was the majority on the scale. A minority of students strongly disagreed (1.25%), and 1.88% of students did not specify their answer to the question. Looking at whether students disagree or agree with the various scales, the majority of students, 85.63%, agreed with the statement that using DLIS improves my ability to search for information.

Table 5.42 Satisfaction with the convenience of DLIS in accessing learning resources

Satisfaction S4	Frequency	Percentage
Did not specify	3	1.88
Strongly disagree	1	0.63
Disagree	5	3.13
Slightly disagree	6	3.75
Neither disagree or agree	14	8.75
Slightly agree	33	20.63
Agree	45	28.13
Strongly agree	53	33.13
Total	160	100.00

When participants were asked if they were satisfied with the convenience of DLIS in accessing learning resources, the majority strongly agreed, 33.13% of students, and a minority strongly disagreed at 0.63%, while 8.75% could neither disagree nor agree that using DLIS would be wise, and 1.88% did not specify. Looking at whether students disagree or agree with the various scales the majority of students, 81.89%, agreed on satisfaction with the convenience of DLIS in accessing learning resources.

Table 5.43 Satisfaction with the DLIS environment

Satisfaction S5	Frequency	Percentage
Did not specify	3	1.88
Strongly disagree	2	1.25
Disagree	6	3.75
Slightly disagree	4	2.50
Neither disagree or agree	24	15.00
Slightly agree	36	22.50
Agree	33	20.63
Strongly agree	52	32.50
Total	160	100.00

When asked about their satisfaction with the DLIS environment, students responded that the majority of 32.50% strongly agreed, the minority on the scale said they strongly disagreed, 1.25% of participants, and 1.88% did not specify their answer to the question. Looking at whether students disagree or agree on the various scales majority of students, 75.63%, agreed with the statement regarding satisfaction with the DLIS environment.

Table 5.44 Using DLIS increases my productivity

Satisfaction S6	Frequency	Percentage
Did not specify	3	1.88
Strongly disagree	6	3.75
Disagree	5	3.13
Slightly disagree	6	3.75
Neither disagree or agree	23	14.38
Slightly agree	22	13.75
Agree	43	26.88
Strongly agree	52	32.50
Total	160	100.00

When asked if using DLIS increases my productivity, 32.50% of the students responded that they strongly agreed with the statement, 3.13% disagreed, and 1.88% did not specify. Looking at whether students disagree or agree on the various scales majority of students, 73.13%, agreed that using DLIS increases productivity.

Table 5.45 DLIS met my expectations

Satisfaction S7	Frequency	Percentage
Did not specify	4	2.50
Strongly disagree	2	1.25
Disagree	8	5.00
Slightly disagree	7	4.38
Neither disagree or agree	24	15.00
Slightly agree	34	21.25
Agree	37	23.13
Strongly agree	44	27.50
Total	160	100.00

Table 5.45, the statement posed to participants was that DLIS met my expectations; 27.50% of students strongly agreed with the statement, which was the majority on the scale. A minority of students strongly disagreed (1.25%), and 2.50% of students did not specify their answer to the question. Looking at whether students disagree or agree on the various scales majority of students, 71.88%, agreed with the statement that DLIS met my expectations.

Table 5.46 I use DLIS for accessing learning resources

Adoption A1	Frequency	Percentage
Did not specify	4	2.50
Strongly disagree	3	1.88
Disagree	8	5.00
Slightly disagree	4	2.50
Neither disagree or agree	18	11.25
Slightly agree	30	18.75
Agree	37	23.13
Strongly agree	56	35.00
Total	160	100.00

When asked whether I use DLIS for accessing learning resources, students responded that the majority (35.00%) strongly agreed, the minority on the scale said they strongly disagreed at 1.88% of participants, and 2.50% did not specify their answer to the question (Table 5.46). Looking at whether students disagree or agree on the various scales majority of students, 76.88%, agreed with the statement I use DLIS for accessing learning resources.

Table 5.47 Would not stop using DLIS.

Adoption A2	Frequency	Percentage
Did not specify	5	3.13
Strongly disagree	3	1.88
Disagree	5	3.13
Slightly disagree	3	1.88
Neither disagree or agree	15	9.38
Slightly agree	31	19.38
Agree	36	22.50
Strongly agree	62	38.75
Total	160	100.00

When participants were asked if they would not stop using DLIS, the majority strongly agreed, 38.75% of students, and a minority strongly disagreed, at 1.88%. While 9.38% could neither disagree nor agree that using DLIS would be wise, 3.13% did not specify. Looking at whether students disagree or agree with the various scales, the majority of students, 80.63%, agreed that they would not stop using DLIS.

Table 5.48 Using DLIS is invaluable in my general learning process

Adoption A3	Frequency	Percentage
Did not specify	5	3.13
Strongly disagree	39	24.38
Disagree	19	11.88
Slightly disagree	6	3.75
Neither disagree or agree	20	12.50
Slightly agree	17	10.63
Agree	27	16.88
Strongly agree	27	16.88
Total	160	100.00

In Table 5.48, the statement posed to participants was if using DLIS is invaluable in my learning process; 24.38% of students strongly disagreed with the statement, which was the majority on the scale. A minority of students disagreed slightly, at 3.75%, and 3.13% did not specify their answer to the question. Looking at whether students disagree or agree on the various scales majority of students, 43.73%, agreed with the statement that using DLIS is invaluable in my general learning process.

Table 5.49 The use of DLIS is necessary for this study

Adoption A4	Frequency	Percentage
Did not specify	4	2.50
Strongly disagree	2	1.25
Disagree	5	3.13
Slightly disagree	3	1.88
Neither disagree or agree	15	9.38
Slightly agree	22	13.75
Agree	35	21.88
Strongly agree	74	46.25
Total	160	100.00

Table 5.49 shows that 46.25% of students strongly agreed with the statement that the use of DLIS was necessary for their studies. Only a tiny minority (1.25%) strongly disagreed, and 2.50% of students did not specify their answer to the question. Worth noting is that the majority of the students generally agreed.

When looking at the different constructs posed in the questionnaire, when it came to online library catalogues. 81.89%, agreed that using DLIS enables them to utilize online

library catalogues to get the location of textbooks and other library resources. 81.26%, agreed that DLIS enables them to exploit online library catalogues for quicker access to resources in the library. 76.25%, agreed that DLIS enables them to employ online catalogues to get general information about the book. 73.13%, agreed to be aware of the different learning resources I can access using online library catalogues. 84.38%, agreed with the statement that online library catalogues are an important aspect of DLIS. Students stated the influence in which Online Library Catalogues had on them, was when it came to the LIS online library catalogues perceived usefulness, attitude towards use and Satisfaction experienced when engaging with the system.

The online library database construct data show 88.13%, agreed with the statement that DLIS enabled them to utilize online library databases to access online resources effectively. 76.26%, agreed with the statement of being aware of online library databases applicable to their discipline. 55.01%, agreed with the statement that they can easily put learning resources on hold using the DLIS. 78.14%, agreed with the statement that "DLIS enables me to efficiently utilize online library databases". There is a positive influence regarding students' attitude towards use, and perceived usefulness. Although students mostly agreed with the statement that they can easily put learning resources on hold using the DLIS. The gap between the percentage of students that agreed 55.01% was quite close to those that did not agree with a gap of 4.99% which highlighted that many students did not feel DLIS enables one to utilize online library databases efficiently.

Self-efficacy data analysis showed that majority of students 76.88%, agreed with the statement of confidence in accessing learning resources using the DLIS. 65.64%, agreed with the statement that I have the necessary skills for using DLIS. 76.26%, agreed with the statement that they were comfortable using DLIS. 67.51%, agreed with the statement I can help others in using DLIS. 68.76%, agreed with the statement that DLIS improved efficiency in accessing learning resources. This shows most students have positive beliefs towards their self-efficacy when using DLIS.

Overall, the students' beliefs regarding perceived usefulness, attitude towards use, adoption and satisfaction when using DLIS have perceived benefits and challenges which are highted when looking at the technology characteristics and individual characteristics.

5.4 Research Reliability and Results

The research instrument used to collect the data in the pilot study and main study needs to be measured to show the reliability and validity of the data collected and the results that will be analysed at the end of this chapter.

5.4.1 Reliability and validity

This research study instrument's reliability and validity are measured by factor loading, mean, standard deviation, Cronbach's Alpha, composite reliability, and the average variance extracted. The first item of measurement we look at is the Mean of this study. Table 5:49 measures the mean, standard deviation, factor loading and Cronbach's Alpha.

5.4.2 Mean

The mean is defined as the average value of a data set; in this study, the mean range is between 5.84 and 7.87, as shown in Table 5.49. The lowest mean of 5.84 has a value greater than 5, which shows a positive evaluation of the library information system from the participants of this study.

5.4.3 Standard deviation

Standard deviation is the measurement of the estimated data dispersion based on the relationship of the data to the mean value Livingston, E (2003). Table 5.49 shows the standard deviation of each construct. The accepted standard deviation is lower than +- 2 standard deviation (SD). In this study, all the values are above one SD and lower than two SDs Livingston, E (2003).

5.4.4 Factor loading

The lowest factor loading in this study is 0.733, which is above the recommended measure variable of 0.7 Bollen (1989) and Gerbing and Anderson (1993). There are three levels of factor loading: low, measured by 0.3, medium by 0.5 and high by 0.7. Table 5.49 shows factor loadings ranging from 0.733 to 0.964, which are above the recommended measurement variable.

5.4.5 Cronbach's Alpha

Cronbach's Alpha is the scale used for internal consistency for items measured; there should be a correlation between the items that should allow all to measure the same Cronbach, L (1951). This coefficient is known as Cronbach's Alpha. So, to satisfy the internal validity score on the scale, it would have to be greater than 0.7. Table 5.49 shows that all values are above the 0.7 scale, which shows that the research instrument satisfies the internal validity criterion.

5.4.6 Composite reliability

Composite reliability uses composite reliabilities to evaluate the scale's internal reliability, with a minimum of 0.6 (Bagozzi & Yi, 1988; Diamantopoulos & Siguaw, 2000). The minimum composite reliability value in Table 5.49 is 0.758, which shows the reliability of the research instrument and scale.

5.4.7 Average variants extracted (AVE)

A scale is considered reliable when the average variance extracted for each construct is greater than 0.5 (Bagozzi and Yi, 1988). In Table 5.49, all averages are above the reliable threshold. The minimum average is 0.713, showing this research instrument's positive reliability.

Table 5.50 Constructs descriptive statistics and instrument reliability and validity

Constructs	Item	Mean	Standard Deviation	Factor Loading	Cronbach's alpha	Composite Reliability	AVE
Online Library Catalogues	OLC1	5.85	1.475	0.912	0.790	0.892	0.798
	OLC2			0.889			
	OLC3			0.922			
	OLC4			0.896			
	OLC5			0.932			
Online Library Database	OLD1	6.34	1.239	0.792	0.776	0.794	0.849
	OLD2			0.768			
	OLD3			0.852			
	OLD4			0.819			
Social Influence	SI1	5.95	1.382	0.771	0.895	0.883	0.776
	SI2			0.862			
	SI3			0.794			
	SI4			0.782			
	SI5			0.801			
Self-Efficacy	SE1	7.46	1.564	0.935	0.796	0.769	0.814
	SE2			0.961			
	SE3			0.895			
	SE4			0.887			
	SE4			0.911			
Perceived Usefulness	PU1	7.87	1.966	0.892	0.829	0.857	0.875
	PU2			0.889			
	PU3			0.896			
	PU4			0.901			
	PU5			0.875			
	PU6			0.916			
Perceived Ease of Use	PEOU1	6.93	1.991	0.798	0.796	0.893	0.800
	PEOU2			0.885			
	PEOU3			0.776			
	PEOU4			0.742			
	PEOU5			0.861			
	PEOU6			0.792			
	PEOU7			0.910			
Attitude Towards Use	ATU1	7.47	1.716	0.754	0.792	0.867	0.713
	ATU2			0.793			
	ATU3			0.862			
	ATU4			0.733			
Satisfaction	S1	6.85	1.128	0.936	0.794	0.758	0.728
	S2			0.899			
	S3			0.924			
	S4			0.876			
	S5			0.911			
	S6			0.877			
	S7			0.964			
Adoption	A1	5.84	1.619	0.798	0.713	0.813	0.777
	A2			0.833			
	A3			0.798			
	A4			0.752			

5.4.8 Correlation matrix

Lawley (1956) stated that the equality of the smallest latent root of a correlation matrix can be tested using the asymptotic variance of a statistic. Variable sets that are non-comparable use a correlation matrix. Table 5.50 refers to the correlation between constructs from this research study. The validity of this study can be seen by the square roots of AVE scoring greater than the correlation coefficients between the constructs. Bookstein (1986) states that the AVE measure higher for the convergent validity to score higher. Testing of equality of all correlation coefficients is achieved through the use of asymptotic chi-squared distribution (Lawley, 1963).

Table 5.51 Latent construct correlation matrix

	OLC	OLD	SI	SE	PU	PEOU	ATU	S	A
OLC	**.746**								
OLD	.546	**.668**							
SI	.635	.534	**.721**						
SE	.712	.625	.672	**.610**					
PU	.634	.542	.634	.546	**.835**				
PEOU	.541	.529	.553	.432	.673	**.624**			
ATU	.547	.498	.655	.546	.722	.555	**.736**		
S	.652	.562	.599	.501	.610	.644	.721	**.711**	
A	.624	.596	.506	.576	.712	.598	.711	.666	**.676**

Bold values show all the square roots of AVE, which are greater than the correlation coefficients between the construct and the other constructs.

Model fit indices for the final measurement model, the data examined in the model fit evaluated by fit indices. Table 5.51 looks at various indices: the Chi-squared, the goodness of fit (GFI), the adjusted goodness of fit (AGFI) and the Tucker-Lewis index. There are two primary fit types: the Locale fit and the Overall fit. The Local fit examines specific parameters, and the overall fit examines the holistic view of the entire data analysis (Smith, D. and McMillan, F, 2001). The overall fit uses several indicators and three primary empirical criteria: tests of the null hypothesis, tests of absolute fit, and tests of incremental fit (Tanaka,1993). The chi-squared statistic (x2) is used for null hypothesis tests (Hu & Bentler,1995). The goodness of fit (GFI) and adjusted goodness of fit (AGFI) indices were developed by (Joreskog & A-born 1984) to test alternative hypotheses about model fit (MacCallum & Hong, 1997). The Tucker-Lewis index uses factor analysis (TLI, 1973).

Table 5.52 Summary of the model fit indices for the final measurement model

Model indices	Fit Recommended values	Values in the Measurement model	Model fit indices	Recommended values	Values in the Measurement Model
x^2/df	≤ 3	2.632	CFI	≥ 0.9	1.251
GFI	≥ 0.85	0.925	RMSEA	≤ 0.08	*0.065*
AGFI	≥ 0.8	1.001	SRMR	≤ 0.08	*0.051*
TLI	≥ 0.9	0.989	PCLOSE	≥ 0.05	*0.077*

Using the various indices covers the shortcomings of the individual indices on their own (Tanaka,1993). The recommended fit value for Chi-squared is ≤3, while the values in the measurement model meet at 2.632. The recommended fit value for the goodness of fit is ≤0.85, which the values in the measurement model meet at 0.925. The recommended fit value for the adjusted goodness of fit is ≥0.8, while the values in the measurement model meet at 1.001. The recommended fit value for the Tucker-Lewis index is ≥0.9, while the values in the measurement model meet at 0.989. The recommended fit value for the comparative fit index is ≥0.9, while the values in the measurement model meet at 1.251. The recommended fit value for the root mean square error of approximation is ≤0.08, which means the values in the measurement model meet at 0.065. The recommended fit value for the root mean square error of approximation is ≤0.08, while the values in the measurement model meet at 0.065.

5.5 Key findings

Analysis of the data collected using the questionnaire produced some key findings of the study. These key findings highted the factors that influence adoption of LIS in South African Universities in the Western Cape. The findings support the development of the proposed conceptual framework.

5.5.1 Technology characteristics

The technology characteristics of this research study were e-library circulation, e-Library databases, and e-library catalogues. Most students (81.26%) agreed that DLIS enabled them to exploit online library catalogues for quicker access to resources in the library. 73.13% knew the different learning resources they can access using online library catalogues. Furthermore, 88.13% agreed that DLIS enabled them to effectively utilise

online library databases to access online resources. Students perceived usefulness and ease of use of the e-library catalogue of the university LIS positively influenced the attitude towards use and satisfaction of the LIS. Also, it positively influenced the attitude towards using and satisfying the LIS. Most students (76.26%) were aware of online library databases that apply to their discipline. In summary, LIS positively influenced the attitude towards using and satisfying the LIS.

5.5.2 Individual characteristics findings

Students' ability to utilise a digital library system in higher education plays a significant role in their decision to accept and use it in higher education (Rafique et al., 2018). Computer self-efficacy and Social influence. According to Almukhlifi, 2019, computer self-efficacy is the extent to which students are confident in their ability to use the digital library system. Students were asked about their confidence level in the LIS, and 76.88% agreed with the statement of confidence in accessing learning resources using the DLIS. Students, 76.26%, agreed with the statement that they were comfortable using LIS.

As stated in Chapter 3, social influence refers to Raven, 1964, for students with a form of dependency from the source of influence, which allows a person to inherit the beliefs or attitude the source has toward the dependent. When asked, people who are important to one (i.e., family members, friends, lecturers, and librarians) would recommend using the DLIS. 78.76% of students stated that those important to them would recommend using LIS. Social influence can play a role in 78.76% of students in this research study. From the findings of the constructs identified, the conceptual relationships were tested using empirical data to better understand the specific phenomenon (Bere, 2019).

5.5.3 Conceptual model findings

In Chapter 3, a conceptual model was proposed and in section 5.4, Table 5.52 Summary of the model fit indices for the final measurement model. The variable of x^2/df measured at 2.632, which was below the value of ≤3 within the recommended fit value for Chi-squared. The GFI value in this research model was above ≥0.85, with the fit value recommendation measuring 0.925 (Smith, D. and McMillan, F, 2001). The AGFI value in the model is 1.001, which is greater than ≥0.8 and is supported by the recommended fit value. The variable of TLI measured at 0.989, which was greater than ≥0.9, accepted

by the recommended fit value of TLI, and the variable of CFI measured at 1.251, which was greater than ≥0.9, the value falls within the recommended fit value. The RMSEA value in the model is 0.065, which is less than ≤0.8 and is supported by the recommended fit value. The SRMR value in the model is 0.051, which is less than the value of ≤0.8, the recommended fit value. The PCLOSE value in the model is 0.077, which is less than the value of ≥0.5, which supports the fit recommendation (Tanaka,1993).

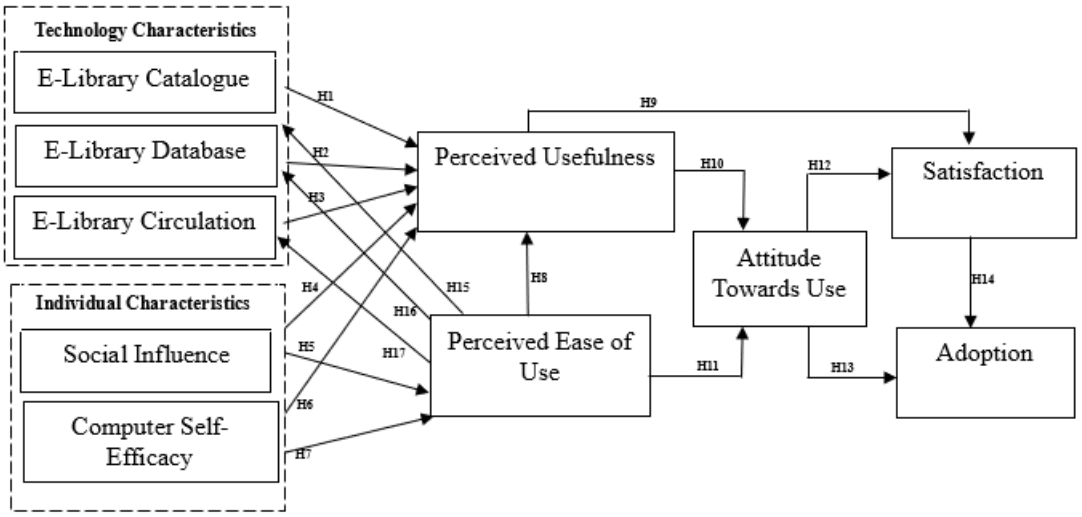

Figure 5.1 Conceptual Framework

The model fit indices support the hypothesis from the conceptual model, accepting the hypothesis and variables of the model displayed in Figure 5.1.

5.6 Discussion

The aim of the study was to investigate the current frameworks for adoption of LIS patterns at two South African universities in the Western Cape. The objectives were to determine the factors that influence adoption of LIS in South African Universities in the Western Cape. The key findings identify a set of constructs and their relationships that can be tested using empirical data to better understand a specific phenomenon This section of Chapter 5 answers the research questions posed in Chapter 1, First looking at the main research question and followed by the Secondary research questions.

5.6.1 Main research question

According to Bere & Rambe, (2016) TAM enables significant progress in understanding the adoption of specific technologies in higher education. This study proposed extending TAM with two categories focus on the aspects related to individual library users and technology associated with digital libraries. The technology characteristics include e-library catalogue, e-library database, and e-library circulation. The individual characteristics include social influence and computer self-efficacy.

The appropriate framework for evaluating the adoption of LIS in selected South African Universities in the Western Cape includes the technology characteristics, e-library circulation, e-library databases, and e-library catalogues, as they play a vital role in the library. The technology characteristics of students in Western Cape higher education were measured in terms of e-library catalogue, e-library database and e-library circulation. The university library process comprises various processes. Three main functions are e-library circulation, e-library databases, and e-library catalogues. A framework consisting of Perceived usefulness, perceived ease of use, attitude towards use, satisfaction, individual characteristics, and adoption. In addition, technology characteristics, e-library circulation, e-library databases, and e-library catalogues would be appropriate for evaluating the adoption of LIS in selected South African Universities in the Western Cape. Chapter 2 literature supports this suggestion with research studies from other contexts. Tables 5.50 (Latent construct correlation matrix), 5.51 (Summary of the model fit indices for the final measurement model) and 5.52 (Constructs descriptive statistics and instrument reliability and validity), support the conceptual model, including technology characteristics, e-library circulation, e-library databases, and e-library catalogues. In all cases, the values are within the recommended values range, for one to accept the reliability and validity of the conceptual framework.

5.6.2 Secondary research questions:

The critical factors identified in this research study were the technology characteristics, e-library circulation, e-library databases, and e-library catalogue, the individual characteristics, computer self-efficacy and social influence. These factors positively influence the attitude towards using, satisfying, and adopting the LIS. The conceptual model findings further support the above-mentioned factors as the values are in the

recommended fit values. The factors were also measured in Table 5.50: constructs descriptive statistics and instrument reliability and validity, supporting the reliability and validity of the factors investigated in this research study Cronbach, L (1951). Bagozzi and Yi, (1988) stated that a scale is considered reliable when the average variance extracted for each construct is greater than 0.5 the values measured above 0.5.

The current patterns and trends for adopting LIS in South African higher education are indicated in section 5.2. Processes and guidelines are created using the TAM, TTF theory, and individual characteristics from the existing framework. Although guidelines with insight into adoption are used, students' attitudes towards use and satisfaction positively influence adoption.

Chapter 2 literature indicates that the higher education libraries in South Africa encourage the utilisation of their LIS. Firstly, by providing insight to users, the LIS can be seen as a useful support tool for the use, creation, and search of digitised information (Borgman, 2002). Secondly, by highlighting the usefulness and ease of use of the Technology characteristics, perceived usefulness and ease of use positively influence the attitude towards use and satisfaction of the LIS. Bere & Rambe, (2016) TRA's attitude measures with the two-technology usage measures: ease of use and usefulness.; Davis, (1989) stated. According, to Davis, (1989), TAM an extension of TRA assumes several factors influence the decisions of users about how and when to use it. This literature supports the findings that Perceived usefulness, perceived ease of use, attitude towards use and satisfaction positively influence using e-library catalogues, e-library databases, and e-library circulations.

5.7 Chapter Summary

In conclusion, the research questions identified in Chapter One were answered regarding the adoption of digital library information systems at two South African universities. This chapter discussed the data analysis regarding adopting digital library information systems at the two South African universities; the data analysis highlighted the factors that influence the adoption of digital library information systems at the two universities. This information could be used to create a framework for the adoption of digital library information systems at South African universities. The findings highlighted the themes selected earlier in the research study that influence adoption and the link of the benefits

of digital library information systems at South African universities. They include Adoption, Perceived Usefulness, Perceived Ease of Use, Attitude Towards Use, Satisfaction, Self-Efficacy, Social Influence, Online Library Databases and Online Library Catalogues.

CHAPTER 6 SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

Chapter 6 presents the conclusions of this study which investigated the current frameworks for adoption of LIS patterns at two South African universities. This chapter concludes the study by summarising the findings of the study and by demonstrating how the research questions were answered. It also highlights the contribution and limitations of the study.

The research study looked at the two universities selected in South Africa, the university of the Western Cape and Cape Peninsula University of Technology both located in the Western Cape. The data collection method select was a questionnaire which was completed by 170 participants. The findings of the research showed a set of constructs and their relationships, to gain insight on the factors that influence adoption. The factors technology characteristics, e-library circulation, e-library databases, and e-library catalogue, the individual characteristics, computer self-efficacy and social influence were identified as critical factors.

6.2 Summary of Study Findings

The critical determinants for adopting the LIS in South Africa identified were technology characteristics, e-library catalogue, e-library database, and e-library circulation. Individual characteristics: social influence and computer self-efficacy. These determine positively influence perceived usefulness, perceived ease of use, satisfaction, adoption and attitude towards use. The conceptual model included technology characteristics, the e-library catalogue, e-library database, and e-library circulation. Individual characteristics: social influence and computer self-efficacy to extend the existing framework of adoption that used TAM and TTF. Chapter 2 presented a conceptual framework which was based on TAM and TTF. Using TAM and TTF, an individual's behavioural intentions are analysed according to technology utilisation through perceived ease of use and usefulness.

Several outcomes and results emerge from this research. First, it provides a better understanding of the critical factors influencing library users to adopt LIS. Second, it shows that LIS would benefit South African higher education institutions, government,

and citizens. Third, it provides insight into future development and potential utilisation of LIS. Fourth, university libraries adopting LIS would serve their users and staff by adopting LIS.

The findings showed that the benefits of e-library catalogue utilisation were many. The majority of students assessed the university LIS positively. They considered it useful for ease of use and welcomed the adoption of the LIS by both universities in the study.

6.3 Contributions of the Study

The study is important both in terms of its methodological, practical, and theoretical contributions. This research gives detailed insight into some factors that influence the adoption of LIS. The findings of this research could help university libraries and library stuff to create new LIS adoption processes for implementation. This research could also provide insight into LIS gaps that South African universities might not be aware of. This study provides the development of a conceptual framework for a framework for understanding the technology adoption of LIS in higher education.

This research study contributes scientifically as it adds to the body of knowledge of library information systems adoption in a south African university context. The findings of the external variables Technology characteristics which consists of e-library catalogue, e-library databases, and e-library circulation. Individuals' characteristics consistent of social influence and computer self-efficacy having a positive influence on perceived usefulness, perceived ease of use, attitude towards use and satisfaction lead to a conceptual modal.

Theoretical contribution

A conceptual modal was proposed as external variables should be included to fill the gap when making use of not just as well as the use of the external variables from the university library information system, a proposed conceptual model was designed to use as a research instrument. Including the above-mentioned external variables to extend an existing framework for adoption focuses on adoption in the library information systems adoption in a south African university context.

Practical contribution

This research gives detailed insight into some factors that influence the adoption of LIS. The findings of this research could help university libraries and library stuff to create new LIS adoption processes for implementation. This research could also provide insight into LIS gaps that South African universities are not aware of.

6.4 Implications of the Study

There are three implications of the study to be addressed. Firstly, this research adds to information systems and will extend the knowledge of information system adoption and usage at a South African university library. Secondly, this study will raise awareness of the challenges tertiary institutions face in adopting and using information systems. Thirdly, this research adds to the existing conceptual framework for adopting technology in the context of a university library information system, technology characteristics; e-library catalogue, e-library database, and e-library circulation. Individual characteristics: social influence and computer self-efficacy. This research will contribute to the existing body of knowledge in the related field.

6.5 Limitations of the Study

This study focused on the library information system with which students engage. However, the following have been excluded:

Although this study focused on library information systems in a South African university context, only two universities (the University of the Western Cape and Cape Peninsula University of Technology) had participants. Therefore, these results do not speak to all South African university library information systems. The validity of this study would have been strengthened by the participation of serval universities in the Western Cape. Due to time and financial constraints serval other universities could not be included in this study.

This study did not evaluate the library system; the results may differ from the library information systems evaluated in the research. The factors researched are based on participants' perceptions and beliefs. By evaluating the library information system, the usage percentage of e-library catalogue, e-library database, and e-library circulation were not analysed to gain insight into what the students were not making use of and the role those technology characteristics. Future research can evaluate the library information

system and gain insight from participants' perceptions and beliefs to add on to this conceptual model.

This study is based on the existing library information systems that students were using at their universities. It essentially captured their perceptions of the digital library systems they engaged with or had engaged in. Any wiling student asked to participate in the study, were not asked to use the library information systems based on the same date, the experiences with the system could differ depending on when last they made use of the system and network. Future research can be carried out based on a set period, as results could vary from the results of this research study.

Due to the research methodology being quantitative, in-depth insight from students was not conducted using qualitative research methods. By using a quantitative method this did not allow for open – ended questions where participants to add on to the answer. A qualitative research study can be conducted to gain in-depth insight from participants.

6.6 Recommendations for Research

This study examined the adoption of library information systems through the TAM, TTF and LIS literature. The results of the conceptual framework suggested did not evaluate the LIS. Future research can extend this conceptual framework by evaluating the LIS. A qualitative research study can be carried out as the quantitative method yielded results that may differ from a qualitative research study.

6.7 Chapter Summary

This chapter concludes with the review of the literature regarding LIS, its adoption by South African university and the research objectives of the study. Chapter 2 literature highlighted the importance of libraries and LIS, as critical points of knowledge repositories. The study reveals that the use of LIS improves the effectiveness and efficiency of libraries. Through the use of TAM and TTF the behavioural intentions of an individual were analysed in accordance to technology utilisation, through perceived ease of use and perceived usefulness. The conceptual model for LIS adoption and South African university was extended with external variables consisting of technology characteristics, E-Library Catalogue, E-Library Database, E-library circulation, and individual characteristics, such as social influence and computer self-efficacy.

6.8 Summary

To conclude this chapter highlighted the key findings of this study. The chapter included an accepted conceptual framework model that was based on the technology and individual variables in context, student responses and the answered research questions. The contributions and limitations of the research study were highlighted. Finally, recommendations for future research were suggested.

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ANNEXURES

Annexure A Main Study Questionnaire

Data collection instrument for a framework for the adoption of a library information system in selected South African Universities in the Western Cape

I am researching a framework for the adoption of a library information system in a South African university context. The study focuses on students' opinions in two South African universities in the Western Cape. As libraries play a vital role in being knowledge repositories to university communities, respondents are requested to complete a paper-based questionnaire to gain insight into their perceptions on adopting the digital library information system at their institution.

Please confirm that your data may be used for students research into digital Library Information System(DLIS).

- Respondents are adequately informed of the aims of the research and the confidentiality of the information they will provide.
- The questionnaire will be administered once participants have a clear understanding of the research intent and that participation is voluntary. The respondents can withdraw anytime during the interview, and consent is given upon marking the checkbox stating "I agree to be a participant in the study" in section 1 below.
- To ensure anonymity, the names of the respondents will not be required in the study. Just so you know --approval by participants for recordings will be sought where recordings are necessary.

If you have any questions about the study, you may contact **2132031@mycput.ac.za**.

Please tick the boxes below to provide all the necessary ethical consent for your anonymised data being used in a research study of a Framework for the adoption of a digital library information system in a South African university context research project at the Faculty of Informatics and Design, Centre for Communication Studies at the Cape Peninsula University of Technology.

Please check all the boxes that apply.

- ☐ I voluntarily agree to participate in the study.
- ☐ I have read the information above and understand the nature of the research and my role. I am aware that I may ask questions about the study and ask for additional information if needed. I understand that I may withdraw from the study at any time.
- ☐ Please keep me informed about the findings of the study before publication

☐ Other: _____

Demographic details

This section is used for the demographics of the participants.

1. Which gender do you identify with?

Mark only one box.

- ☐ Female
- ☐ Male
- ☐ I prefer not to say
- ☐ Other: _____

2. Which faculty are you in? (Tick one) *

Mark only one box.

- ☐ Faculty of Arts and Humanities
- ☐ Faculty of Community Health Sciences
- ☐ Faculty of Dentistry
- ☐ Faculty of Economic and Management Sciences
- ☐ Faculty of Education Faculty of Law
- ☐ Faculty of Natural Sciences

3. Which program are you currently pursuing? *

Please check all that apply.

- ☐ Undergraduate
- ☐ Advanced Diploma
- ☐ Honours
- ☐ Masters
- ☐ Doctorate

All questions in the sections below use a 7 point Likert scale. (**Mark only one circle per question**)

1-Strongly disagree 2– Disagree 3 – Somewhat disagree 4 – Neither agree nor disagree 5 – Somewhat agree

6 – Agree 7 – Strongly agree

Online Library Catalogues

1. Using DLIS enables me to utilise online library catalogues to get the location of textbooks and other library resources.

1 2 3 4 5 6 7

Strongly disagree	○	○	○	○	○	○	○	Strongly agree

2. Using DLIS enables me to exploit online library catalogues for quicker access to resources in the library.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

3. Using DLIS enables me to employ online library catalogues to get general information about the book.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

4. I am aware of the different learning resources I can access using online library catalogues.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

5. Overall, online library catalogues are an important aspect of DLIS.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

Online Library Databases

6. Using DLIS enables me to utilise online library databases to effectively access online resources.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

7. I am aware of online library databases that are applicable to my discipline.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

8. I can easily put learning resources on hold using the DLIS

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

9. Overall, DLIS enables me to efficiently utilise online library databases.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

Social Influence

10. I think people who are important to me (i.e., family members, friends, lecturers, and librarians) would recommend the use of the DLIS.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

11. I think the DLIS is currently used by a lot of people.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

12. My institution requires all students to use DLIS.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

13. It is my decision to use DLIS.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

14. Overall, my decision to use DLIS is influenced by other people.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

Self-Efficacy (SE)

15. I feel confident in accessing learning resources using the DLIS.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

16. I have the necessary skills for using DLIS.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

17. I feel comfortable when I am using DLIS.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

18. I can help others in using DLIS.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

19. Overall, my efficiency in accessing learning resources improved by DLIS.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

Perceived Usefulness

20. Using DLIS enables me to access learning resources efficiently.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

21. Using DLIS would improve my academic performance.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

22. Using DLIS would save me much time searching for learning resources.

	1	2	3	4	5	6	7

Strongly disagree	○	○	○	○	○	○	○	Strongly agree

23. Using DLIS enables me to have anytime and anywhere access to learning resources.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

24. Using DLIS would allow me access to learning resources beyond my institution's library.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

25. Overall, DLIS would be useful for accessing learning resources.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

Perceived Ease of Use

26. Learning how to use DLIS would be easy for me.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

27. It would be easy for me to find the required learning resources using DLIS.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

28. I find it cumbersome, to use DLIS.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

29. My interaction with DLIS is clear and understandable.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

30. I need someone to teach me how to use the DLIS for accessing learning resources.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

31. Using DLIS would not require much mental effort.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

32. Overall, I find it effortless to use DLIS.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

Attitude Towards Use

33. In my opinion, it would be desirable to use DLIS for accessing learning resources.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

34. I think that using DLIS is better than using traditional library systems.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

35. I would like to access learning resources using DLIS.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

36. I think using DLIS will be wise.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

Satisfaction

37. I am satisfied with the performance of DLIS.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

38. I am pleased with the experience of using DLIS.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

39. Use of DLIS improves my ability to search information.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

40. I am satisfied with the convenience of DLIS in accessing learning resources.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

41. I am satisfied with the DLIS environment.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

42. Using DLIS increases my productivity.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

43. Overall, DLIS met my expectations.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

Adoption

44. I use DLIS for accessing learning resources.

1	2	3	4	5	6	7

Strongly disagree	○	○	○	○	○	○	○	Strongly agree

45. I would not stop using DLIS.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

46. Using DLIS is invaluable in my learning process.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

47. Overall, the use of DLIS is necessary for my studies.

	1	2	3	4	5	6	7	
Strongly disagree	○	○	○	○	○	○	○	Strongly agree

Thank you for participating in the study.

Annexure B Ethical Clearances

Cape Peninsula
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creating futures

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Secretary: Mziyanda Ndede

6 October 2021

Chiedza Marisol Tevera
c/o Department of Information Technology
CPUT

Reference no: 213202301/2021/29

Project title: A framework for adoption of a library information system in a South African university context

Approval period: 6 October 2021 – 31 December 2022

This is to certify that the Faculty of Informatics and Design Research Ethics Committee of the Cape Peninsula University of Technology approved the methodology and ethics of Chiedza Marisol Tevera (213202301) for the MTech Information Technology.

Any amendments, extension or other modifications to the protocol must be submitted to the Research Ethics Committee for approval.

The Committee must be informed of any serious adverse event and/or termination of the study.

A/Prof I van Zyl
Chair: Research Ethics Committee
Faculty of Informatics and Design
Cape Peninsula University of Technology

UNIVERSITY OF THE WESTERN CAPE
PERMISSION TO CONDUCT RESEARCH

DEAR **Chiedza Tevera**

This serves as acknowledgement that you have obtained and presented the necessary ethical clearance and your institutional permission required to proceed with the project referenced below:

RESEARCH TOPIC

A FRAMEWORK FOR ADOPTION OF A LIBRARY INFORMATION SYSTEM IN A SOUTH AFRICAN UNIVERSITY CONTEXT.

Name of researcher	:	Chiedza Tevera
Permission valid till	:	31 December 2022
Institution	:	Cape Peninsula University Of Technology
Ethics reference	:	213202301/2021/29
Permission reference	:	UWC 5100067252026864890

You are required to engage this office (researchperm@uwc.ac.za) 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 the Western Cape.

Please be at liberty to contact this office should you require any assistance to conduct your research or require access to either staff or student contact information.

Regards
Dr Ahmed Shaikjee
Deputy Registrar Academic Administration

Approval status: **APPROVED** 14 October 2021

To verify or confirm the authenticity of this document please contact the University at researchperm@uwc.ac.za.

Annexure C Research Instrument

Constructs	Item	Measurement items	Reference
Online Library Catalogues	CS1	Using DLIS enables me to utilise online library catalogues to get the location of the textbooks and other resources in the library	Newly created
	CS2	Using DLIS enables me to exploit online library catalogues for quicker access to resources in the library	Newly created
	CS3	Using DLIS enables me to employ online library catalogues to get general information about the book	Newly created
	CS4	I am aware of the different learning resources I can access using online library catalogues	Newly created
	CS5	Overall, online library catalogues are an important aspect of DLIS	Newly created
Online Library Database	OLD1	Using DLIS enables me to utilise online library databases to effectively access online resources	Newly created
	OLD2	I am aware of online library databases that are applicable to my discipline	Newly created
	OLD3	I am skilful at applying online library databases queries	Newly created
	OLD4	Overall, online library databases are useful for accessing learning resources	Newly created
Online Library Circulation	OLC1	Using DLIS enables me to quickly check-out learning resources	Newly created
	OLC2	Using DLIS enables me to conveniently check-in learning resources	Newly created
	OLC3	I can easily put learning resources on hold using the DLIS	Newly created
	OLC4	Overall, DLIS enables me to efficiently utilise online library databases	Newly created
Social Influence	SI1	I think people who are important to me (i.e., family members, friends, lecturers, and librarians) would recommend the use of the DLIS	(Huang, Guo, Lim, & Chow, 2022)
	SI2	I think the DLIS is currently used by a lot of people	(Huang et al., 2022)
	SI3	My institution requires all students to use DLIS	(Huang et al., 2022)
	SI4	It is my decision to use DLIS	(Huang et al., 2022)

	SI5	Overall, my decision to use DLIS is influenced by other people	(Huang et al., 2022)
Self-Efficacy (SE)	SE1	I feel confident in accessing learning resources using the DLIS	{Chahal, 2022 #26}
	SE2	I have the necessary skills for using DLIS	{Chahal, 2022 #26}
	SE3	I feel comfortable when I am using DLIS	{Chahal, 2022 #26}
	SE4	I can help others in using DLIS	{Chahal, 2022 #26}
	SE5	Overall, my efficiency in accessing learning resources improved by DLIS	{Chahal, 2022 #26}
Perceived Usefulness	PU1	Using DLIS enables me to access learning resources efficiently	(Bere & Rambe, 2016; Davis, 1989; Suki & Suki, 2011)
	PU2	Using DLIS would improve my academic performance	(Bere & Rambe, 2016; Davis, 1989; Suki & Suki, 2011)
	PU3	Using DLIS would save me much time searching for learning resources	(Bere & Rambe, 2016; Davis, 1989; Suki & Suki, 2011)
	PU4	Using DLIS enables me to have anytime and anywhere access to learning resources	(Bere & Rambe, 2016; Davis, 1989; Suki & Suki, 2011)
	PU5	Using DLIS would allow me access to learning resources beyond my institution's library	(Bere & Rambe, 2016; Davis, 1989; Suki & Suki, 2011)
	PU6	Overall, DLIS would be useful for accessing learning resources	(Bere & Rambe, 2016; Davis, 1989; Suki & Suki, 2011)
Perceived Ease of Use	PEOU1	Learning how to use DLIS would be easy for me	{Chahal, 2022 #26}
	PEOU2	It would be easy for me to find the required learning resources using DLIS	{Chahal, 2022 #26}
	PEOU3	I find it cumbersome, to use DLIS	(Davis, 1989; Huang et al., 2022)
	PEOU4	My interaction with DLIS is clear and understandable	{Chahal, 2022 #26}
	PEOU5	I need someone to teach me how to use the DLIS for accessing learning resources	(Davis, 1989; Huang et al., 2022)
	PEOU6	Using DLIS would not require much mental effort	(Bere & Rambe, 2016; Davis, 1989; Suki & Suki, 2011)
	PEOU7	Overall, I find it effortless to use DLIS	(Bere & Rambe, 2016; Davis, 1989; Suki & Suki, 2011)
Attitude Towards Use	ATU1	In my opinion, it would be desirable to use DLIS for accessing learning resources	(Bere & Rambe, 2016; Davis, 1989; Suki & Suki, 2011)

	ATU2	I think that using DLIS is better than using traditional library systems	(Bere & Rambe, 2016; Davis, 1989; Suki & Suki, 2011)
	ATU3	I would like to access learning resources using DLIS	(Bere & Rambe, 2016; Davis, 1989; Suki & Suki, 2011)
	ATU4	I think using DLIS will be wise.	{Bere, 2016 #23}
Satisfaction	S1	I am satisfied with the performance of DLIS	{Rajeh, 2021 #27}
	S2	I am pleased with the experience of using DLIS	{Rajeh, 2021 #27}
	S3	Use of DLIS improves my ability to search information.	{Rajeh, 2021 #27}
	S4	I am satisfied with the convenience of DLIS in accessing learning resources.	{Rajeh, 2021 #27}
	S5	I am satisfied with the DLIS environment.	{Rajeh, 2021 #27}
	S6	Overall, DLIS met my expectations	{Rajeh, 2021 #27}
	S7	Using DLIS increases my productivity.	{Rajeh, 2021 #27}
Adoption	A1	I use DLIS for accessing learning resources	(Bere & Rambe, 2016; Davis, 1989)
	A2	I would not stop using DLIS	(Bere & Rambe, 2016; Davis, 1989)
	A3	Using DLIS is invaluable in my learning process	(Bere & Rambe, 2016; Davis, 1989)
	A4	Overall, the use of DLIS is necessary for my studies.	(Davis, 1989)