

**A User Experience (UX) Evaluation of Adopted Higher Education
Institution Library Portals in Zambia**

By

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A dissertation submitted to the University of Zambia in partial fulfilment of the requirements
of the degree of Master of Library and Information Science

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DECLARATION

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CERTIFICATE OF APPROVAL

This dissertation of Dokowe Thelma Tembo has been approved as partial fulfilment of the requirements for the award of the degree of the Master of Library and Information Science by the University of Zambia.

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ABSTRACT

This study aimed to evaluate the user experience of adopted library portals in Zambian universities. This encompassed the adoption and usability of the library portals. The research objectives were threefold: first, to determine the extent of adoption of library portals in Zambian universities; second, to assess the integration of key library portal features with existing library portals; and third, to examine users' perceived usability of these portals. A survey design was employed in the study. A mixed-method approach was then used which involved the analysis of both quantitative and qualitative data., this involved the distribution of 62 questionnaires to universities registered under the Higher Education Authority (HEA) to collect their URLs. A heuristic evaluation was conducted to assess portal characteristics, involving 12 expert librarians as participants. Additionally, a System Usability Scale (SUS) was utilized to gauge the perceptions of lecturers and students towards the portals, with a sample of 60 lecturers and 324 students. This study was worth carrying out because it aimed at providing answers to the effectiveness of the information design of Zambian university academic library portals as information communication channels and also to show if there was a need to change and improve the current portals. It was also important because it can also be used as a guideline in the creation of a policy that can help librarians as they set up their library portals

The findings revealed that only three Higher Education Institutions (HEIs) in Zambia had adopted library portals: ZCAS University, Mulungushi University and the University of Zambia (UNZA). The study indicated that participants generally rated the usability of these portals as average. Specifically, the average SUS scores for UNZA ($n=132$, $SD=53.685$), ZCAS University ($n=68$, $SD=60.28$) and Mulungushi University ($n=124$, $SD=51.865$) were all above the 50 SUS score threshold. Despite being categorized as 'Ok' according to the SUS scores, the study revealed that this rating falls within the marginal acceptability range. The results underscored the limited presence of library portals in Zambian HEIs and the need for universities to prioritize the redesigning of their existing portals to enhance information provision and overcome distance barriers. Furthermore, the study recommended that the three universities with library portals focus on improving their platforms to encompass all essential characteristics of effective library portals.

Keywords: User Experience, Library Portals, Higher Learning Institutions, Usability, Satisfaction, Efficiency, Effectiveness, Accessibility, Usefulness, Zambia, Universities.

DEDICATION

This work is dedicated to my parents Watson and Jane Tembo. Without them, I wouldn't have completed this. They pushed me forward and asked about my progress every day. This accomplishment makes them very proud. May God bless you abundantly for the unconditional love you have shown me. I am forever grateful to my parents.

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LIST OF ABBREVIATIONS AND ACRONYMS

CSUQ: Computer System Usability Questionnaire

EAD: Encoded Archival Description

GUI: Graphical User Interface

HEA: Higher Education Authority

HEI: Higher Education Institutions

HSSREC: Human and Social Sciences Research and Ethics Committee

HTML: Hyper Text Markup Language

HTTP: Hypertext Transfer Protocol

ICT: Information and Communication Technology

ID: Identification

LIS: Library and Information Science

LMS: Learning Management System

MBA: Masters in Business Administration

MARC: Machine Readable Cataloguing

MLIS: Master of Library and Information Science

MU: Mulungushi University

NPS: Net Promoter Scores

OCLC: Online Computer Library Centre

OPAC: Online Public Access Catalogue

SEQ: Single Ease Question

SIS: Student Information System

SPSS: Statistical Package for Social Sciences

SUPR- Q: Standardized Universal Percentile Rank Questionnaire

SQL: Structured Query Language

SUS: System Usability Scale

TEI: Text Encoding Initiative

UEM: Usability Evaluation Methods

UK: United Kingdom

UNZA: University of Zambia

URL: Uniform Resource Locator

USA: United States of America

UX: User Experience

WWW: World Wide Web

XML: Extensible Markup Language

ZCAS U: ZCAS University

CHAPTER 1: INTRODUCTION

1.1 Overview

In the dynamic landscape of higher education, the role of libraries has evolved beyond mere repositories of books to becoming pivotal hubs of information and knowledge dissemination. As a result, library portals have emerged and this has necessitated the need to evaluate their user experience, weaknesses in their architecture and strengths too. This chapter will give an insight into the introduction and background of the study.

1.2 Introduction of the Study

Libraries are increasingly vital centres for the exchange of information and knowledge, rather than just places to store books in the ever-changing world of higher education. In this day of digitalisation, where technology has made it easier for people to obtain information, library portal user experiences (UX) are vital in determining how lecturers, researchers and students approach their academic careers. To fulfil the changing needs of their academic communities, Zambian universities must prioritise understanding and improving the user experience (UX) of their library portals.

Like many other nations, Zambia has seen a notable transition in the educational system toward digitalisation. A key component of this digital shift is the implementation of library portals, which provide staff and students with easy access to a multitude of academic resources, including research databases and scholarly papers. Having these portals does not ensure the best possible user experience. User interface design, content relevancy, accessibility, and usability all have a significant impact on how people use these platforms.

The purpose of this study was to assess the user experience (UX) of implemented library portals in Zambian universities, highlighting benefits, drawbacks, and potential areas for development. Through a thorough evaluation, useful information guided strategic choices that will improve the general standard of library portals and improve users' academic experiences.

Library portals are crucial because they provide convenience and flexibility by offering online access to resources, library portals enable users to search for and access materials from anywhere at any time (Boss, 2008). This flexibility is particularly valuable for students and faculty who may have busy schedules or need to access resources outside of regular library hours.

With the increasing prevalence of remote and online learning, library portals play a vital role in supporting virtual classrooms. They provide students with access to electronic textbooks,

scholarly articles, and other digital resources necessary for their coursework, regardless of their physical location. This can also be linked to research support, library portals offer a wide range of tools and services to support research activities, including bibliographic management software, citation guides, research databases, and librarian assistance (Saleem, 2017). These resources help students and faculty locate relevant literature, manage citations, and conduct thorough literature reviews for their research projects.

Overall, library portals play a vital role in supporting teaching, learning, research, and scholarly communication within universities, making them indispensable resources for students, faculty, and researchers alike.

The relationship between the user and the portal, however, is extremely fickle. Library portals need to be easily navigable, including obvious signs that quickly lead the user to the information that they need to find. Websites have as little as 25–35 seconds to convince users that the information they are looking for is available (Al-Qallaf, 2019). According to Hasan and Abuelrub (2011), users quickly scan a webpage to determine whether they have what they need. Arguably, users are preoccupied with the following dilemmas as they navigate the website: can the site answer the user's information needs? If so, can the user find it with minimal mental effort while having their query sorted with maximum effectiveness and satisfaction? It is against this background that the user experience evaluation of academic libraries is important.

1.3 Background of the Study

User Experience has various components, usability being one of them. Usability is a multifaceted term. Nowadays, usability is considered one of the most important aspects of the success of any technological product. In the context of software, if a product is difficult to use or provides mechanisms that are hard to understand, then the application is expected to fail (Paz and Pow-Sang, 2016). According to Lazar, Feng, and Hochheiser (2017), a usability problem is something confusing, misleading, or sub-optimal in the interface. Without a doubt, the purpose of usability scrutiny is to find usability complications in a prevailing user interface design and the process uses these complications to make commendations for fixing the problems and improve the usability of the design (Nielsen, 2006). Sherwin (2016) postulates that universities that prioritise a good user experience leverage the website to contribute to larger institutional goals and see a clear return on investment.

Web usability refers to methods for improving ease of use during the design process (Nielsen and Lorangen, 2006). This technique is being widely used in communication, consumer electronics, and knowledge transfer objects. According to Darra and Papanthymou (2018), the emphasis on usability evaluation has increased recently in the library field with the predominance of information technology tools, gadgets, hardware, software, and program applications.

According to Ismail (2021), usability is defined as the extent to which a product can be used by users to achieve specific goals with effectiveness, efficiency, and satisfaction in a specified context of use. As the definition shows, three constructs are used to account for usability in this standard, namely effectiveness, efficiency, and satisfaction. In this study: 1) effectiveness refers to the completeness at which users achieve specified goals; 2) efficiency refers to the time used in completing a task; and 3) satisfaction reveals positive attitudes toward using the system.

Before the internet became widely used, libraries started to digitise their holdings and produce electronic catalogues. Although these early systems were mostly text-based and lacked sophisticated capabilities, they did enable users to do electronic searches for books and other items. Libraries made the switch to online public access catalogues (OPACs) in the 1980s and 1990s. OPACs offered web-based interfaces for users to search library resources. With the ability to search by author, title, subject, and keyword, OPACs represented a major

improvement in accessibility and usability. Library portals started incorporating digital resources including databases, multimedia content, and electronic journals into their platforms when libraries started to acquire these resources. This integration improved the breadth of library collections by giving consumers consolidated access to a variety of electronic resources.

Over time, library portals have developed to provide more than just basic catalogue search functionality. These included online seminars, virtual reference assistance, interlibrary loan services, citation management tools, and customizable user accounts. Enhancing user participation and meeting a variety of research and learning needs were the objectives. User experience became the priority for library portals with the advent of user-centred design ideas. Higher Education Institutions (HEIs) enhanced their portal interfaces, collected user input and carried out usability studies to better serve their academic communities.

Additionally, a lot of HEIs have combined their learning management systems (LMS), such as Moodle or Blackboard, with library portals. This connection made it possible for instructors and students to easily access library resources within the LMS environment, which streamlined the research process.

The adoption of library portals in universities refers to the extent to which higher education institutions in Zambia integrate and utilize digital library portals as part of their academic and information resources infrastructure. The adoption of library portals in universities can be assessed comprehensively, providing insights into the integration of digital resources into the academic environment and the extent to which these technologies contribute to enhancing access to information and supporting teaching, learning, and research activities within higher education institutions in Zambia.

Assessing website usability has become an essential requirement to improve universities' websites and users' interactions can be used to accomplish such improvements in a range of website components, such as library portals. Against this background, Zambia has witnessed a growth in the number of universities with a total of nine public universities (Higher Education Authority, 2023b) and fifty-three private universities (Higher Education Authority, 2023b). In Zambia, very little research has been carried out on the usability of university library portals. A survey of literature and the Internet yielded little to no information.

1.3 Statement of the Problem

Assessing the user experience of a website has become an essential requirement to improve universities' websites and users' interactions can be used to accomplish such improvements in a range of website components, such as library portals. Against this background, Zambia has witnessed a growth in the number of universities with a total of nine public universities (Higher Education Authority, 2023b) and fifty-three private universities (Higher Education Authority, 2023b). In Zambia, very little research has been carried out on the user experience evaluation of university library portals. A survey of literature and the Internet yielded little to no information. The relative usability and comprehensiveness of these library portals were not known. This was achieved by investigating the user experience of the adopted portals that are in the universities and seeing if there is a need to improve the adopted library portals. Given this backdrop, the study attempted to evaluate the user experience of implemented university library portals in Zambia and fill this knowledge gap.

1.5 Research Objectives

1.5.1 General Objective

The main objective of the study was to evaluate the user experience of adopted university library portals in Zambian universities.

1.5.2 Specific Objectives

The specific objectives of this study were:

1. To establish the extent to which universities in Zambia have adopted library portals.
2. To determine if key library portal features or characteristics have been integrated into existing university library portals in Zambia.
3. To find out the users' perceived usability of library portals in universities in Zambia.

1.6 Research Questions

1. To what extent have universities in Zambia adopted library portals?
2. What key features or characteristics have been integrated into existing library portals in Zambia?
3. What is the perceived usability of library portals associated with universities in Zambia?

1.7 Significance of the Study

This study was aimed at providing answers to the effectiveness of the information design of Zambian university academic library portals as information communication channels and if there was a need to change and improve the current portals. It can also be used as a guideline in the creation of a policy that can help librarians as they set up their library portals. In the same vein, the study tried to identify methods and techniques to improve the library portals and

therefore potentially increase the total number of users that access the sites and use them for academic purposes. The study might also benefit the HEA as it may include usability evaluation results as a way of assessing HEIs. The findings of the study added to the already existing literature and increased the body of knowledge.

1.9 Conceptual Framework

A conceptual framework serves as the underlying structure that guides the research process and helps to conceptualize the relationships between key variables or concepts under investigation (Cresswell, 2014). The conceptual framework will provide a theoretical structure that guides the research process, informs data collection and analysis, and helps to interpret the findings within a broader theoretical context. It will serve as a roadmap for the study, grounding the research in established theory while also allowing for the exploration of new insights and relationships.

The conceptual framework is the basis of a research problem and stems from a theoretical framework (Kumar, 2011). Whereas the theoretical framework consists of the theories or issues in which the study is embedded, the conceptual framework describes the aspects selected from the theoretical framework to become the basis of enquiry.

The study adopted a conceptual framework by Ramanayaka et al. (2017). This framework was created to find areas to be developed in terms of usability to give better library service. This framework was suitable for the study because it can be used as a library website usability evaluation tool to assess the strengths and weaknesses of the website usability level. The study by Ramanayaka et al (2017) was carried out to develop a conceptual framework that can be used in the application of library website usability evaluation.

The conceptual framework provides a systematic and organized way to conceptualize, understand and analyze the phenomenon of usability. These concepts are the six components that can be used as a website evaluation tool to assess the strengths and weaknesses. The results of this evaluation would be an improvement in the website performance and eventually enhance library services (Ramanayaka et al.,2017). The six variables (components) that dominate library website usability are Efficiency, Effectiveness, Learnability, Satisfaction, Usefulness, and Accessibility.

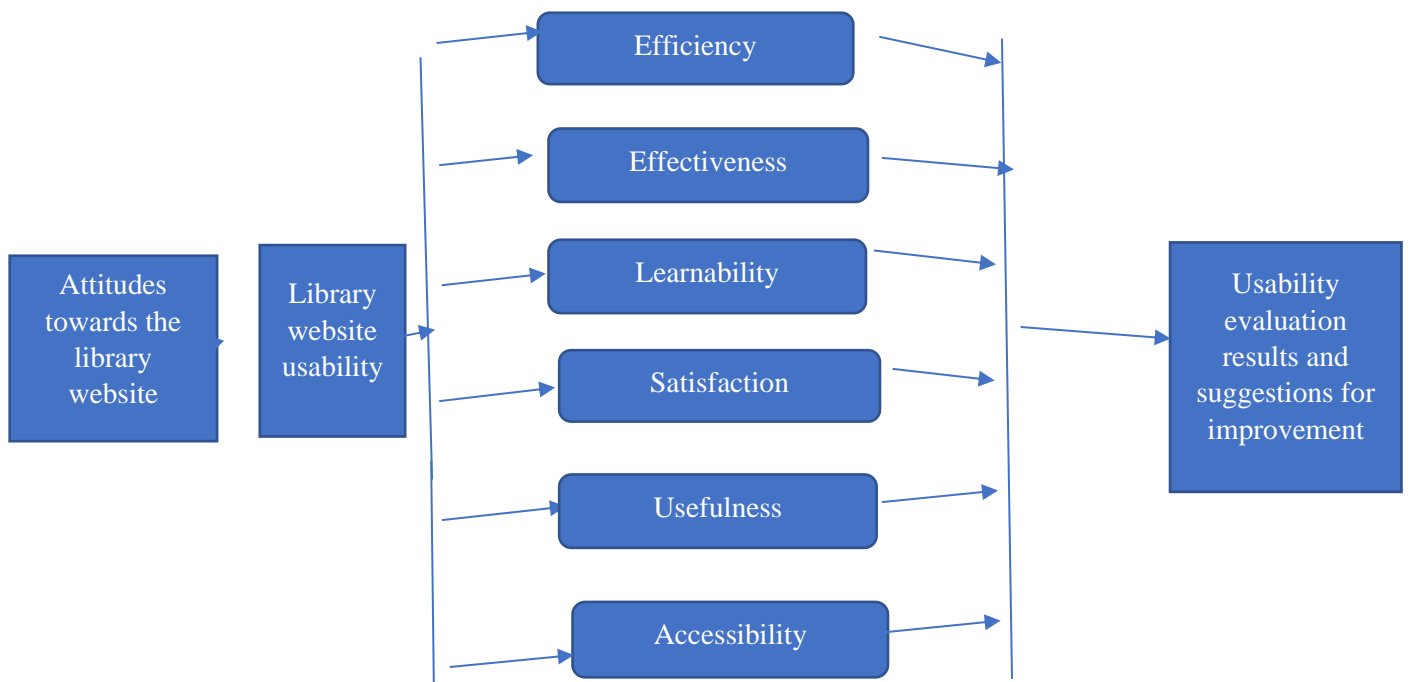


Figure 1: Framework for Library Website Usability Evaluation (Ramanayaka et al., 2017)

The study adopted the System Usability Scale (SUS) to ascertain the usability of the portals. The SUS is a 10-item questionnaire that is used to measure the usability of a system. It is a quick and easy-to-use tool that can be used by anyone, regardless of their technical expertise. It aligns with the six variables of usability that Ramanayaka et al. (2017) mention and that relate to this study. Each question in the SUS questionnaire relates to one of the six variables mentioned by Ramanayaka (2017) as follows;

Table 1: Relationship between Ramayanka’s Variables and SUS

Variable	Item
Efficiency	<ul style="list-style-type: none"> • I found the system easy to use. • I found the system unnecessarily complex. • I found the system cumbersome to use
Satisfaction	<ul style="list-style-type: none"> • I would use the system again

	<ul style="list-style-type: none"> • I would recommend the system to a friend
Learnability	<ul style="list-style-type: none"> • I felt confident using the system • I found the system was easy to learn • I found the system easy to get started with
Usefulness	<ul style="list-style-type: none"> • I found the system was well-organized • I found the system visually appealing

Efficiency is the relation between the accuracy and completeness with which users achieve certain goals and the resources expended in achieving them (Ismail, 2021). In this study, this refers to the user being able to find what was being looked for and being able to complete a resource-finding task quickly. In general terms, efficiency refers to a portal that is easy to use and carries out a user's search tasks in less time. Efficiency in the study refers to the extent to which users can accomplish their tasks on the library portal quickly and with minimal effort. This will involve the page navigation, web page load speed and search functionality of the library portals.

The effectiveness of a portal is the preference the site will be as a primary resource for the information requirements of a user. The measurement item for effectiveness can be put as to how a user completes a task without getting an error and how successful the user will be in finding the resource without any error. Effectiveness and usability are two key aspects of user experience (UX) design that work together to ensure that a product or system meets the needs and goals of its users. Effectiveness refers to the ability of a product or system to achieve its intended goals and objectives efficiently and accurately. In this case, are the library portals effective? Are they meeting their set goals and objectives of providing services to students and lecturers?

Learnability is defined as the level of ease through which a user gains proficiency with an application (Stiles-Shields *et al.*, 2017). The learnability of a library portal will depend on how easily terminologies are understood, how easy is it to learn how to use the portal and how the

library portal provides proper help functions and information. Learnability refers to the ease with which users can learn how to use a product or system when encountering it for the first time. In this study, learnability will mean how the students and lecturers learn how to use the library portals when they start using them and are the terminologies and help functions available are useful to the portal users.

Satisfaction refers to a user experiencing a product that is enjoyable, fun, entertaining, helpful, motivating, aesthetically pleasing, supportive of creativity, rewarding, and able to fulfil the user emotionally (Hassan and Galal-Edeen, 2017). Satisfaction is an important element in the success of any product. A library portal that achieves maximum satisfaction shall be recommended to other users. A satisfied user is comfortable and takes pleasure in using the portal. Satisfaction can also relate to how well a user compares the site to the user's idea of an ideal site. Satisfaction in the study, presented the subjective experience and emotional response of users when interacting with the library portals. This refers to the levels of content of the users with the library portals.

The usefulness of a library portal as stated by Ramanayaka *et al.*, (2017) will be dependent on the contents of the library portal. For example, the e-journals made available through the library portals, the accuracy of the information on the library portals, the e-databases made available through the portals, the information specified about the library through the portal, and the services made available through the portal. The usefulness in the study referred to the degree to which the portal fulfilled the students' or lecturers' needs and provided value in accomplishing their goals. It focused on the relevance, utility, and perceived benefit of the product or system to the user

The accessibility of a library portal according to Ramanayaka *et al.*, (2017) is the ability to load pages without getting errors on the portal. In the study, the speed and reliability of the web page were measurement dimensions in the accessibility of the portals. Ease of reading the pages on the library portal, visual interface of the library portals, and availability of the portal were important components in the accessibility of a portal.

This framework was considered useful because it was used as a tool for evaluating the usability of library websites to determine the website's level of usability and to provide the most recent

information about its performance. The six components or concepts eluded to by Ramanayaka et al are some of the key components of UX.

1.10 Limitations of the Study

External factors such as changes in technology, software updates, or institutional policies occurred during the study, potentially affecting the usability of library portals and the relevance of the findings.

The study was limited by the varying levels of user expertise and experience with technology among participants. Differences in digital literacy skills and prior experience with library portals influenced usability perceptions and behaviours.

The findings of the study may not be generalizable beyond the specific higher education institutions and library portals evaluated. Differences in infrastructure, resources, and user demographics across institutions limited the generalizability of the results to other contexts within Zambia.

1.11 Operational Definitions

Library Portals

For this study, library portals refer to web-based platforms or online interfaces provided by higher learning institutions in Zambia, which serve as digital gateways facilitating access to library resources and services. These portals typically include features such as catalogue search functionality, access to electronic resources, account management tools, research support services, and information about library facilities and policies.

Higher Educational Institutions

In this study, Higher Learning Institutions encompass universities, colleges, and other tertiary education institutions located in Zambia. These institutions offer undergraduate and/or postgraduate degree programs and are recognized by relevant educational authorities in Zambia.

Usability

Usability refers to the extent to which the library portals provided by higher learning institutions in Zambia are user-friendly and efficient in enabling users to accomplish their tasks effectively and satisfactorily. Usability encompasses factors such as ease of navigation, clarity of interface design, intuitiveness of search functionality, and overall user experience.

Satisfaction

Satisfaction, within the context of this study, pertains to the subjective evaluation of users' overall experience with library portals provided by higher learning institutions in Zambia. It encompasses users' feelings of contentment, fulfilment, or pleasure derived from interacting with the portal, as well as their perceptions of the portal's usefulness, ease of use, and effectiveness in meeting their information needs.

Efficiency

Efficiency refers to the degree to which users can accomplish their tasks quickly and with minimal effort when utilizing library portals provided by higher learning institutions in Zambia. It involves aspects such as the speed of information retrieval, the efficiency of search algorithms, and the ability to complete tasks without unnecessary steps or delays.

Effectiveness

Effectiveness relates to the extent to which library portals provided by higher learning institutions in Zambia successfully enable users to achieve their intended goals and objectives. It involves the portal's ability to deliver accurate and relevant search results, facilitate access to desired resources, and support users in accomplishing their information-seeking tasks effectively.

Accessibility

Accessibility refers to the degree to which library portals provided by higher learning institutions in Zambia are accessible to all users, including those with disabilities or special needs. It encompasses factors such as adherence to web accessibility standards, compatibility with assistive technologies, and the provision of alternative formats for content when necessary.

Usefulness

Usefulness refers to the perceived value or utility of library portals provided by higher learning institutions in Zambia in supporting users' academic, research, and learning activities. It involves users' perceptions of the portal's ability to provide access to relevant and high-quality information resources, facilitate knowledge discovery, and enhance their academic success and learning outcomes.

Zambia

In this study, "Zambia" refers to the Republic of Zambia, a landlocked country located in southern Africa. It encompasses all HEIs operating within the territorial boundaries of Zambia, including universities, colleges, and other tertiary education institutions.

Universities

Universities, as defined in this study, are higher learning institutions in Zambia that offer undergraduate and postgraduate degree programs across various academic disciplines. These institutions are typically accredited by the Higher Education Authority (HEA) and are recognized for their role in providing advanced education, conducting research, and fostering intellectual development within the country.

User Experience

User Experience as defined in the study encompasses all aspects of an individual's interaction with the library portal, focusing on the user's emotions, attitudes, perceptions, and behaviours before, during, and after their interaction.

1.12 Summary of the Chapter

The chapter highlighted the background of the study and gave a definition of usability and the components involved in it. It also brought out the importance of usability and highlighted the lack of literature to provide or give evidence of any usability evaluations on existing university library portals hence the problem statement. The study adopted a conceptual framework by Ramanayaka et al. The Library Website Usability Evaluation framework was created to find areas to be developed in terms of usability to give better library service. The limitations encountered in the study included external factors, differences in digital literacy skills and prior experience with library portals and differences in infrastructure, resources, and user demographics across institutions could limit the generalizability of the results to other contexts within Zambia.

CHAPTER 2: LITERATURE REVIEW

2.1 Overview

This chapter presents a review of the literature. It highlights the uses of portals in HEIs and also looks into library portal characteristics. Further, it will go on to delve more into the literature related to the study's three specific objectives. It will also look at the usability evaluation types and instruments involved in the study.

2.2 Portal Uses in HEIs

A Portal is a vehicle by which a user gains access to driving a broad array of resources (Bente 2023). Most web portals require a user to log in, which allows the site to deliver more specific content and services based on who that user is (Bhaskar, 2020). A web portal is user-centric, i.e., users come to these portals to seek some sort of information or data.

Amid this digital revolution, Getts and Stewart, (2008), stated that libraries, whose purpose is to store and provide access to information, are the most affected. The shift from the physical to the virtual permeates almost any aspect of its operation. There is hardly a single library resource category that has not shifted, to at least some extent, to a digitized, web-based format. Online catalogues, indexes and full-text article databases, encyclopaedias and other reference works, reserve materials as well as information about the library itself (schedules, people contacts, library tutorials, and help screen) are now commonly accessed through library portals.

With the growing importance of digitized, web-based information, the issue of access to information is no longer limited to the physical realm. Just as there are enabling and disabling conditions in the physical environment so are there conditions in cyberspace (particularly the web) that result in the inclusion or exclusion of people. To some extent, the ability to access Web-based information is a question of the proper assistive technology, such as a modified computer keyboard, an enlarged screen display, or a properly configured screen-reading program (Getts and Steward, 2018). Library portals have increased the accessibility of information to users irrespective of distance. HEIs also require dedicated web portals to provide a centralized location for library information, such as the library catalogue, hours of operation, policies, procedures, and electronic resources, such as databases, e-books, and streaming media. This can help users find the information they need quickly and easily.

A dedicated portal can be used as a way of promoting a library in an HEI. A web portal can be used to promote library events, resources, and services. This can help raise awareness of the library and encourage users to take advantage of what it has to offer.

Library Portals in HEIs meet the individual needs of users, which either the system itself can tailor the delivery and presentation of information content or the users themselves can customize the type and format of the information displayed. The library portal is now the standard interface to generate library resources and services through a single access and management point for users (Huvila,2018). A study conducted by Bente (2023) stated that a portal is used when there is a need to create specific user audience experiences and have control over what users see. Multiple systems are also integrated into one visual design.

However, some portals may be difficult to navigate. The way a library's web portal is designed can have a significant impact on how simple it is for visitors to obtain the information they require. It may be challenging to find what you're looking for if the portal is poorly designed, and users may give up and visit another site. A study by Koutropoulos(2014) revealed that some HEI library portals may tend to be outdated. To reflect changes in the library's services and collection, online portals for libraries must be updated often. A portal might become out of date and erroneous if it is not routinely updated (Tewell, 2020). Finding them can be also challenging. Users might not be aware of a library online portal's existence if it is not properly advertised. This may provide a challenge, particularly for visitors who are unfamiliar with the library's website.

2.3 Characteristics of Library Portals

Library Portals are the subset of web portals and serve specific academic research communities.

The library portals need to provide new search and navigation interfaces or unproved ranking and display features for Academic content. Users benefit from a library portal, but they will also benefit from the integration of appropriate resources into their research, learning, and information-use behaviours in more ways.

2.3.1 Information about the Library

According to Dhiru (2014), library portals are supposed to contain components of staff, directories, departmental descriptions, maps of the building, hours, etc.

2.3.2 Electronic Versions of the Traditional Library Services

These include online tutorials, book renewals, interlibrary loan requests and status reports, requests for purchase, online chat references, virtual tours of the building, etc. Also, access to library content- catalogue, indexes, full-text magazines, and journals, digitized special collections, free and commercial eBooks, government documents, freely accessible internet resources, electronic encyclopaedias and dictionaries, and licensed content from vendors.

2.3.3 Single-Search Interface

A Library portal should also be web-based. Portals shall accommodate multiple protocols and formats like Z39.50¹, HTML², SQL³, and MARC⁴ format, and others that could emerge (Dhiru, 2014). The library portal is not a single technology. Rather it is a combination of several systems, standards, and protocols that interoperate to create a unified experience for the user (Tewell, 2015). A single-search interface is an essential component in any portal. It sometimes involves a simultaneous search across multiple electronic sources and the return of results in a consistent library customizable format- but identified by source. It can also be called a Federated search or a Broadcast search. Multiprotocol searching is involved because some resources are Z39.50 conforming, some are HTTP, some are SQL, some are XML and others are still in native mode. Various formats and metadata standards must be supported including Dublin Core⁵, TEI⁶, and XML⁷ (Blummer and Kenton, 2018).

A library portal should be capable of setting search limits such as language or date of publication, sorting results, and eliminating duplicate search results. The library manager determines which features to activate (Boss, 2008). An optional but important part of any single-search tool is the measurement of use. Using measurement helps a library make collection development decisions. It also validates the use of figures submitted by online reference services to which a library subscribes

2.3.4 User Authentication

This determines whether patrons are eligible for service by checking the patrons against a library database. This authentication is usually done with a proxy server to limit access to resources the patron is authorized to use. For example, a library may allow anyone to access its patron catalogue, or it may limit access to subscription databases to only registered patrons (Dhiru, 2014). Although libraries generally do not like to restrict access to information, many database providers require authentication of the patron and the transmission of authorization for access before opening the search engine of the targeted database. Among the most severe

¹ <https://core.ac.uk/download/pdf/11877185.pdf>

² <https://html.com/>

³ <https://www.w3schools.com/sql/>

⁴ <https://www.loc.gov/marc/>

⁵ <https://www.dublincore.org/>

⁶ <https://tei-c.org/>

⁷ https://www.w3schools.com/xml/xml_what_is.asp

restrictions is that the user is in a library, rather than coming into the library's proxy server via the internet

2.3.5 Resource Linking

Resource linking allows a library to seamlessly tie electronic resources together. For example, an index or abstract can be linked to a full-text database, or a local bibliographic record can be linked to a review or an e-book. The link need not be text but can go to an image. Most portal products require a library to create links to electronic sources of information (Blummer and Kenton, 2018). Most portal products require a library to create links to electronic sources of information. An example of an application that facilitates resource linking is an Open URL. It is a syntax to create web-transportable packages of metadata or identifiers about an information object (Dhiru, 2014). It provides a uniform way for users to link directly from bibliographic citations to full-text articles, document delivery services, library catalogue searches, and other potential services for which a URL can be constructed.

A bibliographic record usually does not tell a patron much about a title as stated by Dhiru (2014). Content enhancement overcomes that limitation by providing links to tables of contents, book jacket images, author biographies, and reviews.

A portal provides an easy-to-navigate interface that can be designed to match the look and feel of an organization's existing applications. While most portals are implemented with Web browsers, it is possible to use another client interface such as a GUI (Boss, 2008). The user interface can be personalized using user-profile information to deliver personalized content. Each user can gain a view that is tailored to his or her access privileges. Personalization can be for an individual or a category of individuals.

2.3.6 Content Enhancement

A bibliographic record usually does not tell a patron much about an information resource. Content enhancement overcomes that limitation by providing links to tables of contents, book jacket images, author biographies, and reviews (Dhiru, 2014). Although this enhancement is a specific application of resource linking, it often is regarded as a separate component because the additional content usually is supplied on a subscription basis by a vendor.

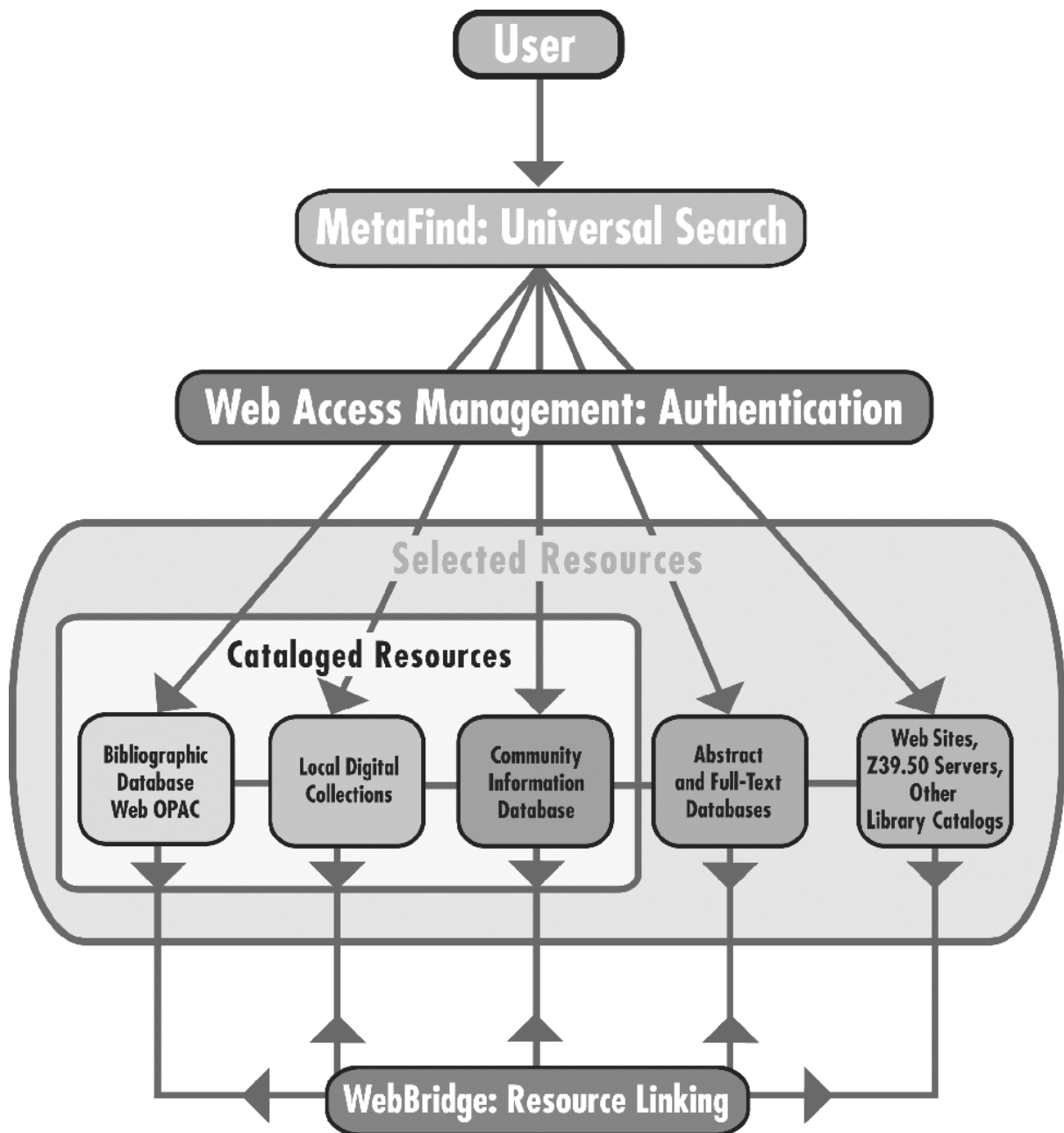


Figure 2: Relationship of the Single Search Interface, Patron Authentication and Resource Linking Components of a Typical Library Portal (Dhiru, 2014)

2.4 Adoption of Library Portals in HEIs in Zambia

Libraries in universities have been undergoing a digital transformation, and the adoption of library portals has become a crucial part of this process. A library portal is a web-based platform that serves as a single point of access to a wide range of library resources, services, and tools. These portals aim to streamline the research process for students, faculty, and researchers by providing a centralized and user-friendly interface. Adoption of Library Portals in Universities" refers to the extent to which higher education institutions in Zambia integrate and utilize digital library portals as part of their academic and information resources infrastructure.

The adoption of library portals and usability evaluation method is a defined procedure that involves a series of activities aimed at gathering usage data regarding the interaction between end users and a software product, as well as how the specific characteristics of the software product contribute to achieving a particular level of usability (Fernandez et al., 2011). The authors Battleson et al. classify usability evaluation methods into two broad categories: empirical methods and inspection methods. Empirical methods can be further categorised into two types: inquiry methods, such as focus groups, interviews, questionnaires, and surveys; and formal usability testing, which involves interacting with a website by performing specific tasks. In Fernández-Marcial and González-Solar's (2019) study, it was discovered that 59% of the papers examined incorporated the adoption of library portals and usability testing methods that involved end-users. These methods included the think-aloud protocol, Question-Asking protocol, performance measurement, log analysis, and remote testing and 43% of the reviewed papers utilised inspection methods, with the most prevalent testing approaches being heuristic evaluation, cognitive walk-through (Albert et al., 2010), perspective-based inspection, and guideline review.

In the library domain, Yan et al. (2008) state that the majority of studies evaluating digital libraries are focused on usability testing. Fry and Rich (2011) found that 85% of libraries had performed usability testing on at least one aspect of their websites. Chowdhury et al. (2006) examined the current level of usability and its influence on digital libraries. Furthermore, multiple scholarly works by Albert and Tullis (2013) have provided recommendations and conducted studies on the usability testing of digital libraries. The choice of suitable research was determined by criteria for inclusion and implementation.

Silvis et al. (2019) surveyed the adoption of digital technologies in South African universities. They found that while the majority of universities had initiated projects to digitize their libraries, the level of implementation varied widely. Factors such as funding, technological expertise, and institutional support were identified as critical determinants of adoption rates. A new service quality model that reflects digital environments was created by the DigiQUAL project, which is part of 7 LibQUAL+ (Kyrillidou and Giersch 2005). These evaluation frameworks are specific to academic libraries and are only capable of evaluating the quality of services. While many efforts have been made to evaluate the usability of digital libraries, there are not many usability evaluation models that specifically target university library websites in Zambia.

2.5 Integration of Key Features or Characteristics into Existing Library Portals in Universities in Zambia

To improve user experience and enhance academic research and learning, university library portals must incorporate crucial features and qualities. Libraries can create more inclusive, user-centric, and productive digital environments for their academic communities by incorporating personalized user profiles, advanced search capabilities, mobile-friendly design, interactive tutorials, virtual reference services, accessibility features, open-access resources, collaborative tools, and usage analytics.

Despite the literature's long-standing association with academic libraries as the central hub of universities and higher learning institutions, students have not fully utilised libraries to their potential. Universities often make multiple efforts to maximise the utilisation of their libraries. Nevertheless, these endeavours have not yet yielded outcomes. A study conducted by Abosede and Ibikunle (2011) at the School of Agriculture of the Lagos State Polytechnic, Ikorodu campus found that university libraries in Nigeria face challenges in delivering a wide range of services to users and catering to their diverse needs, characteristics, and interests. Additionally, the challenges encompass the endeavour of consistently engaging in self-assessment to remain vigilant to the evolving requirements of its users. In addition, library services strive to maintain a harmonious equilibrium between catering to specific research and information requirements and providing a practical assortment of informational resources to support the institution's academic programmes.

A study conducted by Giannopoulou and Tsakonas (2014) found that in Greece, library patrons exhibit a preference for utilising traditional, physical services over electronic such as portals. This is due to a lack of knowledge about electronic services or a lack of integration of these

services into the curricula. Users also exhibit a preference for features that have an immediate impact on their daily interactions. According to their perspective, an ideal library is a welcoming space that promotes reading and collaboration, with approachable and helpful staff, as well as reasonable fees and fines. Library users expressed satisfaction with the behaviour and productivity of the library staff. However, they also believe that there is room for further enhancement to expand their knowledge. Students also believe that the cost of services should be reevaluated and reflect their financial circumstances.

A study by Lungu and Mwamba (2016) investigated the implementation of open-source library management systems (LMS) in Zambian universities. Their research revealed that while LMS platforms offered a wide range of features, the customization and integration of these features into existing library portals were often limited by technical constraints and budgetary considerations. While a large body of literature exists on the factors that influence technology acceptance and information systems success, relatively little research has been done on how these factors affect students' acceptance and use of academic library Web portals.

Ibraheem and Devine (2016) assert that the American academic library is commonly employed. A significant proportion of the students utilise the library regularly, with nearly one-fifth accessing it virtually every day. While library resources are widely acknowledged, a small yet significant number of students admitted to being unfamiliar with at least one fundamental service, such as borrowing print books or accessing electronic books and databases.

Kim and Shumaker (2015) contend that there is a lack of research examining the correlation between students' changing perceptions of library services and systems and their actual usage. Therefore, it is essential to comprehend how students' perceptions of usability and even small modifications in this aspect may be altering the utilisation of the library portal. Students in different institutions encounter diverse challenges when it comes to utilising the library. Due to a strong rationale, it is crucial to examine the students' views on the usability of the library portal at Tshwane University of Technology, Polokwane Campus (TUT, PC). Usability, in the context of this research, encompasses the typical usage of the library, motivations for using it, the ease of using it, and the circumstances in which students are more likely to utilise the portal.

Therefore, the way students view the library's ease of use can assist libraries in improving and adapting to meet the needs and usage patterns of students (Datig 2014). Additionally, the insights of students can assist libraries in developing effective strategies to enhance students' utilisation of the library and foster their independence as library users. This study aims to

examine the opinions of students regarding the usability of the library in South Africa. Currently, there is a lack of literature that explores the perceptions of South African students in this regard. Therefore, it is crucial to examine students' perspectives on the usability of the library. The investigation takes place at the Tshwane University of Technology, Polokwane Campus (TUT, PC).

A study by Masrek and Gaskin (2016), revealed that in terms of information quality assessment, respondents had indicated that the library portal met their expectations. All the information quality attributes, namely completeness, comprehensiveness, accuracy, timeliness, reliability and appropriateness of format were rated highly by users. Equally important to information quality are systems quality and service quality. When asked to evaluate the systems quality aspect of the library portal, respondents also rated it highly. However, little is known about the evaluation of portal attributes in *Zambian university libraries*.

2.6 Users' Perceived Usability of University Library Portals

A study by Jeng (2008) focused on assessing users' perceived usability of library portals in universities. Their findings indicated that while users appreciated the convenience of online access to resources, they often encountered challenges related to navigation, search functionality, and interface design. These usability issues were found to impact user satisfaction and ultimately hindered the effectiveness of library portals in supporting academic endeavours. The ability of users to navigate and comprehend a website to accomplish their objectives is the main focus of usability. It also alludes to user satisfaction levels with that particular website. The Jisc programme of 2011 on the usability of user interfaces in research tools and library resources states that usability is about usability, a well-designed website facilitates the user's ability to accomplish tasks quickly, efficiently, and error-free. This user experience also takes into account the user's desire, joy, meaning, reflection, value, and frustration when attempting to retrieve necessary information from the website. The main subjects or information categories are usually represented by information retrieval menus. A variety of organisational styles can be used to arrange information, including mirroring the formal structure of an organisation, reflecting the site's functional use, offering pathways based on user interest and need, reflecting a chronological sequence, revealing the frequency of use, or displaying a geographical orientation.

In a user study of nine e-commerce sites, Spool (1998) discovered that while graphic design elements may have a significant visual impact and marketing effect, there was no positive or negative correlation between them and a user's ability to find information on the website. They

went on to say that, in their experience, the user's ability to navigate the website efficiently was more important based on regular use. According to Scully (2002), a website's structure should be dynamic and supported by interactive elements that make it simple for users to access library databases and retrieve information. The websites of libraries ought to offer multiple ways for users to access the same server or retrieve information. To know which pages are linked and how, the design is planned by creating a diagram of the website (Jorgensen, 2001). It is important to remember that for optimal use, websites should consist of a collection of web pages connected logically.

According to Forrester Research, (Harley et. al. 1998) 40% of users who do not find what they are looking for will not return to a website because of their negative initial experience, and poorly designed websites can lose up to 50% of potential users.

Several writers have offered their opinions on the usability standards for assessing library websites. Studies on assessing the usability of websites, including libraries, also exist. Usability, according to Jorgensen (2001), is the most important component of websites since it is largely dependent on the opinions of the individual user regarding the system being used. Usability, defined as the degree to which a product can be used by specific users to achieve specific goals with effectiveness, efficiency, and satisfaction in a specific context of use, is the basis for the information architecture website's provision of the necessary information that is expected to be found on the website of an academic library. It may also be described as a feature that pertains to how user-friendly a product is. In particular, it pertains to how quickly people pick up new skills, how effective they are when using something, how memorable it is, how prone to errors it is, and how much the user enjoys using it. A feature may as well not exist if users are unable to use it or choose not to (Lazar, 2006). Liu et al (2021) state that assessing a website's quality entails figuring out how well it satisfies the needs of specific library patrons.

Stover and Zink (1996) employed ten criteria, such as the number of links on the home page, the number of typographical errors on a page, and the site's purpose—based on the supposition that librarians would offer excellent models of well-organized websites—to assess forty randomly chosen university and college libraries' websites in the United States and Canada. Interestingly, information architecture was not specifically covered by any of the criteria. Because usability is comprised of many constructs from different angles, researchers from different fields have identified distinct characteristics of usability measures. Four

characteristics of usability—usefulness, effectiveness, learnability, and attitude—were proposed by Ramanayanka et al (2017). Five attributes proposed by Nielsen's (1993) model are the most cited in the field of usability engineering: learnability, efficiency, memorability, low error rate (easy error recovery), and subjective satisfaction. Functionally correct, efficient to use, easy to learn and remember, error tolerant, and subjectively pleasing are among the usability constructs identified by Brinck, Gergle, and Wood (2002). Efficiency, helpfulness, and adaptability were proposed as usability criteria by Oulanov and Pajarillo (2002). Lee (2004), adopted usability criteria that included usefulness, effectiveness, satisfaction, supportiveness, and intuitiveness.

The three primary constructs of effectiveness, efficiency, and satisfaction are the foundation upon which the International Organisation for Standardisation (ISO) bases its assessment of usability. These three constructs have been recognised by ISO as an international standard and are referred to as ISO9241-11. The Jeng (2006) usability model, which is frequently cited in the assessment of the usability of library websites, includes four usability constructs: effectiveness, efficiency, satisfaction, and ease of use. Six constructs are taken into account in Bevan's (2016) comprehensive framework, which offers a general research framework for corporate information systems assessment. Over the years, this framework or model has been explored, altered, and expanded in the literature relating to the requirements for website usability. According to Alexander and Tate (1999), five primary factors determine how useful a website is: coverage of websites, accuracy, authority, objectivity, and currency. Pant (2015) used the usability constructs of usefulness, efficiency, effectiveness, learnability, and accessibility to evaluate the usability of websites for academic libraries. Three usability constructs are covered by the Joo et al (2011) usability evaluation model measurement instrument: effectiveness, efficiency, and learnability.

According to a study conducted by McMullen (2001) on usability testing for a library website redesign project, users are bewildered and overwhelmed by the initial interface and find too many resource options available on the first screen without any explanation of how to use them. Furthermore, there is a lack of clarity in the terminology used. When looking for periodical articles, for instance, users do not consider links to online databases and indexes to be the best resources. He came to the conclusion that there is no differentiation made between experienced and inexperienced users, nor is assistance offered beneficially. Some website issues, such as the back button on the website for library architecture and design and the links to the Lund University publications repository, were simple to fix, according to a case study conducted by

Persson, Langh, and Nilsson (2010) on usability testing and redesign of library web pages at Lund University. It is nearly impossible for libraries to have a search box aimed at the library services, which is unfortunate since this is a request that students make time and time again. However, part of the navigation issues on the websites are caused by the fact that all the libraries have to deal with the overall style sheets of the university's website, with predetermined sizes and colours of fonts, bars, and frames including search this site box.

A usability study conducted by Azadbakht, Blair, and Jones at the University of Southern Mississippi examined the variations in the use of library websites among different user groups, including undergraduate students, graduate students, faculty members, and library employees. The objective was to identify specific areas of the website that required redesign to better cater to the needs of these users (Jones et al., 2017). This necessitated the implementation of a usability test due to the diverse nationalities of our users. Consequently, the study aimed to investigate the variations among our users in their utilisation of the website. The Florida International University Libraries as asserted by Hammill (2003) conducted a usability test on three specific groups: 26 undergraduates, 14 graduate students, and 5 faculty members. The purpose was to assess the usability of the top page of their website. Based on the results, they made the required modifications to enhance user experience.

Similarly, a survey conducted by Achugbue et al (2023) investigated user satisfaction with library portals in Nigerian universities. Their study revealed mixed perceptions among users, with some expressing frustration over usability issues while others appreciated the convenience of digital access. The study underscored the need for continuous improvement and user feedback mechanisms to enhance the usability of library portals.

2.7 Usability Evaluation Types

The best usability evaluation method for a particular project will depend on the specific goals of the evaluation, the resources available, and the target audience. There are three main usability evaluation types. The first one is the inspection method; this involves experts evaluating the usability of a product or system based on a set of usability heuristics or principles. Heuristic evaluations are a quick and inexpensive way to get an overview of the usability of a product or system (Muhammad, 2022), however, it is important to note that heuristic evaluations are subjective and can be biased by the experience of the evaluators.

The second type is user testing according to Hasan, Morris, and Steve, (2012) This method involves users performing tasks using the product or system while being observed by a researcher. User testing is a more in-depth way to evaluate usability, but it can be more time-consuming and expensive. User testing can be very helpful in identifying specific usability problems, but it is not always possible to generalize the results to a wider population.

The final method is called the inquiry method. It involves users providing feedback about their experience using the product or system. Surveys, focus groups, and card sorting are all examples of inquiry methods (Gupta, Ahlawat and Sagar, 2014). Inquiry methods can be a quick and easy way to collect feedback from many users. However, surveys can be difficult to design and interpret, and they may not provide enough detail about specific usability problems. Focus groups can help get feedback from a diverse group of users. However, focus groups can be time-consuming and expensive, and it can be difficult to control the discussion. Card sorting is a quick and easy way to understand how users think about the content of a product or system. However, card sorting does not provide any information about how users interact with the product or system.

The study adopted the inspection method for objective two with the use of the heuristic evaluation because a group of experts were selected to evaluate the portals because they have experience and knowledge in Library and Information Science. The other evaluation type adopted was the inquiry method because questionnaires were administered to provide feedback on the portals. It was used because it was a quick and easy way to collect feedback.

2.8 Usability Evaluation Instruments

Usability evaluation instruments are tools and methods used to assess the usability of products, websites, software applications, or any other user interfaces. These instruments help designers and developers identify usability issues, gather user feedback, and make informed improvements. There are several usability evaluation instruments and techniques available, and choosing the right one depends on your specific goals, resources, and constraints. The SUS consists of ten ten-item questionnaires with five response actions from strongly agree to strongly disagree⁸. Another example of a usability evaluation instrument is the Standardized Universal Percentile Rank Questionnaire (SUPR-Q) which consists of 8 items that measure the four essential items used for making a website successful. The evaluators use the result to

⁸ <https://www.usability.gov/how-to-and-tools/methods/system-usability-scale.html>

identify any usability problems, collect quantitative data on participants' performance (error rate, time on task, etc.), and determine whether the product or website can fulfil user satisfaction or not.

The Post Study System Usability Questionnaire (PSSUQ) and the Computer System Usability Questionnaire (CSUQ)⁹. The two questionnaires are very similar. Both have 16 items and use the same response scale. The main difference is in the tense of the items. The PSSUQ wording is appropriate for use at the end of a standard task-based usability study and the items are phrased in the past tense to reference the just completed tasks (e.g., I was able to use this system). In contrast, the CSUQ wording is appropriate for surveys and field research and the items are worded in the present tense (e.g., It is simple to use the system).

The Single Ease Question (SEQ) is another evaluation instrument¹⁰. It is a single-item questionnaire that asks users to rate the overall ease of use of a product or system on a scale from very difficult to very easy. It provides 7 quick and straightforward items as an assessment of usability.

The study adopted the use of the SUS for its usability testing. The SUS was used because it is quick and easy to administer and can be completed in a few minutes. This makes it a convenient tool for usability testing, especially when you need to gather feedback from many users. It has also been shown to be a reliable and valid measure of usability. This means that it can be used to consistently measure the usability of different products and systems (Kortum et al. 2021). It applies to a wide range of products and systems and is a free tool to use.

2.9 Summary of the Literature Review

This chapter attempted to review the literature in themes. It attempted to show the use of portals in HEIs which mainly was to store and provide access to information and it discussed the various characteristics of library portals which included resource linking, content enhancement etc and went on to look at the adoption of library portals in HEIs and gave examples of studies indicating the adoption of library portals. It further discussed the integration of key features or characteristics into existing library portals in universities in Zambia and stated that one of the

⁹ <https://measuringu.com/pssuq/>

¹⁰ <https://measuringu.com/seq10/>

important reasons for the integration is to improve user experience and enhance academic research. Users' perception of the usability of university library portals reviewed various studies and listed common usability measurement instruments such as effectiveness learnability and efficiency. A further review of the literature explored the usability evaluation types and the usability evaluation instrument used in the study.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Overview

This chapter outlines the methodology employed in conducting a usability evaluation of adopted higher education institution library portals in Zambia. The methodology encompasses the research design, data collection methods, participant selection criteria, and data analysis techniques utilized in this study.

3.2 Research Design

A research design is a broad plan of how a study will be conducted. This design starts with qualitative data collection and analysis, followed by quantitative data collection and analysis. The qualitative phase helps in understanding the research problem and generating hypotheses, which are then tested using quantitative methods (Cresswell, 2014). This design is useful when little is known about the research area and a preliminary understanding is needed before conducting quantitative research.

The study used a mixed-method approach which involved combining qualitative and quantitative research methods. By integrating qualitative and quantitative methods, researchers gain a more comprehensive understanding of a research topic (Cresswell, 2014). Quantitative research allows for the understanding of relationships between variables. A variable will be a characteristic, value, attribute, or behaviour that is of interest.

3.3 Target Population

The target population was 62 registered universities¹¹ registered under the HEA in Zambia. This involved carrying out a census to investigate to what extent universities in Zambia have adopted library portals. A list was compiled together with their email addresses (see Appendix A). Once these emails were sent to these contacts, there was a request for them to be transferred to their respective librarians to respond to the questionnaires. This was conducted to obtain Uniform Resource Locators (URL) and get an accurate number of universities that have websites (see Appendix B for the questionnaire).

¹¹ <https://heaims.heg.org.zm/frontend/web/site/institutions>

3.4 Sample Size

The sample for objective two was the University of Zambia master's in library and information Science cohorts that were in their research (final) level. The students' email addresses were obtained from the Master' Coordinator and an introductory email was sent out to them to enquire if they had basic knowledge and experience in academic libraries and library portals. This objective was achieved by carrying out a heuristic evaluation with the evaluators or experts being librarians. According to Nielson (2012), 3 to 5 participants are appropriate for a heuristic evaluation as a type of usability testing because as more users are added less and less will be learned because the tester will keep seeing the same things again and again. There was no real need to keep observing the same thing multiple times when there was already motivation to go back to the drawing board and redesign the site to eliminate the usability problems. The participants were required to inspect their portals whilst answering the questions for the heuristic evaluation to have been considered viable and accurate. Therefore, 20 participants (experts) were selected with 5 experts evaluating each university portal.

The target population for objective 3 were students and lecturers from Mulungushi University, ZCAS University and UNZA. According to Cochran (1977), when the population size is infinite sample size is calculated as follows:

$$n = \frac{z^2 pq}{d^2}$$

n= desired sample size

z=standard normal deviation at the required confidence level. In this study, the confidence level was 1.96 which corresponds to a 95% confidence level.

p= the proportion in the target population estimated to have the characteristics being measured (since there was no reasonable estimate, this study used 50% (i.e. $0.5q = 1-p$ (proportion in the target population not having the characteristics)). The one used was 0.5

d=level of statistical significance set (degree of accuracy required is usually set at 0.05)

The actual sample size calculation was.

$$n = \frac{(1.96)^2 (0.5)(0.5)}{(0.05)^2} = 384$$

The results obtained from the data collection in Objective 1 gave an accurate number of universities that had implemented library portals which was then divided into 384 to get an equal number of representatives for all 3 universities. Therefore, each university was allocated

128 questionnaires. 108 questionnaires were for the students and 20 for lecturers at each university. See Appendix G and H for student and lecturer SUS questionnaires.

The lists of lecturers were obtained from the student administration offices and respective websites. Online questionnaires were sent to all the lecturers to increase the usability testing and have a broader scope of results.

3.5 Sampling Procedure

Purposive sampling was used to select participants to be sampled for objective two. This sampling procedure was used because the participants had knowledge relating to the research problem.

Convenience sampling was used in the third objective. This was used because respondents were chosen based on their convenience and availability.

3.6 Data Collection Instruments

An online questionnaire was used as a measurement instrument for objective one (see Appendix B). It was sent to all 62 contacts. The questionnaire was administered online using the Google Forms software.¹²

Data were collected electronically using online questionnaires for objective two (see Appendix C). This questionnaire was developed from the characteristics of library portals¹³ as stated in the literature. These characteristics were used as heuristics for the evaluation exercise.

Data was collected online through questionnaires generated from the SUS for objective three (see Appendix D).

3.7 Data Collection Procedures

After the questionnaires relating to objective one had been administered and returned, a preliminary heuristic evaluation was conducted by the researcher to verify if the links provided were real. The heuristic evaluation involved the researcher surveying each portal and verifying if the characteristics of library portals are present on the provided links. A checklist that comprised the characteristics of library portals was used for the exercise. This checklist was created from existing literature.

¹² <https://docs.google.com/forms/d/1h-QEL6HxcXsMGRU6KIEC3I9qJQngV9IMHtr3tkTkjpM/edit>

¹³ <https://alair.ala.org/bitstream/handle/11213/18997/Library%20Web%20Portals.pdf?sequence=1>

Checklist

- i. Using a web browser go to the URL provided.
- ii. Look for the library link that should direct to a library page.
- iii. Browse the page and see if interactive services such as forums, blogs, tagging, and information sharing are present.
- iv. Browse the page and check for the availability of traditional library services such as online tutorials, book renewals, library catalogues, full-text journals and digitized special collections, and free and commercial eBooks.

An expert usability method in the form of a heuristic evaluation was then conducted. Heuristic evaluation involves having a small set of experts examine the interface and judge its compliance with recognized usability principles. It involved the experts undergoing a practical exercise (tasks) on their respective portals as they answered the checklist provided (Nielson, 2006). Each question in the questionnaire required the respondent to give a rating on a five-point Likert scale and a brief explanation for their answer. The checklist was arrived at by using the principles used in the creation of portals as derived from literature.

Table 2: Portal Aspect and Description

Portal Aspect	Description
Federated searching	multiple or simultaneous searches across multiple electronic sources that are present on the library portal and then return results in a consistent library customizable format, for example, a search query should be able to search through all the databases that are present on the portal and return in a usable format (Blummer and Kenton, 2018).
Interactive services	library web portals can provide interactive services like forums, blogs, tagging, and sharing information (Boss, 2008).
User authentication	users may be categorized as patron and administrative users. Patron authentication determines whether patrons are authorized for service or not via the use of usernames and passwords (Dhiru, 2014).
Resource linking	allows a library portal system to seamlessly integrate with electronic resources. For example, an author could be linked to his/her

	book, or a record could be linked to an image (Blummer and Kenton, 2018).
Information about the Library	components of information on staff, directories, departmental descriptions, maps of the building, opening hours, contact information, etc. (Dhiru, 2014).
The electronic version of traditional library services	services such as online tutorials, book renewals, interlibrary loan requests and status reports, requests for purchase, online chat reference, virtual tours of the building, access to library content- catalogue, indexes, full-text magazines, and journals, digitized special collections, free and commercial e-books (Dhiru, 2014).

As the heuristic evaluation was carried out, an exemplar portal was selected as a comparison to the 3 adopted by the Zambian universities. This exemplar was the Stellenbosch University library portal and was also evaluated in the heuristic evaluation. Stellenbosch University was used because it is ranked third highest in Africa on the list of the best universities¹⁴ and it had fewer non-member user restrictions on its portal as compared to the University of Cape Town and the University of Witwaterands which ranked first and second respectively.

The results obtained from the data collection in Objective 1 gave an accurate number of universities that had implemented library portals which was then divided into 384 to get an equal number of representatives for all 3 universities. Therefore, each university was allocated 128 questionnaires. 108 questionnaires were for the students and 20 for lecturers at each university. See Appendix G and H for student and lecturer SUS questionnaires respectively. More students were allocated the questionnaires because they used the portals more for research purposes and there are more students than lecturers at each of the universities.

¹⁴ <https://www.usnews.com/education/best-global-universities/africa>

3.8 Data Analysis

The data was analysed by reviewing the answered questionnaires of the heuristic evaluation and verifying each URL to confirm if they were functioning and if there was any presence of a library link.

Descriptive statistics were employed to analyse the data for objective two. SPSS was the tool employed in the analysis of the data. Averages were calculated for each portal. The averages were rated on the severity scale provided ranging from 1 for cosmetic, 2- for minor, 3- for medium, 4-major and 5- for catastrophic.

The quantitative data were collected using online questionnaires that were generated from the SUS. The average SUS scores were arrived at by converting SUS responses to numbers, 1 for “Strongly Disagree”, and 5 for “Strongly Agree”. For odd-numbered questions, 1 was subtracted from the response. For even-numbered questions, 5 was subtracted from the response. The scores were added from each question and the total was multiplied by 2.5. The SUS score interpretation was through the net promoter scores, acceptable scales adjective ratings and grade scales.

SPSS was the tool used to analyse the data. Hypothesis testing was conducted. The null and alternative hypotheses were formulated and tested. This was conducted to serve as a proposed explanation or prediction for the influence of demographic factors on the average SUS scores. Non-parametric and parametric statistical tests were used to achieve this.

3.9 Ethical Considerations

The research stuck and adhered to all research ethics. All sources of literature were acknowledged and cited using the Harvard reference style. All data collected from the respondents were treated with the utmost confidentiality during the analysis of the feedback. All respondents had their anonymity respected. Permission and consent were sought from would-be respondents before they began to participate by providing them with Information and Consent forms. Participants had the right to withdraw partially or completely from the process if they felt the need to do so. Respondents who did not wish to answer a question were free to leave it and go to the next question. Participants were also assured that the data collected would be securely stored.

Approval from the UNZA Humanities and Social Sciences Research and Ethics Committee (HSSREC)¹⁵ was given for the study under reference code HSSREC-2020-JUL-031 see Appendix I for the letter of approval.

3.10 Summary of the Chapter

The chapter outlined the process and techniques used to conduct the research. It provided an overview of the research design adopted by the study which was a survey design. The target population was the 62 registered universities under the HEA with a sample size of 20 respondents that were in their research level in the MLIS program for objective two whilst for objective three the sample size was 384. Objective two involved purposive sampling with convenient sampling being performed for objective three. Data was collected online using questionnaires and the data collection procedure involved a heuristic evaluation and the use of the SUS. The data was analysed using the SPSS. Descriptive statistics were employed and hypothesis testing was also conducted. Ethical considerations were also adhered to.

¹⁵ <https://graduate.unza.zm/>

CHAPTER 4: RESULTS

4.1 Overview

This chapter presents the findings of the study, which aimed to assess the usability of adopted university library portals in Zambia. The study was guided by the following research questions: To what extent have universities in Zambia adopted library portals? This research question involved determining the number of university libraries that had embraced the use of library portals as a means of knowledge delivery. The second research question was: What key features or characteristics have been integrated into existing library portals? This research question focused on identifying whether the portals have basic functions and possess traits and characteristics that users seek, as mentioned in various literature. The last research question was: What were the users' perceptions of the usability of universities' library portals? The goal of this research question was to understand users' perceptions of these portals. The study utilized the System Usability Scale (SUS) to measure usability (Thomas, 2020), as it is considered one of the most efficient ways to gather statistically valid data and provide a website with a clear and reasonably precise score.

4.2 Adoption of Library Portals in Zambian Universities

The first research question involved finding out how many university libraries have adopted portals. A list of HEIs was compiled from the HEA website. This list comprised a total of 62 universities (both private and public) in Zambia.

From the 62 contacts obtained, only 28 contacts were reachable when contacted via email and telephone. Emails were sent to these contacts. These responded and provided their URLs and stated they had websites. The 34 unreachable contacts were searched for on the internet and findings showed that they either had no websites or had no library links on their websites.

Table 3: List of Universities and URLs

No.	Higher Education Institution	Website
1.	African Christian University	https://acu-usa.com/
2.	African Open University	http://ao.university/site/
3.	Africa Research University	https://aru-online.com/
4.	Ambassador International University	https://www.aiuzambia.com/
5.	Bethel University	https://www.betheluniversitymungu.org/
6.	Blessings University of Excellence	https://www.betheluniversitymungu.org/

7.	Brook Besor University	No website
8.	Cavendish University	https://www.cavendishza.org/
9.	Chalimbana University	https://www.chau.ac.zm/
10.	Copperbelt University	https://www.cbu.ac.zm/
11.	Eden University	https://www.edenuniversity.edu.zm/
12.	Evangelical University	https://www.evangelicaluniversity.ac.zm/
13.	Harvest University	No website
14.	Justo Mwale University	https://justomwale.net/
15.	Kwame Nkrumah University	https://www.nkrumah.edu.zm/home/
16.	Livingstone International University	https://liutebmuniversity.org/
17.	Mukuba University	https://mukuba.edu.zm/
18.	Mulungushi University	https://www.mu.ac.zm/
19.	Northrise University	https://www.northriseuniversity.com/
20.	Rockview University	http://www.rockview.edu.zm/
21.	Rusangu University	https://ru.edu.zm/
22.	Texila University	https://zm.tauedu.org/
23.	UNICAF University	https://unicafuniversity.ac.zm/
24.	University of Africa	https://www.keystoneuo.com/
25.	University of Lusaka	https://www.unilus.ac.zm/
26.	University of Zambia	https://www.unza.zm
27.	Zambia Open University	https://zaou.ac.zm/
28.	ZCAS University	https://www.zcas.ac.zm/

Table 3 above shows the 28 universities that responded to the email. The universities are listed in alphabetical order together with their URLs and those that had no websites indicated so.

The list obtained from the HEA website proved that the remaining 34 universities had no websites. The Researcher took an exercise to individually check this list and its URL, and it was proved that the websites were either non-existent or out of service.

A preliminary heuristic evaluation was carried out on the 26 responses as two of them indicated that they did not have any websites. The results of the evaluation revealed that only three universities in Zambia had library portals. These were ZCAS University, Mulungushi University, and the UNZA, as shown in Table 4.

Table 4:List of Universities that have adopted Library Portals

University	Portal URL
Mulungushi University	https://www.mu.ac.zm/index.php/library
University of Zambia	https://www.unza.zm/library
ZCAS University	https://zcas.ac.zm/zcaslibrary/

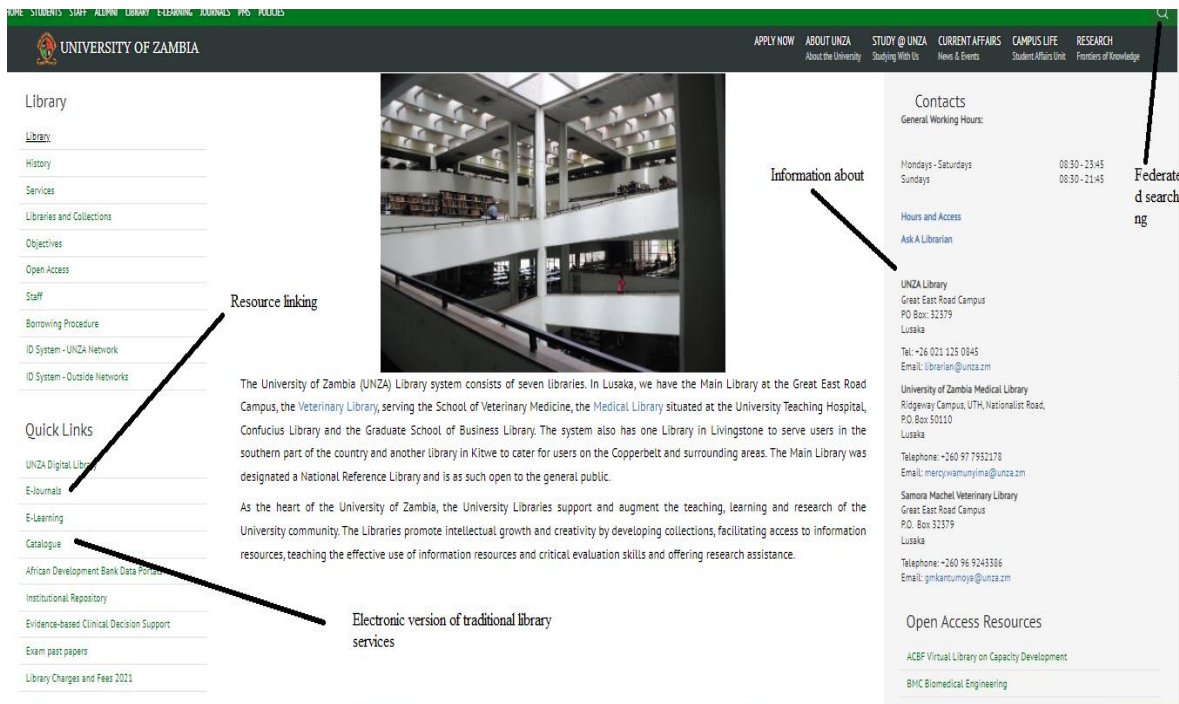


Figure 3: Screenshot of UNZA Library Portal

Figure 3 shows a screenshot of the UNZA library portal with characteristics of the portals that it possesses. These are resource linking, electronic versions of traditional library services, information about and federated searching.

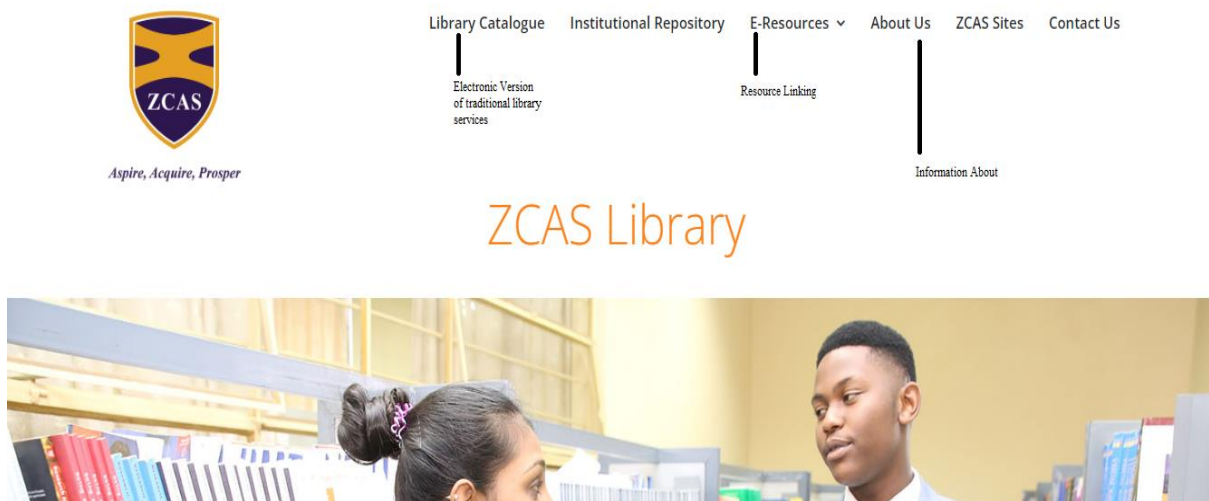


Figure 4: Screenshot of ZCAS University Library Portal

Figure 4 shows a screenshot of the ZCAS University library portal. This portal has an electronic version of traditional library services, resource linking and information about the library characteristics.

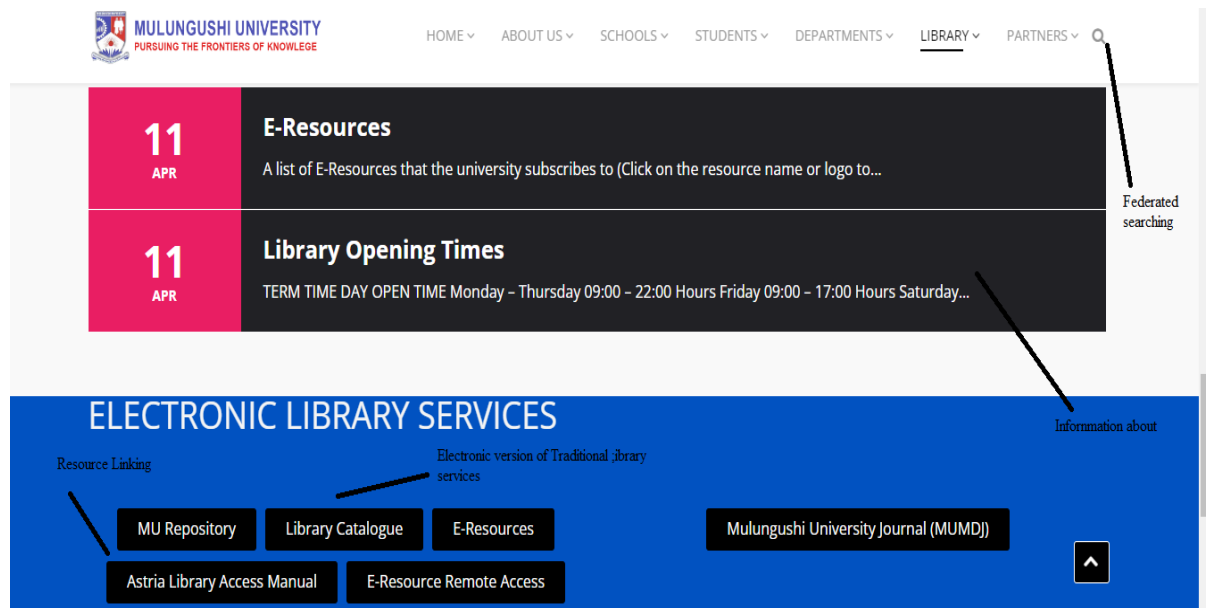


Figure 5: Screenshot of Mulungushi University Library Portal

Figure 5 illustrates the characteristics of the Mulungushi University portal. These characteristics are resource linking, electronic versions of traditional library services, and information about the library.

4.3 Demographic Characteristics of the Respondents

The distribution in the years of experience in librarianship among the respondents for research question two was as follows; six had 0-5 years of experience, two had 6-10 years of experience, two had 10-15 years of experience, and two had over 15 years of experience. All of the respondents indicated that they have an undergraduate qualification in Library and Information Science as indicated in Table 5 below.

Table 5: Demographic Characteristics of Respondents

Variable	Values	Frequency	Percentage (%)
Employment status	Yes	8	67
	No	4	33
Work experience (years)	0-5	6	50
	6-10	2	16.7
	11-15	2	16.7
	16+	2	16.7

Undergraduate degree	Yes	12	100
	No	0	0

Research question three which was related to objective three involved the administering of questionnaires at the three universities that have implemented library portals in Zambia, with the target sample being lecturers and students. A total of 384 questionnaires were administered. Each institution was allocated 128 questionnaires.

A total of 20 lecturers from all three universities responded to the questionnaires from a combined 60 questionnaires that were administered at all 3 universities (20 questionnaires for each university). Table 6 represents the lecturer demographics at each university. Out of the 9 respondents at UNZA, 8 were male whilst 1 was female. Three indicated that they were from the Directorate of Research and Postgraduate Studies, 2 were from the School of Information and Communication Technologies 2 each were from the Graduate School of Business and School of Veterinary respectively. Concerning the highest level of qualification, 7 had Master’s degrees and 2 had attained their PhDs. Four indicated that they have been lecturers between 5-10 years, 2 indicated that they have lectured between 10-15 years and 3 had been lecturing for over 15 years. At ZCAS University, 4 of the respondents were male whilst 2 were female. Two were from the School of Information and Communication Technologies and 4 were from the Graduate School of Business. Concerning the highest level of qualification, 3 had Masters’ degrees and 3 had attained their PhD’s. One indicated that they have been a lecturer between 0-5 years, another indicated that they have lectured between 5-10 years, 2 had been lecturing for 10-15years and another 2 for over 15 years. At Mulungushi University, the 5 respondents were all male. Two indicated that they were from the Directorate of Research and Postgraduate Studies whilst 3 were from the School of Information and Communication Technologies. Concerning the highest level of qualification, 4 had Masters’ degrees and 1 had attained their PhD. Two indicated that they have been lecturers between 5-10 years, 2 indicated that they have lectured between 10-15 years and 1 had been lecturing for over 15 years.

Table 6: Lecturer Demographic Characteristics

Variable	Values (Frequency)	UNZA (n=9)	ZCAS (n=6)	University	Mulungushi (n=5)
Gender	Male	8	4		5
	Female	1	2		0

Faculty	Directorate of Research and Postgraduate Studies	3	0	2
	School of Information and Communication Technologies	2	2	3
	Veterinary	2	0	0
	Graduate School of Business	2	4	0
Highest qualification attained	Masters	7	3	4
	PhD	2	3	1
Years of being a lecturer	0-5 years	0	1	0
	5-10 years	4	1	2
	10-15 years	2	2	2
	Over 15 years	3	2	1

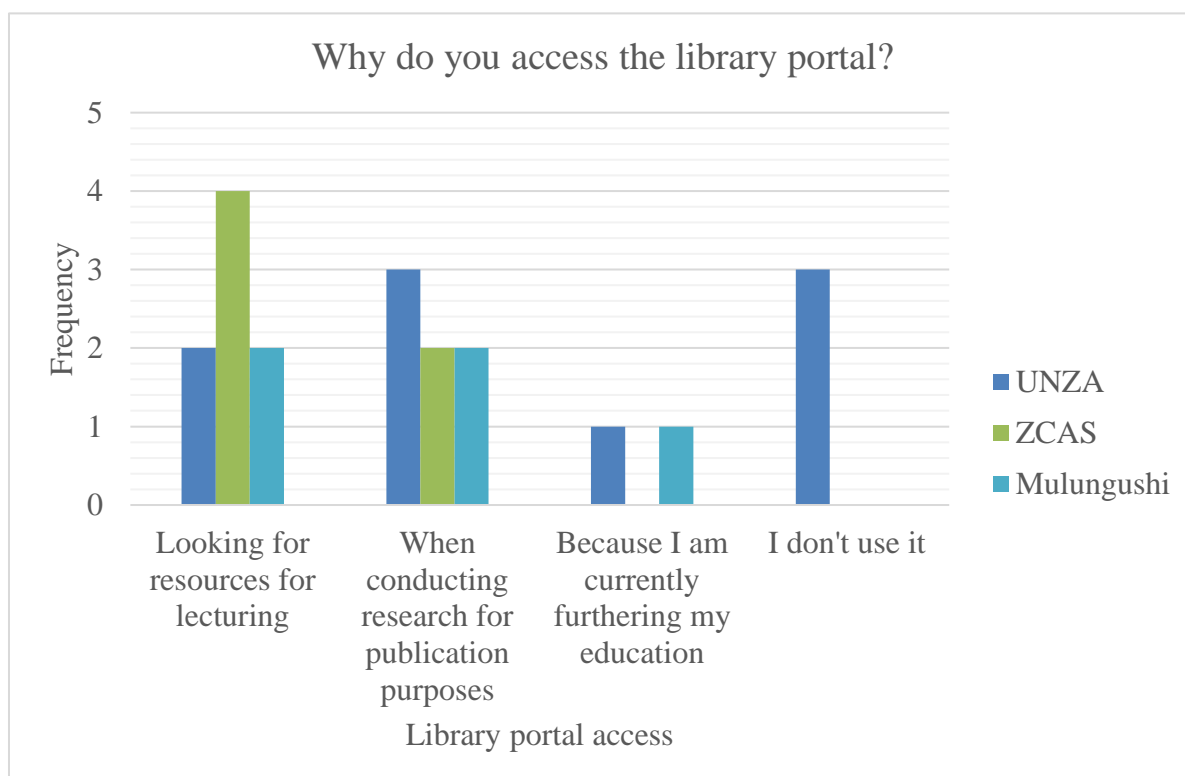


Figure 6: Reasons for Accessing the Library Portal

Of the 9 respondents at the UNZA, 2 stated that they accessed the portal when looking for resources for lecturing while 3 stated that they used the portal when conducting research for publication purposes. One stated that they use it because they were furthering their studies and 3 stated that they do not use it at all.

Of the 6 respondents at ZCAS, four stated that they used the portal when looking for resources for lecturing and 2 used it when conducting research for publication purposes.

At Mulungushi University, 5 questionnaires were answered. Two of these respondents used the portal when looking for resources for lecturing while another 2 used the portal when conducting research for publication purposes and one used it because they were furthering their education.

The response rate amongst the lecturers was low as they did not respond to the questionnaires. This could have been due to factors such as timing and the method of distribution (email).

A total of 120 students responded to the questionnaires at Mulungushi University while at the UNZA 124 students gave feedback, and at ZCAS University 62 students responded to the questionnaires. The response rate at ZCAS University was low due to factors such as timing and the method of distribution (email). Out of the 304 students that responded to the study at all the 3 universities, 48% of these were female while 52% were male. Of the 304 respondents, 88% were enrolled in undergraduate programs while 12% were enrolled in postgraduate programs. 52% of the students were in their third and fourth years of study. 2% of the students were between their fifth the seventh years and 46% of them were in their first or second year of study (see Table 7 below).

Table 7: Student Demographic Characteristics

		UNZA (n=123)		ZCAS (n=62)		MULUNGUSH (n=119)		Total (N=304)	
		Freq.	%	Freq	%	Freq.	%	Freq.	%
Gender	Male	63	51%	40	65%	54	45%	157	52%
	Female	60	49%	22	35%	65	55%	147	48%
Year of Study	First - second year	88	72%	28	45%	23	19%	139	46%

	Third - fourth	32	26%	32	52%	95	80%	159	52%
	Fifth - seventh	3	2%	2	3%	1	1%	6	2%
Program enrolled	Undergraduate	115	93%	49	79%	105	88%	269	88%
	Postgraduate	8	7%	13	21%	14	12%	35	12%

Of the 304 students, 44% were from the School of Business, 32% were from the School of Social Sciences and 24% were from the STEM (see Table 8).

Table 8: Discipline of Study

		UNZA (n=123)		ZCAS (n=62)		MULUNGUSH (n=119)		Total (n=304)	
		Freq.	%	Freq.	%	Freq.	%	Freq.	%
Discipline of study	STEM	30	24%	6	10%	37	31%	73	24%
	Social sciences	69	56%	21	34%	8	7%	98	32%
	Business	24	20%	35	56%	74	62%	133	44%

4.4 Investigation of Characteristics or Features Used in the Adoption of University Library Portals

Objective two involved conducting a heuristic evaluation to investigate the features or characteristics implored in the adoption of the university library portals. The three universities (ZCAS University, UNZA, and Mulungushi University) were evaluated together with the exemplar Stellenbosch University portal. Stellenbosch University¹⁶ was used as an exemplar portal because after an evaluation was conducted by the researcher it possessed all the characteristics of library portals mentioned in the literature.

¹⁶ <https://library.sun.ac.za/en-za/Pages/Home.aspx>

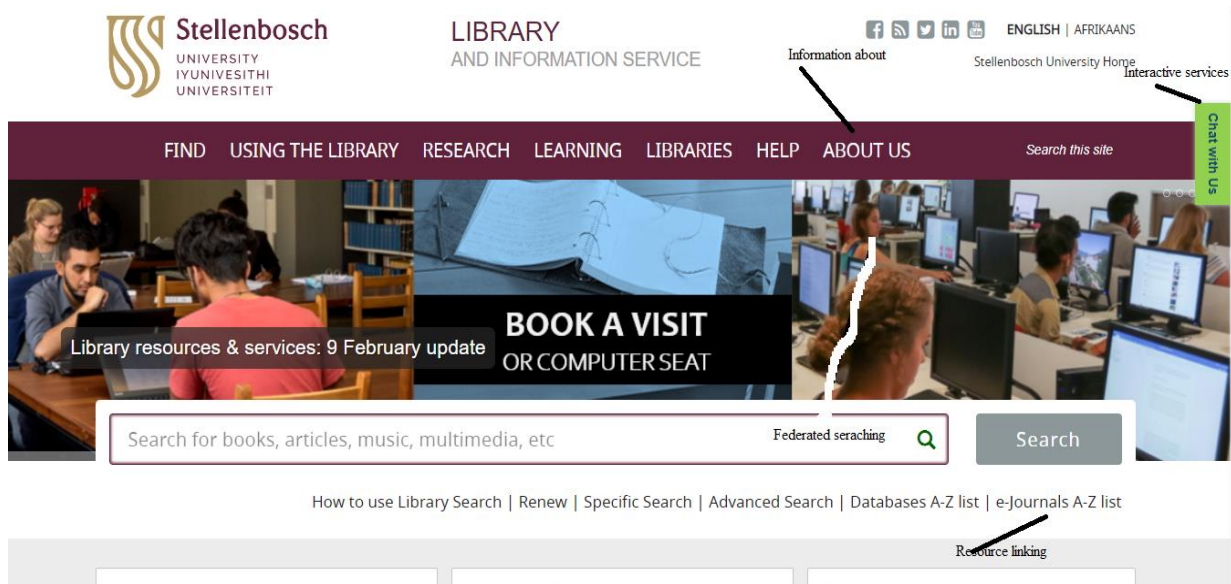


Figure 7: Screenshot of Stellenbosch University Library Portal

Figure 7 illustrates a screenshot of the Stellenbosch University portal. It has federated searching, information about, interactive services and resource-linking characteristics.

As described in Section 3.4 out of the 20 questionnaires that were distributed to the experts online through email addresses obtained from the Postgraduate coordinator. Five experts evaluated each portal. Twelve questionnaires were answered giving a response rate of 60%.

4.4.1 Heuristic Evaluation: Federated Search

Out of the five experts that evaluated the ZCAS University portal, two had cosmetic problems while one had minor challenges and another one had major problems while the remaining one suggested that the portal was catastrophic. With the UNZA, the two respondents found the portal with medium issues, meaning they found problems but could easily adapt to the problems on the portal. Out of the three experts evaluating the Stellenbosch University portal, two had cosmetic problems and one had minor problems. The two experts evaluating the Mulungushi portal found the portal to have cosmetic issues that did not affect its usability of the portal. The averages were rated on the severity scale provided ranging from 1 for cosmetic, 2- for minor, 3- for medium, 4-major and 5- for catastrophic. The average score for UNZA was 3 and rated medium on the severity scale, ZCAS University was 2.6 which was medium, with Mulungushi University having an average of 3 and rated medium as well. Stellenbosch University had a score of 1.3 and was rated cosmetic as shown in Table 9 below.

Table 9: HEI Portal Heuristic Evaluation: Federated Search

Portal	Federated search	
	Severity rating	Average score
UNZA	Medium	3
ZCAS	Medium	2.6
MULUNGUSHI	Medium	3
STELLENBOSCH	Cosmetic	1.3

4.4.2 Heuristic Evaluation: User Authentication

When it came to user authentication, one expert who evaluated the UNZA portal rated the user authentication feature with major issues that should be fixed. The other one stated that it was catastrophic with issues that needed to be addressed immediately. Two out of the five experts evaluating the ZCAS portal found cosmetic issues only while one had minor usability issues another one had major issues with workarounds and the last one found the portal to be catastrophic. The evaluation of Stellenbosch saw two out of the three experts coming across cosmetic issues and one had minor issues. One expert evaluating the Mulungushi University portal encountered cosmetic issues that did not affect the usability of the portal while the other one found the portal to be catastrophic. The average score for UNZA was 2.6 which was medium on the severity scale, for ZCAS University the average was 4.5 which was catastrophic while for Mulungushi University it was 3 with a medium rating. Stellenbosch was 1.3 which was cosmetic on the severity scale, see Table 10 below.

Table 10: HEI Portal Heuristic Evaluation: User Authentication

Portal	User authentication	
	Severity rating	Average score
UNZA	Medium	2.6
ZCAS	Catastrophic	4.5
Mulungushi	Medium	3
Stellenbosch	Cosmetic	1.3

4.4.3 Heuristic Evaluation: Resource Linking

Out of the two experts evaluating the UNZA portal, one of the evaluators rated the portal with cosmetic issues whilst another one had usability issues with medium priority. Out of the five experts evaluating the ZCAS University portal, three came up with cosmetic issues that did not affect usability whilst one had medium-priority issues and another one had major issues. Out

of the three experts evaluating the Stellenbosch portal, one of the experts came up with cosmetic issues, while another one had minor and the last one had medium issues. With the Mulungushi University portal, one expert had cosmetic issues while another one had catastrophic issues. The severity rating for UNZA was minor with an average score of 2, while that of ZCAS University was medium with a rating of 2.8. The average score for Mulungushi was 3 with a medium rating while the average score for Stellenbosch was 2 and it was rated minor on the severity scale as shown in Table 11.

Table 11: Portal Heuristic Evaluation: Resource Linking

Portal	Resource linking	
	Severity rating	Average score
UNZA	Minor	2
ZCAS	Medium	2.8
Mulungushi	Medium	3
Stellenbosch	Minor	2

4.4.4 Heuristic Evaluation: Interactive Services

Two evaluators found the interactive services on the UNZA portal to be catastrophic. Out of the five experts that evaluated the ZCAS University portal, one of the experts rated the portal to have cosmetic issues while the other one had medium issues, two had major issues and one found the usability of the portal to be catastrophic. Out of the three experts evaluating the Stellenbosch University portal, one had cosmetic issues while two had medium issues. With the Mulungushi University portal, one had cosmetic issues while another one had catastrophic issues. The average score for UNZA was 5 and catastrophic on the severity scale. The average score for ZCAS University was 3.4 and medium on the severity scale while the rating for Mulungushi University was medium with an average of 3. The severity rating for Stellenbosch University was minor with an average score of 2.3, see Table 12 below.

Table 12: HEI Portal Heuristic Evaluation: Interactive Services

Portal	Interactive services	
	Severity rating	Average score
UNZA	Catastrophic	5
ZCAS	Medium	3.4
Mulungushi	Medium	3
Stellenbosch	Minor	2.3

4.4.5 Heuristic Evaluation: Electronic Version of Traditional Library Services

After the evaluation of the UNZA portal, one of the experts found minor issues while another one had catastrophic as a result. Out of the five experts evaluating the ZCAS University portal evaluators found cosmetic issues with the portal while another two had medium issues with one having major issues and the final expert having catastrophic issues. All three and two experts for Stellenbosch and Mulungushi University rated the portals with cosmetic issues, respectively. The average score for the UNZA portal was 3.5 and was rated major on the severity scale. The rating of the ZCAS University portal was medium and had an average score of 3.2. Mulungushi University and Stellenbosch University both had an average score of 1 and were rated cosmetic on the severity scale as shown in Table 13 below.

Table 13:HEI Portal Heuristic Evaluation: Electronic Version of Traditional Library Services

Portal	Electronic version	
	Severity rating	Average score
UNZA	Major	3.5
ZCAS	Medium	3.2
Mulungushi	Cosmetic	1
Stellenbosch	Cosmetic	1

4.4.6 Heuristic Evaluation: Information about the Library

Two of the evaluators found the “information about the library” on the UNZA portal with major usability issues that would require attention. One evaluator encountered cosmetic issues on the ZCAS University portal, while another one encountered minor issues, two encountered medium issues and a final one had catastrophic issues. All three of the evaluators found the Stellenbosch portal to have cosmetic issues. The Mulungushi portal was also found to have cosmetic issues by both two experts. The average score for the UNZA portal was 4 with a major severity rating. The ZCAS University average score was 2.8 and had a severity rating of medium. Mulungushi University and Stellenbosch University both had an average score of 1 and were rated cosmetic on the severity scale as shown in Table 14 below.

Table 14:HEI Portal Heuristic Evaluation: Information about the Library

Portal	Information about	
	Severity rating	Average score
UNZA	Major	4
ZCAS	Medium	2.8
Mulungushi	Cosmetic	1
Stellenbosch	Cosmetic	1

4.5 System Usability Scale Scores

To determine the usability of the university library portal the SUS method was used as outlined in Chapter 3. Table 15 shows the calculated SUS scores for lecturers and students as well as the overall average SUS scores for three portals. Figure 8 gives an interpretation of the average SUS scores using the Acceptability Ratings, Adjective Ratings and Net Promoter Scores (NPS).

Table 6: Overall Average SUS Scores

Lecturers		Students		Total	
	SUS scores		SUS scores		Average SUS Scores
UNZA (n=9)	56.11	UNZA (n=123)	51.26	UNZA (n=132)	53.685
ZCAS (n=6)	61.25	ZCAS (n=62)	59.31	ZCAS (n=68)	60.28
MULUNGUSHI (n=5)	50.5	MULUNGUSHI (n=119)	53.23	MULUNGUSHI (n=124)	51.865

The average Lecturers' SUS scores were 50.5 (n=5), 56.1 (n=9) and 61.25 (n=6) for Mulungushi University, UNZA and ZCAS University respectively. The Mulungushi University SUS score was 50.5 which fell under "ok" on the adjective rating scale while the UNZA SUS score was 56.11 which was acceptable under the same. ZCAS SUS score was 61.25 which was also acceptable on the adjective scale. Under the acceptability rating, Mulungushi was at 50.5 and not acceptable. UNZA SUS score was 56.11 which was marginal on the acceptability rating scale. ZCAS University at 61.25 was marginally acceptable on the scale (Figure 8). On the NPS, Mulungushi University (50.5) was a detractor while UNZA at 56.11 was also a detractor. ZCAS University with a SUS score of 61.25 was still a detractor.

The average Students' SUS scores were 51.26 (n=123), 59.31 (n=62) and 53.23 (n=119) for

UNZA, ZCAS University and Mulungushi University respectively. The Mulungushi University SUS score was 53.23 which fell under ok on the adjective rating scale while the UNZA SUS score was 51.26 which also fell under ok the same scale whilst the ZCAS University SUS score was 59.31 which was also “ok” on the adjective scale. Under the acceptability rating scale, Mulungushi University at 50.5 was marginal. UNZA SUS score (56.11) was not acceptable and the ZCAS University SUS score (61.25) was marginal on the acceptability scale. On the NPS, Mulungushi University was a detractor while UNZA was also a detractor. ZCAS University was found to be passive.

The average SUS score for the UNZA was 53.685 which according to the adjective rating fell under “ok” on the adjective rating and marginal on the acceptability rating scale while on the NPS it was a detractor. The ZCAS University portal average SUS score was 60.28 which fell under okay on the adjective rating and marginal on the acceptability scale while on the NPS it was detractor. The Mulungushi University average SUS score was 51.863 which was okay on the adjective rating scale while on the acceptability rating scale, it fell under marginal. On the NPS, the portal was a detractor.

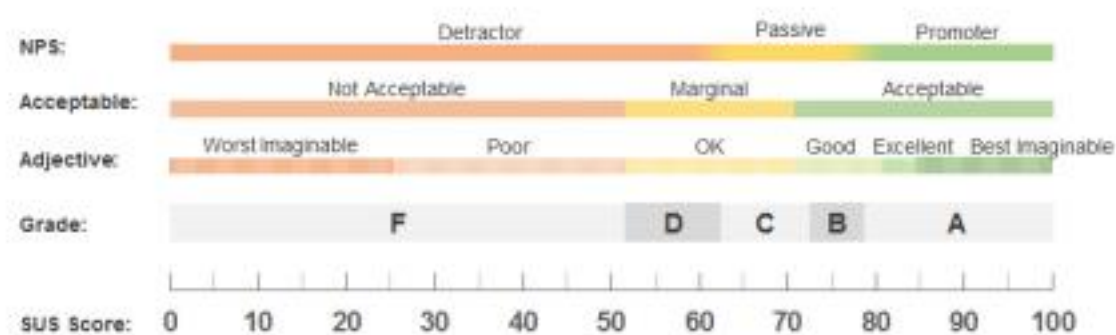


Figure 8: SUS Score Interpretation Using Net Promoter Scores, Acceptable Rating Scale, and Adjective Scale (Sasmito and Nishom, 2019)

SUS scores can be correlated with NPS categories to gauge users' likelihood to recommend the system based on its perceived usability. Generally, SUS scores above 68 are considered above average and correlate with NPS categories such as Promoters, people who are likely to recommend the product (SUS scores 80-100), Passives (SUS scores 70-79), and Detractors (SUS scores below 70) are more likely to discourage rather than recommend the product.

Another variation on using words to describe the SUS is to think in terms of what is “acceptable” or “not acceptable.” Bangor et al. (2008) assigned these terms for when the SUS

was well above average or well below average. Acceptable corresponds to roughly above 70 (above our average of 68) and unacceptable to below 50 designated the range between 50-70 as “marginal”.

Building on the idea of using words instead of numbers to describe an experience, Bangor et al.(2008) associated 1,000 SUS scores with a 7-point adjective scale. The scale contains adjectives including “Good,” “OK,” and “Poor”—words users loosely associate with the usability of a product.

By integrating these scales, one can provide a more comprehensive interpretation of SUS scores, considering both quantitative metrics and qualitative descriptors of usability. This approach allowed for a clearer understanding of users' perceptions of system usability and facilitated actionable insights for usability improvement efforts.

4.6. Influence of Demographic Factors on the User Perception of the University Library Portals

4.6.1 University of Zambia Normality Test for the Distribution

A normality test was conducted on the data using the Shapiro-Wilk test. The test did not show a significant departure from the normality.

Influence of Gender on SUS Scores

The researcher aimed to evaluate how gender affects System Usability Scale (SUS) scores based on the following hypotheses:

Null Hypothesis (H_0): There is no significant difference in SUS scores between Males and Females.

Alternative Hypothesis (H_a): There is a significant difference in SUS scores between Males and Females.

The statistical analysis employed a two-tailed independent t-test to examine gender-based differences in SUS scores. The test resulted in a p-value of 0.19, signifying that there is no statistically significant distinction between males and females concerning SUS scores (refer to Tables 16 and 17). This implies that a student's gender does not have a significant impact on the usability of the portal.

Table 7: Independent Samples Test Group Statistics

	Group	N	Mean	Std. Deviation	S.E. Mean
SUS SCORE	Male	63	53.52	19.09	2.41
	Female	60	49.32	16.51	2.13

Table 8: Independent Sample Test

		Levene's Test for Equality of Variances		T-Test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
SUS SCORE	Equal variances assumed	2.56	0.112	1.3	121	0.195	4.21	3.23	-2.18	10.59

	Equal varian ces not assum ed			1.31	119. 91	0.193	4.21	3.21	-2.16	10. 57
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Influence of Program Enrolled on SUS Scores.

Likewise, when examining the program's impact on SUS scores for the UNZA portal, the researcher formulated the following hypotheses:

Null Hypothesis (H_0): There is no significant difference in SUS scores between Undergraduate and Postgraduate students.

Alternative Hypothesis (H_a): There is a significant difference in SUS scores between Undergraduate and Postgraduate students.

The statistical analysis utilized a two-tailed independent test, resulting in a p-value of 0.021 (see Tables 18 and 19). This finding suggests a statistically significant difference between undergraduate and postgraduate students in terms of SUS scores, indicating that a student's program of study influences the usability of the portal.

Table 9: Independent Samples Test Group Statistics

	Group	N	Mean	Std. Deviation	S.E. Mean
SUS SCORE	Undergraduate	115	50.5	17.92	1.67
	Postgraduate	8	65.5	11.59	4.1

Table 10: Independent Samples Test

		Levene's Test for Equality of Variances		T-Test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
SUS_S CORE	Equal variances assumed	1.12	0.293	-2.33	121	0.021	-15	6.44	-27.76	-2.25
	Equal variances not assumed			-3.39	95.1	0.007	-15	4.42	-24.93	-5.08

Influence of Year of Study on SUS Scores

The researcher aimed to evaluate how the year of study impacts SUS scores and formulated the following hypotheses:

Null Hypothesis (H_0): There is no significant difference in SUS scores between the years of study.

Alternative Hypothesis (H_a): There is a significant difference in SUS scores between the years of study.

A One-way ANOVA was conducted for the statistical analysis, resulting in a p-value of 0.55 (refer to Tables 20 and 21). This outcome suggests no statistically significant difference among the groups concerning SUS scores, indicating that a student's year of study does not significantly influence the usability of the portal.

Table 11: Anova Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
	Year of Study					Lower Bound	Upper Bound		
SUS SCORE	First - second year	88	52.57	16.88	1.8	48.99	56.14	13	90
	Third - fourth year	32	48.5	21.21	3.75	40.85	56.15	0	88
	Fifth - seven	3	51	7.94	4.58	31.28	70.72	45	60

	th year								
	Total	12 3	51.4 7	17.93	1.62	48.27	54.6 7	0	90

Table 12: One Way Anova

		Sum of Squares	df	Mean Square	F	Sig.
SUS SCORE	Between Groups	389.06	2	194.53	0.6	0.55
	Within Groups	38847.5 9	120	323.73		
	Total	39236.6 5	122			

Influence of Discipline of Study

In a similar vein, the researcher aimed to examine how the enrolled faculty influences SUS scores, and the hypotheses were formulated as follows:

Null Hypothesis (H_0): There is no significant difference in SUS scores between the disciplines.

Alternative Hypothesis (H_a): There is a significant difference in SUS scores between the disciplines.

A One-way ANOVA was used for the statistical analysis, yielding a p-value of 0.857 (see Tables 22 and 23). This result suggests no statistically significant difference among the groups concerning SUS scores, indicating that a student's discipline of study does not significantly impact the usability of the portal.

Table 13: Anova Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
	Discipline					Lower Bound	Upper Bound		
SUS SCORE	STEM	30	50	18.61	3.4	43.05	56.95	13	90
	Social sciences	69	51.71	18.8	2.26	47.19	56.23	0	88
	Business	24	52.63	14.84	3.03	46.36	58.89	20	83
	Total	123	51.47	17.93	1.62	48.27	54.67	0	90

Table 14: One Way Anova

		Sum of Squares	df	Mean Square	F	Sig.
SUS SCORE	Between Groups	100.82	2	50.41	0.15	0.857
	Within Groups	39135.83	120	326.13		
	Total	39236.65	122			

Influence of Combined Variables (Gender, Program, Year of Study and Discipline) on SUS Scores

The researcher aimed to assess the collective impact of multiple variables on SUS scores, considering the combination of demographic factors such as gender, program, year of study, and discipline. The hypotheses were formulated as follows:

Null Hypothesis (H₀): There is no substantial difference in SUS scores among the combined demographic variables (gender, program, year of study, and discipline).

Alternative Hypothesis (H_a): There exists a meaningful difference in SUS scores among the combined demographic variables (gender, program, year of study, and discipline).

To perform this analysis, a two-way ANOVA (factorial ANOVA) was used. The obtained p-value was 0.461 (refer to Table 24 below), indicating no statistically significant difference in SUS scores attributed to the combination of gender, year of study, program, and discipline. This suggests that these combined demographic variables do not significantly impact SUS scores.

Table 15: Test of between-subjects- Factorial Anova

	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	3502.4	11	318.4	0.99	0.461
Intercept					
sex	0	1	0	0	1
program	0	1	0	0	1
year of study	104.68	2	52.34	0.16	0.85
sex × program	0	1	0	0	1
sex × year of study	5.36	2	2.68	0.01	0.992
program × year of study	3.16	2	1.58	0	0.995
Sex × program × year of study	0.1	2	0.05	0	1
Error	35734.25	111	321.93		
Total	365103	123			
Corrected Total	39236.65	122			

**4.6.2. ZCAS University
Normality Test for Distribution**

A normality test was conducted on the data using the Shapiro-Wilk test. The test did not show a significant departure from the normality.

Influence of Gender on SUS Scores

When examining the influence of gender on SUS scores for the ZCAS University portal, the researcher formulated the following hypotheses:

Null Hypothesis (H₀): There is no substantial difference in SUS scores between males and females.

Alternative Hypothesis (H_a): There exists a meaningful difference in SUS scores between males and females.

The statistical analysis employed a two-tailed independent test, resulting in a p-value of 0.65 (refer to Tables 25 and 26 below). This finding suggests no statistically significant difference between males and females in terms of SUS scores, indicating that a student's gender did not significantly impact the usability of the portal.

Table 16: Independent Samples Test Group Statistics

	Group	N	Mean	Std. Deviation	S.E. Mean
SUS SCORE	Male	40	60.3	17.8	2.81
	Female	22	58.18	17.7	3.77

Table 17: Independent Samples Test

		Levene's Test for Equality of Variances	T-Test for Equality of Means							
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		F	Sig.	t	df	Sig. (2-tailed)	Mean Differ ence	Std. Error Differ ence	95% Confid ence Interva l of the Differ ence	
									Lower	Up per
SUS_S CORE	Equal varia nces assu med	0.01	0.9 22	0.45	60	0.655	2.12	4.71	-7.31	11. 55
	Equal varia nces not assu med			0.45	43. 59	0.655	2.12	4.71	-7.37	11. 61

Influence of Program on SUS Scores

Similarly, when examining the impact of the program on SUS scores for the ZCAS portal, the researcher formulated the following hypotheses:

Null Hypothesis (H₀): There is no substantial difference in SUS scores between undergraduate and postgraduate students.

Alternative Hypothesis (H_a): There exists a meaningful difference in SUS scores between undergraduate and postgraduate students.

The statistical analysis utilized a two-tailed independent test, resulting in a p-value of 0.984 (refer to Tables 27 and 28). This suggests no statistically significant difference between

undergraduate and postgraduate students in terms of SUS scores, indicating that a student's program of study did not significantly influence the usability of the portal.

Table 18:Independent Samples Test Group Statistics

	Group	N	Mean	Std. Deviation	S.E. Mean
SUS_SCORE	Undergraduate	49	59.57	17.11	2.44
	Postgraduate	13	59.46	20.28	5.62

Table 28: Independent Samples Test

		Levene's Test for Equality of Variances		T-Test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
SUS_SCORE	Equal variances	0.59	0.447	0.02	60	0.984	0.11	5.55	-10.99	11.21

	assumed									
	Equal variances not assumed			0.02	16.81	0.986	0.11	6.13	-12.84	13.06

Influence of Year of Study on SUS Scores

The researcher aimed to evaluate the influence of the year of study on SUS scores and formulated the following hypotheses:

Null Hypothesis (H₀): There is no substantial difference in SUS scores across different years of study.

Alternative Hypothesis (H_a): There exists a meaningful difference in SUS scores between various years of study.

For this analysis, a One-way ANOVA was performed, resulting in a p-value of 0.119 (refer to Tables 29 and 30). This suggests no statistically significant difference among the groups concerning SUS scores, indicating that a student's year of the study did not significantly contribute to determining the usability of the portal.

Table 29: Anova Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
	year of study					Lower Bound	Upper Bound		
SUS SCORE	First - second year	28	55.46	17.1	3.23	48.83	62.09	20	100
	Third - fourth year	32	63.84	17.76	3.14	57.44	70.25	28	90

	Fifth - seventh year	2	48	0	0	48	48	48	48
	Total	62	59.5	17.65	2.24	55.07	64.03	20	100

Table 30: One Way Anova

		Sum of Squares	df	Mean Square	F	Sig.
SUS SCORE	Between Groups	1324.17	2	662.09	2.21	0.119
	Within Groups	17669.18	59	299.48		
	Total	18993.35	61			

Influence of Discipline on SUS Scores

Likewise, the researcher sought to evaluate how the faculty enrolled affects SUS scores and framed the following hypotheses:

Null Hypothesis (H_0): There is no substantial difference in SUS scores among the various disciplines.

Alternative Hypothesis (H_a): There exists a meaningful difference in SUS scores between the disciplines.

For statistical analysis, a One-way ANOVA was used, yielding a p-value of 0.708 (refer to Tables 31 and 32). This suggests no statistically significant difference among the groups concerning SUS scores, indicating that a student's discipline of study did not play a significant role in determining the usability of the portal.

Table 31: Anova Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
	discipline					Lower Bound	Upper Bound		
SUS SCORE	STEM	6	64.5	13.19	5.38	50.66	78.34	50	83

	Social sciences	21	60.33	20.16	4.4	51.16	69.51	28	100
	Business	35	58.23	16.96	2.87	52.4	64.05	20	90
	Total	62	59.55	17.65	2.24	55.07	64.03	20	100

Table 32: One Way Anova

		Sum of Squares	df	Mean Square	F	Sig.
SUS SCORE	Between Groups	221.02	2	110.51	0.35	0.708
	Within Groups	18772.34	59	318.18		
	Total	18993.35	61			

Influence of Combined Variables (Gender, Program, Year of Study and Discipline) on SUS scores

The researcher set out to assess the collective impact of several variables on SUS scores, considering the combination of demographic factors such as gender, program, year of study, and discipline. The hypotheses were framed as follows:

Null Hypothesis (H_0): There is no significant difference in SUS scores among the combined demographic variables (gender, program, year of study, and discipline).

Alternative Hypothesis (H_a): There is a significant difference in SUS scores among the combined demographic variables (gender, program, year of study, and discipline).

To conduct this analysis, a two-way ANOVA (factorial ANOVA) was utilized, resulting in a p-value of 0.025 (refer to Table 33). This indicates a statistically significant difference in SUS scores among the combined variables of gender, year of study, program, and discipline, implying that these demographic variables collectively have a significant impact on SUS scores.

Table 33: Test of between-Subjects -Factorial Anova

	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	6325.15	11	575.01	2.27	0.025
Intercept					
sex	0	1	0	0	1
program	0	1	0	0	1
year of study	187.62	2	93.81	0.37	0.692
sex × program	0	1	0	0	NaN
sex × year of study	693.87	2	346.93	1.37	0.264
program × year of study	536.25	2	268.12	1.06	0.355
sex × program × year of study	1486.6	2	743.3	2.93	0.062
Error	12668.2	50	253.36		
Total	238846	62			
Corrected Total	18993.35	61			

4.6.3. Mulungushi University Normality Test for Distribution

The normality test was conducted on the data using the Shapiro-Wilk test. The test showed a significant departure from normality.

Influence of Gender on SUS Scores

In the investigation of the impact of gender on SUS scores for the Mulungushi University portal, the researcher formulated the following hypotheses:

Null Hypothesis (H₀): There is no significant difference in SUS scores between males and females.

Alternative Hypothesis (H_a): There is a significant difference in SUS scores between males and females.

To assess this, the researcher employed the Mann-Whitney U test, resulting in a p-value of 0.533 (refer to Table 34 below). This suggests no statistically significant difference between males and females concerning SUS scores, indicating that the gender of the student did not play a significant role in influencing the usability of the portal.

Table 34: Mann-Whitney Test (Impact of Gender on SUS Score)

Independent-Samples Mann-Whitney U Test Summary	
Total N	119
Mann-Whitney U	1644,000
Wilcoxon W	3789,000
Test Statistic	1644,000
Standard Error	186,882
Standardized Test Statistic	-0,594
Asymptotic Sig. (2-sided test)	0,553

Influence of Program Enrolled on SUS Scores

Likewise, in assessing the impact of the program on SUS scores for the Mulungushi portal, the researcher formulated the following hypotheses:

Null Hypothesis (H_0): There is no significant difference in SUS scores between undergraduate and postgraduate students.

Alternative Hypothesis (H_a): There is a significant difference in SUS scores between undergraduate and postgraduate students.

To investigate this, the researcher employed the Mann-Whitney U test, resulting in a p-value of 0.021 (refer to Table 35). This implies a statistically significant difference between undergraduate and postgraduate students concerning SUS scores, suggesting that a student's program of study does indeed influence the usability of the portal.

Table 35: Independent Samples Mann-Whitney U Test (Impact of Program on SUS Scores)

Independent-Samples Mann-Whitney U Test Summary	
Total N	119
Mann-Whitney U	1015,000
Wilcoxon W	1120,000
Test Statistic	1015,000
Standard Error	120,941
Standardized Test Statistic	2,315
Asymptotic Sig. (2-sided test)	0,021

Influence of Year of Study on SUS Scores

The researcher set out to assess the impact of the year of study on SUS scores and formulated the following hypotheses:

Null Hypothesis (H_0): There is no significant difference in SUS scores across different years of study.

Alternative Hypothesis (H_a): There is a significant difference in SUS scores between various years of study.

To conduct this analysis, the researcher employed the Kruskal-Wallis test, resulting in a p-value of 0.428 (refer to Table 36). This suggests no statistically significant difference among the groups concerning SUS scores, indicating that a student's year of study did not play a significant role in determining the usability of the portal.

Table 36: Independent Samples Kruskal-Wallis Test (Impact of Year of Study on SUS Scores)

Independent-Samples Kruskal-Wallis Test Summary	
Total N	119
Test Statistic	1,699 ^a
Degree Of Freedom	2
Asymptotic Sig. (2-sided test)	0,428

Influence of Discipline of Study on SUS Scores

Similarly, the researcher aimed to assess how the enrolled faculty influences SUS scores and formulated the following hypotheses:

Null Hypothesis (H_0): There is no significant difference in SUS scores among the various disciplines.

Alternative Hypothesis (H_a): There is a significant difference in SUS scores between the disciplines.

To conduct this analysis, the researcher employed the Kruskal-Wallis test, resulting in a p-value of 0.088 (refer to Table 37). This implies no statistically significant difference among the groups concerning SUS scores, indicating that a student's discipline of study did not play a significant role in determining the usability of the portal.

Table 37: Independent Samples Kruskal- Wallis Test (Impact of Discipline of Study on SUS Scores)

Independent-Samples Kruskal-Wallis Test Summary	
Total N	118
Test Statistic	9,587 ^a
Degree Of Freedom	5
Asymptotic Sig. (2-sided test)	0,088

Influence of Combined Variables (Gender, Program, Year of Study and Discipline) on SUS Scores

The researcher embarked on an investigation to assess the collective impact of multiple variables on SUS scores, considering the combination of demographic factors, including gender, program, year of study, and discipline. The hypotheses were structured as follows:

Null Hypothesis (H_0): There is no significant difference in SUS scores among the combined demographic variables (gender, program, year of study, and discipline).

Alternative Hypothesis (H_a): There is a significant difference in SUS scores among the combined demographic variables (gender, program, year of study, and discipline).

For the statistical analysis, ANCOVA was used, yielding a p-value of 0.017 (refer to Table 38). This implies a statistically significant difference in SUS scores among the combined variables of gender, year of study, program, and discipline, suggesting that these demographic variables collectively have a significant impact on SUS scores.

Table 38: Test of Between (Dependent Variable vs Independent Variable)

Tests of Between-Subjects Effects					
Dependent Variable:	SUS SCORE				
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2831,170 ^a	4	707,793	3,162	0,017
Intercept	4444,765	1	4444,765	19,857	0,000
Program	1067,736	1	1067,736	4,770	0,031
Faculty	1317,574	1	1317,574	5,886	0,017
Year of Study	26,690	1	26,690	0,119	0,731
Sex	313,199	1	313,199	1,399	0,239
Error	25294,254	113	223,843		
Total	365550,000	118			
Corrected Total	28125,424	117			

4.7 Summary of Chapter

This chapter dealt with the analysis and presentation of the findings from the data collected. It narrowed down the list of universities from 62 to 3 as the only universities that have library portals in Zambia. From the 3, an expert evaluation was performed that included an exemplar portal that possessed more characteristics of library portals as mentioned in the literature researched. The final stage involved the presentation of the findings on user perception at the 3 universities. These users comprised lecturers and students. This was carried out by performing a system usability scale and parametric and non-parametric statistical tests.

CHAPTER 5: DISCUSSION OF THE FINDINGS

5.1 Overview

This section presents a discussion of the research findings of the study on the evaluation of adopted university library portals in Zambia. The presentation is organized according to the research objectives as outlined in Chapter One.

5.2 The Extent to which Universities in Zambia have Adopted Library Portals

The findings established that to a larger extent, many university libraries had not adopted library portals and that this remains a far-fetched dream as many universities still stay behind with non-functional portals. This was observed in the number of universities operating without functional portals. Accordingly, the results showed that out of the 26 universities which had fully functional websites as verified through their Universal Resource Locator (URL), only three (03) libraries had adopted library portals.

Many universities are not utilising the internet in providing and allowing access to information for their patrons through the creation of library portals. Iqbal and Warraich (2012) state that as libraries move forward into the digital times, network presence becomes increasingly vital for gathering the needs of our users

A study by Anyaoku and Akpojotor (2020) on the usability evaluation of university library websites in South Nigeria found that out of the 11 library portals sampled from different universities, at least six library portals had 50% and above in terms of usefulness, efficiency, effectiveness, learnability, and accessibility. The findings of this study are different from those of Anyaoku and Akpojotor's study in that, the study by the duo established that many sampled universities had functional library portals while this study found that many universities in Zambia had no library portals. The findings can be attributed to the fact that most Zambian universities still use face-to-face interactions to facilitate and provide information needs of individual users.

Amid the coming of technology, however, a library portal either academic or public ought to facilitate its users by connecting with the library 24 hours a day. Today it is feasible for a scholar to carry out research for papers without physically stepping into an academic library (Hugar, 2019). They can ask reference questions virtually; carry out research in databases; as well as place interlibrary loan requirements by electronic means. All these functions make use of library portals, requiring those websites to be timely and easy to use.

5.3 To Determine if Key Portal Features or Characteristics have been Integrated into Existing Library Portals

The findings unveiled several issues. Six features or characteristics namely federated search, user authentication, resource linking, interactive services, electronic version of traditional library services as well as information about the library were determined.

Firstly, under federated search, the findings showed that the ZCAS library portal had a minor challenge, a cosmetic problem and was catastrophic. UNZA library portal had medium issues while the Mulungushi University library portal had cosmetic problems.

Secondly, the results on user authentication established that both major and catastrophic issues were found at the UNZA library portal. ZCAS library portal had three issues namely cosmetic, minor, and major while catastrophic issues were found on the Mulungushi library portal.

Thirdly, the study found that resource linking, cosmetic and medium issues were found on the UNZA library portal. ZCAS library portal established cosmetic issues that did not affect usability while both cosmetic and catastrophic issues were found on the Mulungushi University library portal. The fourth feature to be determined was interactive services. UNZA recorded a catastrophic issue. Cosmetics and medium issues were found on the ZCAS library portal while cosmetic and catastrophic issues were established on the Mulungushi library portal. The electronic version of traditional library services was the fifth characteristic. UNZA library portal established that there were minor and catastrophic issues while both ZCAS and Mulungushi library portals found cosmetic issues. The last characteristic which looked at information about the library established that there was major usability requiring attention with the UNZA library portal. ZCAS found cosmetic and minor issues while the Mulungushi library portal found cosmetic issues. The ratings of the Stellenbosch University portal were mostly cosmetic and that is why it was selected to be used as an exemplar.

From the findings above, despite the three Universities having a functional library portal, there are challenges related to how the information is accessed by patrons for the three existing library portals in Zambia. A similar study was conducted by Pramatha (2018) on website usability and content accessibility of the top 50 United States of America Universities. Factors used to investigate were accessibility and usability. Findings revealed that most of the university websites' usability ratings were very low, while in the case of the website content accessibility guide, the complaint rate was very low.

The findings from the study above complement the findings from this study. This can be attributed to how user-friendly the portal interface is designed, the orientation as well and how to use federated searches to acquire the desired results. It is for this reason that some studies such as one conducted by Iqbal et al. (2022) went further to deal with how to help patrons resolve system problems, difficulties and users' opinions about the stability and standardization of the Punjab University library website.

Valenti (2019) supports the assertion that a library interface plays a role in usability. His study on usability testing in a library observed that website redesign projects revealed that users are overwhelmed and confused with the initial interface and that there are too many resource choices offered from the first screen with no explanation about their use. However, usability should refer to the extent to which a website is easy to exploit, resourceful in performing a specific task, and satisfactory for end users.

5.4 To Explore the Users' Perception of the Usability of the University Library Portals

A higher SUS score indicates better-perceived usability. The average SUS scores were interpreted using the NPS, adjective and acceptability ratings. The NPS provides insight into user loyalty. A high NPS indicates that users are likely to promote the system, while a low score suggests room for improvement. Adjective ratings offer qualitative insights. Acceptability rating provides a general sense of overall satisfaction. A high acceptability rating suggests that users find the system acceptable and satisfactory (Sasmitho and Nishom, 2019). By combining these metrics, a comprehensive understanding of the user experience can be developed, areas for improvement identified, and changes tracked in usability and user sentiment over time. This holistic approach guides product development and enhancement efforts.

The study established that most students had average usability of the Library Portals. Furthermore, lecturers also had an average perception towards the usability of the Library Portals. The overall average SUS scores for each university fell under "ok" on the adjective rating scale, not acceptable to marginal on the acceptability scale and were detractors and passive on the NPS. These findings can be attributed to the orientation of both students and lecturers towards available information on the Library Portal. Furthermore, other attributing factors could be the time taken for the portal to respond to the needs of patrons as well as the limited internet bandwidth that inhibits many libraries from meeting the needs of its patrons. The findings on average perception towards usability are attributed to an observation made by Matusiak (2021). She noted that limited utilization of digital libraries is linked to perceptions

such as library systems being viewed as not being user-friendly, which in turn discourages potential users from exploring digital Library Portals provided by academic libraries. She further observed that academic libraries are perceived as places of primarily textual resources; perceptions of usefulness, especially regarding the relevance of content, coverage, and currency, seem to harm user intention to use Library Portals, especially when searching for visual materials. These findings can be attributed to the orientation of both students and lecturers towards available information on the library portal. Furthermore, other attributing factors could be the time taken for the portal to respond to the needs of patrons as well as the limited internet bandwidth that inhibits many libraries from meeting the needs of its patrons. On the other hand, De Rosa et al (2010) stressed that the usability and perception of library portals are affected by misinformation. This is because many patrons seem not to understand the credibility of a library as a source of verified information. Therefore, they feel that they are privileged to find whatever information from any source provided they have internet access. In a recent study for OCLC conducted by De Rosa et al (2010), it was established that the number of college students starting their information inquiry with a search engine slightly decreased (83%) but also indicates a shift to other online resource discovery tools with 7% of students beginning their search with Wikipedia and 2% with social networking sites. None of the surveyed students began their information search with a library website. However, when they discovered it (27%), often through a search engine, the library website fulfilled their needs, and they were more likely to return to it. The top reason for not using the library website was not a lack of awareness, but rather the perception that other sites had better information. Bwalya (2014) noted that the use of library portals is also affected by the services made available to the patrons. This was observed from the study he conducted which found that despite the availability of web library services, UNZA and CBU libraries did not provide an online reference, self-circulation, and web inter-library loan services which some of the patrons may find useful. This in turn affected the rate at which the library portal at UNZA is used.

5.4.1 Impact of Demographic Factors on SUS Scores

Though technological progress has allowed many improvements like new business opportunities, faster data transfers, etc., it is still recommended that human-computer interface design has a significant influence on usability and user satisfaction levels. The objective of this study was to understand the satisfaction level of users from an interface usability perspective. A pilot survey was conducted by Sindhuja and Dastidar (2009) to fix the most popular website among the student community. An actual questionnaire survey was administered to 174 students pursuing an MBA to elicit the required data. The study used two principal component

analyses to extract the factors influencing usability and satisfaction separately. Later, satisfaction was regressed onto the factors influencing usability to determine the relative significance of each factor. An Independent sample t-test was done to examine the impact of gender. The study found that information content, format, consistency, and ease of navigation are significant in explaining the satisfaction level of the users. No difference in gender was found concerning the factors influencing the usability of a website.

The relationship between Web design attributes (personalisation, structure, navigation, layout, search, and performance) and users' characteristics to website usability and user satisfaction was investigated among 798 online banking users in Iran (Iman et al. 2019). The design and usability of the evaluated websites were not satisfactory from the users' perspectives. Multivariate regression models indicated that Web layout and performance were the main predictors of website usability, while personal characteristics including gender, age and Web usage_experience of users had no effect.

At the UNZA, there was a significant difference between the undergraduate and postgraduate SUS scores whilst at ZCAS University and Mulungushi University, there was no significant influence on the program enrolled for. According to a study carried out by Vlachogianni and Tselios (2022), most platforms were rated as satisfactory in terms of perceived usability as measured by SUS. SUS scores were not found to be significantly related to participants' age, gender, private/public school, or working relationship. Furthermore, openness to new experiences and extraversion demonstrated the strongest positive correlation with perceived usability evaluation.

The discipline and year of the study did not have any significant influence on the SUS scores at all three universities. The findings of this study are different from the findings of similar studies, for example, Ng et al. (2012) in their study was undertaken, investigated the effects of demographic factors of age, gender, education level, major discipline, work nature, and years of work experience on the usability assessment of safety signs. The relationship between SUS score and comprehension accuracy and the colour associations for sign design was also assessed. Three hundred and ninety-eight participants were first asked to complete a self-administered questionnaire on safety sign comprehension and then a modified SUS questionnaire. The results showed that education level was the only demographic factor that had a major effect on sign usability. Participants with a higher diploma education perceived the sign usability significantly better than the diploma students. Besides, the perceived sign

usability was found to be positively and significantly related to comprehension accuracy, indicating the usability of safety signs can be judged by how effectively the signs can communicate with the readers.

5.5 Summary of the Chapter

This chapter discussed the findings of the study. Literature was highlighted to support the results of the findings. It seemed to elaborate more on the importance of portals as a source of information with the change and improvement in technology. This is not the case on the ground, the findings from the study seemed to show that users in the 3 respective universities prefer face-to-face interactions or the provision of information resources as compared to online usage through portals.

CHAPTER 6: CONCLUSION, RECOMMENDATIONS AND FUTURE WORK

6.1 Overview

This chapter highlights the conclusion of the study and its recommendations and future work.

6.2 Conclusion

The first objective sought to investigate the extent to which universities in Zambia have adopted library portals. It is evident that to a larger extent, many university libraries have not adopted library portals. The results showed that out of the 26 universities which had fully functional websites as verified through their URLs only UNZA, Mulungushi University and ZCAS University libraries had adopted portals.

Secondly, the study established in the second objective that several issues focusing on the six portal characteristics namely federated search, user authentication, resource linking, interactive services, electronic version of traditional library services as well as information about the library. Firstly, under federated search, the findings showed that the ZCAS University library portal had a minor challenge, a cosmetic problem and was catastrophic. UNZA library portal had medium issues while the Mulungushi University library portal had cosmetic problems. Stellenbosch University had cosmetic and minor issues only. Secondly, the results on user authentication established that both major and catastrophic issues were found at the UNZA library portal. ZCAS University library portal had three issues namely cosmetic, minor, and major while catastrophic was found on the Mulungushi library portal with Stellenbosch University only having cosmetic and minor issues. Thirdly, the study found that resource linking, cosmetic and medium issues were found on the UNZA library portal. ZCAS University library portal established cosmetic issues that did not affect usability while both cosmetic and catastrophic issues were found on the Mulungushi University library portal. Stellenbosch University only had cosmetic, minor and medium issues. The fourth feature to be determined was interactive services. UNZA recorded a catastrophic issue. Cosmetics and medium issues were found on the ZCAS University library portal while cosmetic and catastrophic issues were established on the Mulungushi library portal. Stellenbosch University experienced cosmetic and minor issues only. The electronic version of traditional library services was the fifth characteristic. UNZA library portal established that there were minor and catastrophic issues while both ZCAS University and Mulungushi library portals found cosmetic issues. Stellenbosch University only had cosmic issues. The last characteristic which looked at information about the library established that there was major usability requiring attention. ZCAS University found cosmetic and minor issues while the Mulungushi library portal found

cosmetic issues. Stellenbosch only has cosmetic issues. From the results of this objective, it can be concluded that all 3 library portals had issues related to the six characteristics that their evaluation was based on and that the exemplar portal (Stellenbosch) only had cosmetic issues that did not affect usability.

The last objective established that most of the lecturers and students had average usability of the library portals with ZCAS University recording the highest (59.31) and UNZA the lowest (41.26) System Usability Scores for lecturers. Furthermore, lecturers also indicated an averaged perception towards the usability of the library portals with the highest indicating the use of resources for lecturing. 51.26 was recorded for UNZA as the lowest and 59.31 was recorded for ZCAS as the highest as indicated on the SUS scores for students. Therefore, from the (SUS) scale the three Universities fall under 'ok' and 'good' termed as marginal on the acceptability scale.

6.3 Recommendations

From the results of the study, the study suggests the following recommendations.

6.3.1 Adoption of Library Portals

- i. HEA to include portal evaluation in their quality assurance criteria.
- ii. HEIs without portals to implement portals and set up portals.

6.3.2 Features of Library Portals in Zambian HEIs

- i. HEIs to explore the use of specialised Free and Open-Source Library Portal software such as VuFind, Koha etc
- ii. HEIs with portals with missing crucial services to implement services.
- iii. HEIs with portals to extensively evaluate how to incorporate the missing feature.

6.3.3 Usability of Library Portals

The three HEIs need to extensively improve the design and content of the portals.

6.4 Future Work

This study was carried out to evaluate university library portals in Zambia. It identified that more universities need to effectively adopt library portals as a means of information provision. Therefore, it has brought out issues that require future research on an in-depth understanding of library portals, how to effectively create them for maximum use and factors that have caused most universities to not adopt library portals.

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APPENDICES

Appendix A: List of Universities, Contact Roles, and Email Addresses

No.	Higher Education Institution	Contact Role	Contact
1	African Christian University	Vice Chancellor	admissions@keystoneuoa.com
2	African Research University	Vice Chancellor	office@acu-zambia.com
3	African Open University	Vice Chancellor	apply@ao.university
4	Ambassador International University	Vice Chancellor	aiu.zambia@gmail.com
5	Bethel University	Vice Chancellor	betheluniversitymungu@gmail.com
6	Blessings University of Excellence	Vice Chancellor	admin@blueuniversity.net
7	Brook Bresor University	Vice Chancellor	admissions@brookbesoruniversity.edu.zm
8	Cavendish University	Vice Chancellor	cavendish@cavendish.co.zm
9	Central Baptist University	Vice Chancellor	info@cabuniversity.com
10	Chalimbana University	Vice Chancellor	info@chau.ac.zm
11	Chreso University	Vice Chancellor	hq@chreso.org
12	City University of Science and Technology	Vice Chancellor	cityuniversity2008@gmail.com
13	Copperbelt University	Vice Chancellor	external.relations@cbu.ac.zm
14	DMI St. Eugene University	Vice Chancellor	info@dmiseu.edu.zm
15	Eden University	Vice Chancellor	edenuniversity@edenuniversity.net
16	Evangelical University	Vice Chancellor	info@evangelicaluniversity.ac.zm
17	Gideon Robert University	Vice Chancellor	admin@gideonrobertuniversity.com
18	Harvest University	Registrar	registrar@harvestuniversity.edu.zm
19	Information and Communication University	Vice Chancellor	icu@icuzambia.net
20	Justo Mwale University	Vice Chancellor	info@justomwale.net
21	Kenneth Kaunda Metropolitan University	Vice Chancellor	info@kkmu.ac.zm
22	Kopaline University	Principal	info@kopalineuniversity.com
23	Kwame Nkrumah University	Registrar	registrar@nkrumah.edu.zm
24	Livingstone International University of Tourism Excellence and Business Management	Registrar	liutebmuniversity@gmail.com
25	Lusaka Apex Medical University	Vice Chancellor	info@lamu.edu.zm
26	Levy Mwanawasa Medical University	Vice Chancellor	info@lmmu.ac.zm
27	Management College of Southern Africa	Director	zambia@mancosa.co.za
28	Mansfield University	Vice Chancellor	admin@mansfielduniversitylusaka.com

29	Mosa University	Vice Chancellor	lewisbanda84@gmail.com
30	Mukuba University	Registrar	registrar@mukuba.edu.zm
31	Mulungushi University	Vice Chancellor	vc@mu.ac.zm
32	Northrise University	Registrar	nuinfo@northrise.net
33	Oak University	Vice Chancellor	info@oakuniversity.co.zm
34	Open Windows University	Vice Chancellor	info@owu.edu.zm
35	Pabalana University		Not available on the HEA website
36	Paglory University	Vice Chancellor	pagloryuniversity@gmail.com
37	Robert Makasa University	N/A	Not available on the HEA website
38	Rockview University	Vice Chancellor	rockviewprofessionals@yahoo.com
39	Rusangu University	Vice Chancellor	info@ru.edu.zm
40	South Valley University	Vice Chancellor	svuzambia@gmail.com
41	St Bonaventure University	Vice Chancellor	office@sbuc-zm.org
42	St Dominic's Major Seminary	Vice Chancellor	seminary1978@live.com
43	Sunningdale University	Vice Chancellor	info@sunningdaleuniversity.ac.zm
44	Supershine University	Registrar	registrar@supershineuniversity.net
45	Texila American University	Vice Chancellor	info@tauedu.org
46	The University of Barotseland	Vice Chancellor	admissions@ubl.edu.zm
47	Trans-African Christian University	Vice Chancellor	registrar@tacuzambia.org
48	Trinity University	Vice Chancellor	admissions@trinityuniversity.edu.zm
49	Twin Palm University	Vice Chancellor	tplu2018@gmail.com
50	United Church of Zambia University	Registrar	registrar@uczuniversity.org
51	UNICAF University Zambia	Vice Chancellor	info@unicafuniversity.com
52	University of Africa	Vice Chancellor	admissions@keystoneuo.com
53	University of Edenberg	Vice Chancellor	info@ue.edu.zm
54	University for Foundation of Cross-Cultural	Vice Chancellor	admin@fceunicol.com
55	University of Lusaka	Vice Chancellor	info@unilus.ac.zm
56	University of Zambia	Registrar	registrar@unza.zm
57	Victoria Falls University of Technology	Vice Chancellor	admissionsvfu@gmail.com
58	Zambia Catholic University	Vice Chancellor	regoffice@zcuniversity.edu.zm
59	Zambia Christian University	Vice Chancellor	biczambia@gmail.com
60	Zambia Open University	Vice Chancellor	admissions@zaou.ac.zm
61	Zambian Royal Medical University	Vice Chancellor	zmedicaluniversity@gmail.com
62	ZCAS University	Vice Chancellor	information@zcas.edu.zm

Appendix B: Information and Consent Form

University of Zambia

School of Education

Department of Library and Information Science

Title: Usability Evaluation of Higher Education Institution Library Portals in Zambia

Section A: Information Sheet (for men and women > 18 years old)

My names are Dokowe Thelma Tembo. I am pursuing a master's degree in Library and Information Science at the University of Zambia in the School of Education. You are invited to participate in research focused on University Library Portals. The purpose of this research is to carry out an Assessment of these University Library Portals.

Since you are a Student, Lecturer, or Librarian at this respective University you have been randomly selected amongst those that meet the entry criteria into the study. The research will involve answering a few background questions and also questions on your use of the University Library Portals. Before you decide on whether you would like to participate in the research; you would be advised, if you may, to speak to anyone you feel comfortable with. In the case that there are some words that you do not understand, please feel free to ask me for clarification.

Purpose of the Research

To Evaluate University Library Portals in Zambia.

Type of Research Intervention

The research involves answering questionnaires that will be administered to you.

Participant selection

You are being invited to take part in this research because you are a user of your University Library Portal and there is a need to determine the Usability of these University Library Portals and know if any changes and improvements need to be made.

Voluntary Participation

Your decision to participate in this study is entirely voluntary. It is your choice whether you want to take part or not. If you choose not to consent, nothing will change.

You may also choose to change your mind later and stop participating, even if you had earlier agreed, and still, nothing will change.

Procedures

You are invited to participate in a research study by answering a questionnaire. You have been randomly selected and if you do not wish to answer any questions you may skip them and move to the next question. The information recorded is confidential, your name is not included on the forms, only a number will identify you, and no one else except the Principal Investigator will have access to the survey.

Risk and discomfort

You do not have to answer any question or take part in the survey if you feel the question(s) are too personal.

Reimbursements

You will not be provided any incentive to take part in the research.

There may not be any benefit for you directly now but allowing your participation will help find the answer to the research question and benefit your University Library in its quest to improve in its Information provision.

Confidentiality

The information that will be collected from this research project will be kept confidential. The information about you and your use of the Portal that will be collected from the research will be put away and no-one but the Principal Investigator will be able to see it. All information on your questionnaire will have a number on it instead of a name.

Sharing of Results

The knowledge that will be obtained from this study will be shared with you through your University Libraries. Confidential information will not be shared.

Right to Refuse or Withdraw

You do not have to agree to take part in this research if you do not wish to do so and refusing to will not affect you. You may stop participating in the research at any time that you wish.

Who to Contact

If you have any questions you may ask them now or later, even after the study has started. If you wish to ask questions later, please contact me on:

Dokowe Thelma Tembo, Lusaka. Cell- 0977- 340992. E-mail: doko87.tembo@gmail.com

This proposal or protocol has been reviewed and approved by HSSREC which is a committee whose task is to make sure that research participants are protected from harm. If you wish to find about more about the IRB, contact:

The Chairperson,
Dr Jason Mwanza,
Humanities and Social Sciences, Research Ethics Committee,
University of Zambia
P O Box 32379
LUSAKA

OR

The Director
Professor. Henry M. Sichingabula
Directorate of Research and Graduate Studies

University of Zambia
P O Box 32379
LUSAKA

Section B: Certificate of Consent

I have been invited to participate in this research on the Evaluation of University Library Portals in Zambia. I have read the foregoing information, or it has been read to me and I have understood it. I have had the opportunity to ask questions about it and any questions that I have asked have been answered to my satisfaction. I will receive no payment for participating in the study. I know that my participation is anonymous and I have access to the data and records at any time. I know that I can stop my participation in this study at any time. I consent voluntarily to answer the questionnaire.

Print Name of Participant: _____

Signature of Participant: _____

Date _____

Statement by Researcher/Person taking consent

I have accurately read out the information sheet to the potential participant and the best of my ability made sure that the participant understands that the following will be done

1. Questionnaires will be administered to them
2. Their answered questionnaires will be kept as confidential documents

I confirm that the participant was allowed to ask questions about the study and all the questions asked by the participant have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent and the consent has been given freely and voluntarily.

A copy of the ICF has been given to the participant.

Print Name of the Researcher/ person taking the consent: _____

Signature of Researcher/person taking the consent: _____

Date: _____

**Contacts for Questions
Principal Investigator**

Names: Dokowe Thelma Tembo
Phone: 0977-340992
Email: doko87.tembo@gmail.com

Appendix C: Questionnaire for the Librarian at the University

The University of Zambia

School of Education

Department of Library and Information Science

Questionnaire

Research Title: Usability Evaluation of Higher Education Institution Library Portals in Zambia

Dear Respondent,

I am a Masters of Library and Information Science student at the University of Zambia, Great East Road researching the title above purely for academic purposes. Please be advised that all 62 Registered Universities Under the Higher Learning Authority (HEA) are being surveyed. The main goal of the questionnaire is to find out whether your Institution’s Library has a Portal or not.

Be assured that the information you will provide in this Questionnaire will be treated with the utmost confidentiality. Your participation will be highly appreciated.

Instructions:

Please answer all questions

1. What is the name of your Learning Institution?

.....

2. What is your position at the Institution?

.....

3. Is your Institution a Public or Private one?

.....

The questions below are in the form of an exercise that requires you to sit before a computer or laptop. You will be required to open the portal whose URL has been given to you. This exercise is called a Heuristic Evaluation which is an expert user evaluation. You have been picked because you are currently pursuing a Master's in Library and Information Science. This Heuristic Evaluation is solely intended to find out the usability problems encountered when using these portals. A usability problem is anything in a product or website that leads a user to an undesirable outcome. A heuristic, in this case, will be deployed to find out the severity of the usability problems. A heuristic is an aid to learning, discovery, or problem-solving by experiment. The severity ratings will rank from 1-5. With;

- 1- Cosmetic; issue does not affect usability but should be fixed
- 2- Minor; low priority. Users easily find a workaround but the issue should be fixed.
- 3- Medium; medium priority. Users find the problem but can easily adapt, but the issue needs to be fixed.
- 4- Major; users find workarounds with some difficulty. Issues should be fixed.
- 5- Catastrophic; users cannot find workarounds and the issue needs to be fixed immediately.

Before you begin the exercise kindly go to the URL that is provided below and familiarise yourself with the portal. You will be required to read and understand the heuristic then carry out the task and rate it using the severity scale and finally provide a comment. If you are stuck or would like any clarification kindly feel free to get in touch with me on 0977340992 or doko87.tembo@gmail.com.

Section A: Background Information

1. Are you currently employed in a University Library?
 - A. Yes
 - B. No

2. If the answer to one above is yes, how many years of experience do you have?
 - A. 0-5 years
 - B. 5-10 years
 - C. 10-15years
 - D. Over 15 years

3. If the answer to 1 above is No, do you have any work experience in a University Library?
- A. Yes
- B. No
4. Is your Undergraduate degree in Library and Information Science?
- A. Yes
- B. No

Section B: Heuristic Evaluation

Please type in the URL of the portal being evaluated in your web browser.

Heuristic	Task	Rating	Comments
<p>Federated Search A multiple or simultaneous search across multiple electronic sources that are present on the library portal and then return results in a consistent library customizable format for example a search query should be able to search through all the databases that are present on the portal and return in a usable format.</p>	<p>Click on the search icon at the top far right and key in the search query Business Accounting, the results are supposed to yield information or metadata from all databases, journals, or books on the portal. Rate this task 1-5 using the severity scale based on the resulting outcome.</p>		
<p>User Authentication Users may be categorized as patron and administrative users. Patron authentication determines whether patrons are authorized for service or not via the use of usernames and passwords</p>	<p>On your left side is the icon "Quick Links". To access the services listed there such as the e-journals, does one require a unique username and password? Rate the answer 1-5 on the severity scale.</p>		
<p>Resource Linking This allows a library portal system to seamlessly integrate</p>	<p>On the far left of your screen, you will see the icon Quick Links, below it is the link</p>		

<p>with electronic resources. For example, an author could be linked to his/her book or a record could be linked to an image.</p>	<p>Catalogue, click on it. When the Catalogue screen comes on, please enter the search Research Methods in the search provision and press enter. Then click on any title (a bibliographic record) from the results and observe if it will link you to an abstract or index that can further link to a full-text database. How usable is this feature when rated 1-5 on the severity scale?</p>		
<p>Interactive services. Library web portals can provide interactive services like forums, blogs, tagging, sharing information</p>	<p>Browse through the library home page and check if any of these services are available. Rate usability according to a severity scale of 1-5.</p>		
<p>Electronic Version of Traditional Library Services. Services such as; online tutorials, book renewals, interlibrary loan requests and status reports, requests for purchase, online chat reference, virtual tours of the building, access to library content-catalogue, indexes, full-text magazines and journals, digitized special collections, free and commercial ebooks</p>	<p>Check for the availability of these services on the library home page. Rate the usability of this feature according to the severity scale of 1-5.</p>		
<p>Information about the Library.</p>	<p>Availability of “information about”</p>		

<p>Components of information of staff, directories, departmental descriptions, maps of the building, opening hours, contact information, etc</p>	<p>on the library home page. Rate usability according to a severity scale of 1-5.</p>		
--	---	--	--

The End

Thank you

Appendix E: Student User Perception of the Library

The University of Zambia

School of Education

Department of Library and Information Science

Questionnaire

Research Title:

Usability Evaluation of Higher Education Institution Library Portals in Zambia

Dear Respondent,

I am a Masters of Library and Information Science student at the University of Zambia, Great East Road researching the title above purely for academic purposes.

Be assured that the information you will provide in this Questionnaire will be treated with the utmost confidentiality. Your participation will be highly appreciated.

Instructions:

1. Kindly answer all questions

Strongly disagree
agree

Strongly

--	--	--	--	--

1

2

3

4

5

11. I would imagine that most people would learn to use the Library portal very quickly.

Strongly disagree
agree

Strongly

--	--	--	--	--

1

2

3

4

5

12. I found the Library portal very cumbersome to use.

Strongly disagree
agree

Strongly

--	--	--	--	--

1

2

3

4

5

13. I felt very confident using the Library portal.

Strongly disagree
agree

Strongly

--	--	--	--	--

1

2

3

4

5

14. I needed to learn a lot of things before I could get going with the Library portal.

Strongly disagree
agree

Strongly

--	--	--	--	--

1

2

3

4

5

THE END

Thank you for taking the time to answer this questionnaire

Appendix F: Lecturer User Perception of the Library

The University of Zambia

School of Education

Department of Library and Information Science

Questionnaire

Research Title:

Usability Evaluation of Higher Education Institution Library Portals in Zambia

Dear Respondent,

I am a Masters of Library and Information Science student at the University of Zambia, Great East Road researching the title above purely for academic purposes.

Be assured that the information you provide in this Questionnaire will be treated with the utmost confidentiality. Your participation will be highly appreciated.

Instructions:

1. Kindly answer all questions
2. Do not write your name or identity information on the Questionnaire.
3. For Section B, kindly rank each question from 1 to 5 based on how much you agree with the statement. 1 means completely disagreeing while 5 means completely agreeing.

Section A: Background Information

1. What is your sex?

B. Male []

B. Female []

1. What faculty are you lecturing in?

.....
.....

2. How often do you use the library portal?

A. Frequently []

B. Not frequently []

C. Do not use it []

3. What faculty are you lecturing in?

.....

Section B: Usability Perceptions of the Library Portal

4. I think that I would like to use this Library portal frequently.

Strongly disagree
agree

Strongly

--	--	--	--	--

1

2

3

4

5

5. I found the Library portal unnecessarily complex.

Strongly disagree
agree

Strongly

--	--	--	--	--

1

2

3

4

5

6. I thought the Library portal was easy to use.

Strongly disagree
agree

Strongly

--	--	--	--	--

1

2

3

4

5

7. I think that I would need the support of a technical person to be able to use the Library portal.

Strongly disagree
agree

Strongly

--	--	--	--	--

1

2

3

4

5

8. I found the various functions in the Library portal were well integrated.

Strongly disagree
agree

Strongly

--	--	--	--	--

1

2

3

4

5

9. I thought there was too much inconsistency in the Library portal.

Strongly disagree
agree

Strongly

--	--	--	--	--

1

2

3

4

5

10. I would imagine that most people would learn to use the Library portal very quickly.

Strongly disagree
agree

Strongly

--	--	--	--	--

1

2

3

4

5

11. I found the Library portal very cumbersome to use.

Strongly disagree
agree

Strongly

--	--	--	--	--

1

2

3

4

5

12. I felt very confident using the Library portal.

Strongly disagree
agree

Strongly

--	--	--	--	--

1

2

3

4

5

13. I needed to learn a lot of things before I could get going with the Library portal.

Strongly disagree
agree

Strongly

--	--	--	--	--

THE END

Thank you for taking the time to answer this questionnaire.

Appendix G: Research and Ethical Clearance



THE UNIVERSITY OF ZAMBIA

DIRECTORATE OF RESEARCH AND GRADUATE STUDIES

RESEARCH DEPARTMENT

APPROVAL OF STUDY

15th September 2020.

REF NO.HSSREC-2020-JUL-031

Dokowe Thelma Tembo
LUSAKA

Dear Ms. Tembo,

RE: “A USABILITY ASSESSMENT OF IMPLEMENTED UNIVERSITY LIBRARY PORTALS IN ZAMBIA”

Reference is made to your protocol dated 1st July 2020. HSSREC resolved to approve this study and your participation as Principal Investigator for a period of one year.

REVIEW TYPE	ORDINARY REVIEW	APPROVAL NO. HSSREC-2019- MAY-031
Approval and Expiry Date	Approval Date: 15 th September, 2020	Expiry Date: 14 th September, 2021
Protocol Version and Date	Version - Nil.	14 th September, 2021
Information Sheet,	• English.	To be provided

Consent Forms and Dates		
Consent form ID and Date	Version - Nil	To be provided
Recruitment Materials	Nil	Nil
Other Study Documents	Questionnaire.	
Number of Participants Approved for Study		

Specific conditions will apply to this approval. As Principal Investigator it is your responsibility to ensure that the contents of this letter are adhered to. If these are not adhered to, the approval may be suspended. Should the study be suspended, study sponsors and other regulatory authorities will be informed.

Conditions of Approval

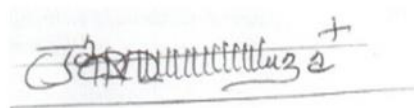
- No participant may be involved in any study procedure prior to the study approval or after the expiration date.
- All unanticipated or Serious Adverse Events (SAEs) must be reported to HSSREC within 5 days.
- All protocol modifications must be approved by HSSREC prior to implementation unless they are intended to reduce risk (but must still be reported for approval). Modifications will include any change of investigator/s or site address.
- All protocol deviations must be reported to HSSREC within 5 working days.
- All recruitment materials must be approved by HSSREC prior to being used.
- Principal investigators are responsible for initiating Continuing Review proceedings. HSSREC will only approve a study for 12 months.
- It is the responsibility of the PI to renew his/her ethics approval through a renewal application to HSSREC.
- Where the PI desires to extend the study after expiry of the study period, documents for study extension must be received by HSSREC at least 30 days before the expiry date. This is for the purpose of facilitating the review process. Documents received within 30 days after expiry will be labelled “late submissions” and will incur a penalty fee of K500.00. No study shall be renewed whose documents are submitted for renewal 30 days after expiry of the certificate.
- Every 6 (six) months a progress report form supplied by The University of Zambia Humanities and Social Sciences Research Ethics Committee as an IRB must be filled in and submitted to us. There is a penalty of K500.00 for failure to submit the report.

- When closing a project, the PI is responsible for notifying, in writing or using the Research Ethics and Management Online (REMO), both HSSREC and the National Health Research Authority (NHRA) when ethics certification is no longer required for a project.
- In order to close an approved study, a Closing Report must be submitted in writing or through the REMO system. A Closing Report should be filed when data collection has ended and the study team will no longer be using human participants or animals or secondary data or have any direct or indirect contact with the research participants or animals for the study.
- Filing a closing report (rather than just letting your approval lapse) is important as it assists HSSREC in efficiently tracking and reporting on projects. Note that some funding agencies and sponsors require a notice of closure from the IRB which had approved the study and can only be generated after the Closing Report has been filed.
- A reprint of this letter shall be done at a fee.
- All protocol modifications must be approved by HSSREC by way of an application for an amendment prior to implementation unless they are intended to reduce risk (but must still be reported for approval). Modifications will include any change of investigator/s or site address or methodology and methods. Many modifications entail minimal risk adjustments to a protocol and/or consent form and can be made on an Expedited basis (via the IRB Chair). Some examples are format changes, correcting spelling errors, adding key personnel, minor changes to questionnaires, recruiting and changes, and so forth. Other, more substantive changes, especially those that may alter the risk-benefit ratio, may require Full Board review. In all cases, except where noted above regarding subject safety, any changes to any protocol document or procedure must first be approved by HSSREC before they can be implemented.

Should you have any questions regarding anything indicated in this letter, please do not hesitate to get in touch with us at the above-indicated address.

On behalf of HSSREC, we would like to wish you all the success as you carry out your study.

Yours faithfully,



Dr. J. Mwanza
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CHAIRPERSON
THE UNIVERSITY OF ZAMBIA HUMANITIES AND
SOCIAL SCIENCES RESEARCH ETHICS COMMITTEE - IRB

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APPENDIX H: 4th African Human Computer Interaction Conference Publication Usability Evaluation of University Library Portals in Zambia

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The Republic of Zambia has a total of 68 Higher Education Institutions (HEIs) accredited with the Higher Education Authority (HEA) of Zambia. The increase in the number of HEIs has necessitated the need to comprehensively evaluate the usability of services offered via Library Portals. This paper outlines a study conducted to investigate and establish the relative usability of library portals associated with HEIs in Zambia. The specific objectives of the study were to establish the extent to which universities in Zambia have adopted library portals; to determine if key library portal features have been integrated into existing library portals in Zambia, and to determine the users' perceived usability of library portals in HEIs. The study used a mixed-method design. Questionnaires were administered to all HEIs in Zambia to determine HEIs with functional library portals. A heuristic evaluation was carried out by 12 experts in to ascertain the library portal services and characteristics. The findings revealed that not all six characteristics or traits have been included in the adopted library portals. Finally, the System Usability Scale was used to determine the users' (20 Lecturers and 304 students) perceptions of the library portals. The findings revealed that only three (3) HEIs—ZCAS University (ZCAS), Mulungushi University (Mulungushi), and the University of Zambia (UNZA) have adopted library portals. The computed average SUS scores were UNZA 51.26 ($p=0.01$), ZCAS 59.31 ($p=0.8435$) and Mulungushi 53.26 ($p=0.01$). The SUS scores from the three (3) HEIs suggest that the perceived usability for the HEIs falls under 'Ok', which according to the acceptability score is under the marginal area. The results of the study suggest that there is a need for the HEIs in Zambia to take a keen interest in the re-design of their Library Portals as this increases the provision of information and removes the distance barrier.

CCS CONCEPTS • Human-computer interaction (HCI) • HCI design and evaluation methods
• Usability testing.

Additional Keywords and Phrases: Heuristic Evaluation, Usability, Satisfaction, Usefulness, Web Portals

ACM Reference Format:

1 INTRODUCTION

Driven by an effort to better serve customers, many libraries of Higher Education Institutions (HEI) have developed and implemented Library Portals. In line with the growing number of academic universities implementing Library Portals, there is also growing interest among researchers to investigate the effectiveness of these portals [1].

Users quickly scan a webpage to determine whether they have what they need. Arguably, users are also preoccupied with the following dilemmas as they navigate the website: can the site answer the user's information needs? If so, can the user find it with minimal mental effort while having their query sorted with maximum effectiveness and satisfaction [2]? It is against this background that the usability of academic Library Portals is essential. Usability is defined as the extent to which a product can be used by users to achieve specific goals with effectiveness, efficiency, and satisfaction in a specified context of use [3].

The increase in the number of HEIs in Zambia—53 private HEIs and 15 public HEIs — registered under the Higher Education Authority (HEA) has seen an increase in the number of portals, portals that need to have their usability evaluated. This increase brought about the research problem which was to investigate and establish the relative usability of these university portals and identify their usability issues. The HEA provides a document called Regulations for the Registration of Private Higher Education Institutions and the Accreditation of HEI's that stipulates that for the same to be registered and have their programs accredited one of the requirements is that these institutions are to provide facilities and platforms for e-learning [4]. This mandates these university libraries to provide electronic resources that are required to provide e-learning facilities through portals. What distinguishes a Library Portal from any ordinary portal gateway is that it augments the user interface with federated searching, patron authentication, and link resolution [5]. The study also sought to investigate if these principles that distinguish Library Portals from ordinary ones had been incorporated into the implementation process of these university Library Portals.

The main objective of the study was to evaluate the usability of university Library Portals in Zambia. Specifically, the study aimed to comprehensively investigate the extent to which universities in Zambia have adopted Library Portals was conducted. In addition, the study was aimed at investigating key Library Portal features or characteristics that have been integrated into existing university Library Portals in Zambia. Finally, this work was aimed at experimentally determining users' perceived usability of Library Portals in universities in Zambia.

The remainder of this paper is organised as follows: Section 2 discusses existing literature relevant to the study; Section 3 outlines the methodological approach used in this work; Section 4 presents the results of data collected during the study; Section 5 is a discussion of the results and, finally, Section 6 presents concluding remarks, recommendations, and potential future work.

Ejikeme and Ukamaka [6] mentioned in their work that research reflects the growing importance of portals in higher education institutions around the world. The research, which was carried out with senior representatives of 47 institutions in the UK, USA, Canada, Italy, Singapore, and Australia, revealed that a total of 96% of the respondents were planning, developing, or currently implementing an institutional portal and most respondents considered the development of institutional portals to be important to their institution.

Fatima et al. [7] explained the purpose of the development of people-centred portals and suggested some directions for the future development of the same. Currently, most libraries' web portals are inventories and access points for information. Libraries are facing a new generation of online users who are technologically savvy and integrate information access. They approach traditional libraries with a certain expectation that may conflict with the existing services, policies, and values of the library as an information broker. Thus, the Library Portal became the greatest information discovery tool, and many university libraries started implementing Library Portals [8]. To achieve the high quality of a Library Portal, the designers must first understand the different quality dimensions that users expect, and then relate the quality characteristics to the design features.

Brahma and Verma assessed the usability of the current status of library websites of top 25 Universities of India ranked in National Institutional Ranking Framework (NIRF) and found that the design of library websites failed to consider how people approach the information problem [9]. The authors also presented a few recommendations to increase the portal's usability by overcoming the lacunas in the design and development of the Library Portal. Mane and Panage in their study evaluated e-portals providing access to e-resources such as Elsevier Science Direct, Project Gutenberg, Digital Library of India, University of Virginia Library (E-Text century), and Batlleby.com, using twenty selected parameters and found that the majority of the respondents gave average value to their Library Portal provision of course material and useful links; and that they needed instructions and help for the effective utilization of resources on the Library Portal [8]. The results also indicated that less effort/resources should be devoted to personalization and customization, and more to making sure that websites are easy to use.

The table below shows how different authors have explained usability measures used in various usability definitions and goals of usability.

Table 1: Usability measures used in various usability definitions and goals of usability.

Term	Hamid [10]	Preece, Rodgers and Sharp [11]	Shneiderman et al. [12]
Effectiveness	X	Effectiveness	X
Efficiency	Efficiency	Efficiency	Speed of Performance
Learnability	Learnability	Learnability	Time to Learn
Memorability	Memorability	Memorability	Retention Over Time
Safety	Few Errors	Safety	Rate of Errors by Users
Satisfaction	Satisfaction	X	Subject Satisfaction
Utility	X	Utility	X

2 METHODOLOGY

The study used a mixed-method approach. Through quantitative research, there was need to understand the relationships between variables. A variable will be a characteristic, value, attribute, or behaviour that is of interest. The study further adopted a survey design as it provided a quantitative or numeric description of trends, attitudes, or opinions of a population by studying a sample of that population.

2.1 University Library Adoption of Portals

To determine the rate of adoption of Library Portals, an online questionnaire was distributed to Librarians in all HEIs in Zambia. The questionnaire was, in part, used to obtain URLs corresponding to Library Portals in the HEIs.

A preliminary heuristic evaluation of URLs specified in the responses was then conducted using a checklist comprising characteristics of Library Portals. This process involved a physical inspection of each Library Portal URL corresponding to the HEIs.

2.2 Investigation of Characteristics or Guidelines used in the Adoption Process

A heuristic evaluation was employed to determine Library Portal features integrated in Library Portals corresponding to the HEIs. Experts were recruited amongst postgraduate students enrolled into the Master in Library and Information Science programme at the University of Zambia. Participants were purposively sampled from a population of 20 postgraduate students. According to Nielson, three to five participants are appropriate for a heuristic evaluation as a type of usability testing [13].

The participants were required to inspect Library Portals corresponding to four (4) HEIs— Stellenbosch University (Stellenbosch), Mulungushi University (Mulungushi), University of Zambia (UNZA) and ZCAS University (ZCAS), shown in Figures 1, 2, 3 and 4, respectively— and subsequently respond to questions in a heuristic evaluation measurement instrument. Questionnaire items required respondents to provide a rating, on a 5-point Likert Scale—1 for cosmetic, 2- for minor, 3- for medium, 4-major and 5- for catastrophic— and, additionally, provide a brief explanation for their response. The checklist was arrived at by using the principles used in the creation of portals as derived from literature. The Stellenbosch Library Portal was selected as a gold standard Library Portal to be used as a basis for ratings.

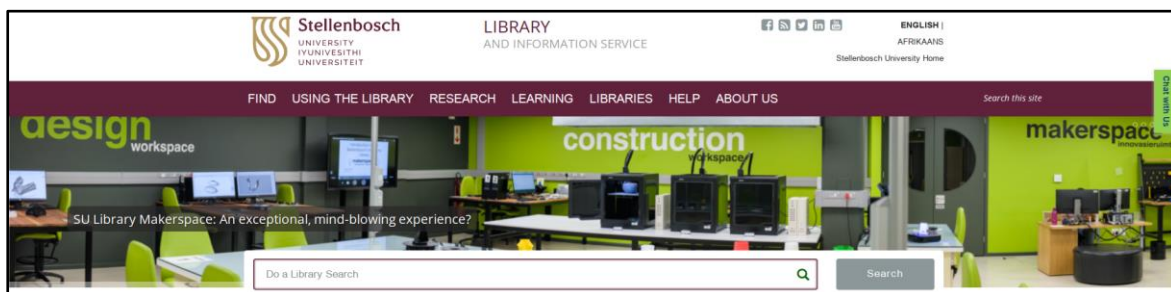


Figure 1: Stellenbosch University Library Portal Dashboard

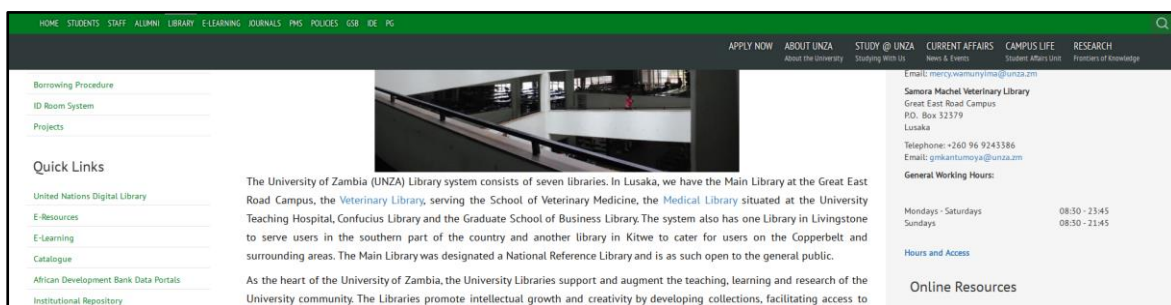


Figure 2: University of Zambia Library Portal Dashboard

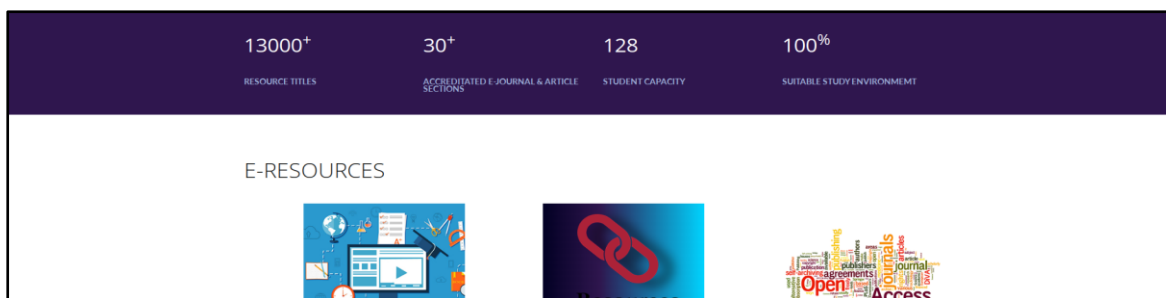


Figure 3: ZCAS University Library Portal Dashboard

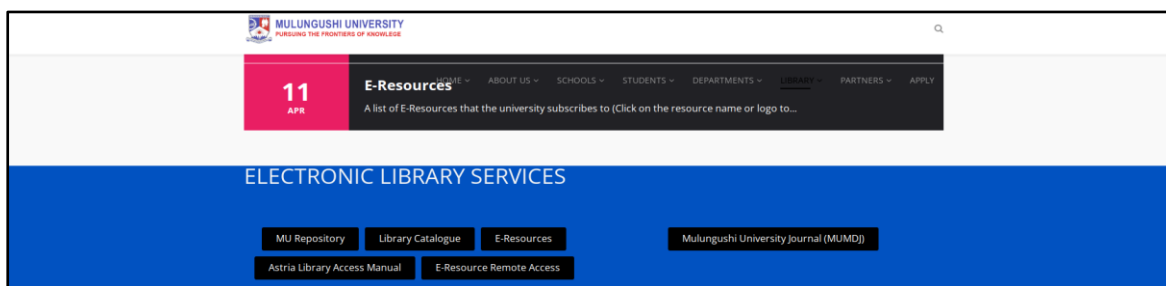


Figure 4: Mulungushi University Library Portal Dashboard

2.3 Exploring User Perceptions of the Usability of the Portals

The third objective was to investigate the user perceptions of the usability of these portals. These portals are those that were obtained from the initial heuristic evaluation carried out in objective one. Participants included students and lecturers at their respective universities as these are the main users of the portals. Convenience sampling was used in the study. This was used because respondents were chosen based on their convenience and availability.

The results obtained from the data collection in Objective one gave an accurate number of universities that had implemented Library Portals which was then divided into 384 to get an equal number of representatives for all universities. Therefore, each university was allocated 128 questionnaires. 108 questionnaires were for the students and 20 for lecturers at each university. Online questionnaires were sent to all the lecturers to increase the usability testing and have a broader scope of results. The quantitative data were collected using online questionnaires that were generated using a System Usability Scale (SUS) questionnaire. The SUS is a standardized questionnaire designed to assess perceived usability and has 10 items each with 5 steps anchored with strongly disagree and strongly agree. It is a mixed tone questionnaire in which the odd numbered items have a positive tone and the even numbered items have a negative tone [14].

384 questionnaires were administered to the three HEIs. Each institution was allocated 128 questionnaires. 20 lecturers from all three universities responded to the questionnaires. To determine the usability of the university Library Portal the Systems Usability Scores (SUS) method was used. The SUS scores were calculated by adding up the total score for all odd-numbered questions (1,3,5,7 and 9), then subtracting 5 from the total to get (X). Added up the total score for all even-numbered questions (2,4,6,8 and 10), then subtract that total from 25 to get (Y). Then add up the total score of the new values (X+Y) and multiply by 2.5.

3 RESULTS

3.1 Adoption of Library Portals in Zambian Universities

From the 68 contacts obtained from the HEA, only 28 contacts were reachable. Emails were sent to these contacts. These responded and provided their URLs and stated if they had websites. The remaining 40 did not have websites. From the 28 that responded, two indicated that they did not have websites. The results of the preliminary heuristic evaluation showed that only three universities in Zambia have Library Portals. These were Mulungushi, UNZA and ZCAS.

3.2 Investigation of Characteristics or Features Used in the Adoption of University Library Portals

Objective two involved carrying out a heuristic evaluation to investigate the features or characteristics implored in the adoption of the university Library Portals. The three universities (ZCAS, UNZA, and Mulungushi) were evaluated together with the exemplar Stellenbosch University (Stellenbosch) portal. Stellenbosch¹⁷ was used as an exemplar portal because after an evaluation was carried out by the researcher it possessed all the characteristics of Library Portals mentioned in the literature. The table below represents the results from the heuristic evaluation and the ratings found by the evaluators. The number in the brackets represents the number of evaluators that arrived at that rating.

Table 2: Heuristic Evaluation Results

Heuristic Evaluation	Stellenbosch	ZCAS	UNZA	Mulungushi
Federated Search	Cosmetic (1) Minor (1)	Cosmetic (2) Minor (1) Catastrophic (1) Major (1)	Medium (4)	Cosmetic (2)
User Authentication	Cosmetic (2) Minor (1)	Cosmetic (1) Minor (1)	Major (1) Catastrophic (1)	Cosmetic (1) Catastrophic (1)
Resource Linking	Cosmetic (1) Minor (1) Medium (1)	Cosmetic (3) Medium (1) Major (1) Catastrophic (1)	Cosmetic (1) Medium (1)	Cosmetic (1) Catastrophic (1)
Interactive Services	Cosmetic (1) Medium (2)	Cosmetic (1) Medium (1) Major (1) Catastrophic (1)	Catastrophic (2)	Cosmetic (1) Catastrophic (1)

¹⁷ <https://library.sun.ac.za/en-za/Pages/Home.aspx>

Heuristic Evaluation	Stellenbosch	ZCAS	UNZA	Mulungushi
Electronic Version of Traditional Library Services	Cosmetic (3)	Cosmetic (1) Medium (2) Major (1) Catastrophic (1)	Minor (1) Catastrophic (1)	Cosmetic (2)
Information about the Library	Cosmetic (3)	Cosmetic (1) Minor (1) Medium (2) Catastrophic (1)	Major (2)	Cosmetic (2)

3.3 User Perception of Usability of The Portals

The individual SUS scores for each of the participants were computed using the standard approach [14]. The average SUS scores were subsequently computed for each of the three (3) HEIs. In addition, average SUS scores were computed relative to the demographic factors included in the questionnaire: Gender, Level of Study, Number of years lecturing and Faculty for lecturers while for students the demographic factors included: Gender, Programme enrolled, Year of Study and Discipline.

The SUS scores were interpreted using Acceptability Ratings, Adjective Ratings Net Promoter Scores (NPS) and overall Grades, as shown in Figure 5.

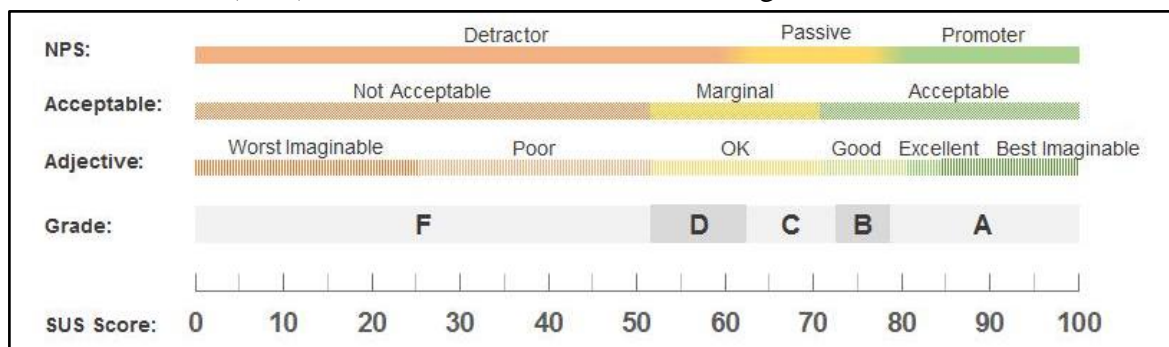


Figure 5: SUS Score Interpretation Using Net Promoter Scores, Acceptable Scales, Adjective Ratings and Grade

3.3.1 Lecturer User Perception of Usability of The Portals

The average SUS scores were 50.5 (n=5), 56.1 (n=9) and 61.25 (n=6) for Mulungushi, UNZA and ZCAS, respectively. The Mulungushi SUS score was 50.5 which fell under ok on the adjective rating scale while the UNZA SUS score was 56.11 which was acceptable under the same. ZCAS SUS score was 61.25 which was also acceptable on the adjective scale (figure 5). Under the acceptability rating scale, Mulungushi was at 50.5 and not acceptable. UNZA SUS score was 56.11 which was marginal on the acceptability rating scale. ZCAS at 61.25 was marginally acceptable on the scale (figure 6). On the NPS, Mulungushi (50.5) was a detractor while UNZA at 56.11 was also a detractor. ZCAS with a SUS score of 61.25 was still a detractor (Figure 6).

3.3.2 Student User Perception of Usability of the Portals

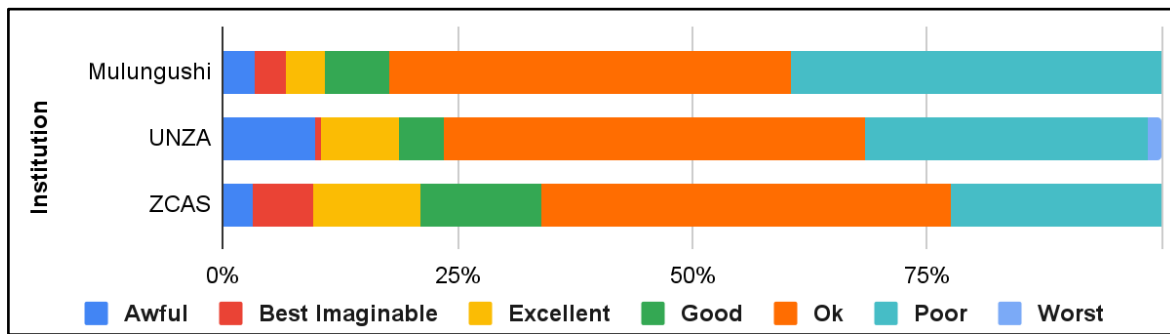


Figure 6: SUS Comparison to Adjective Ratings

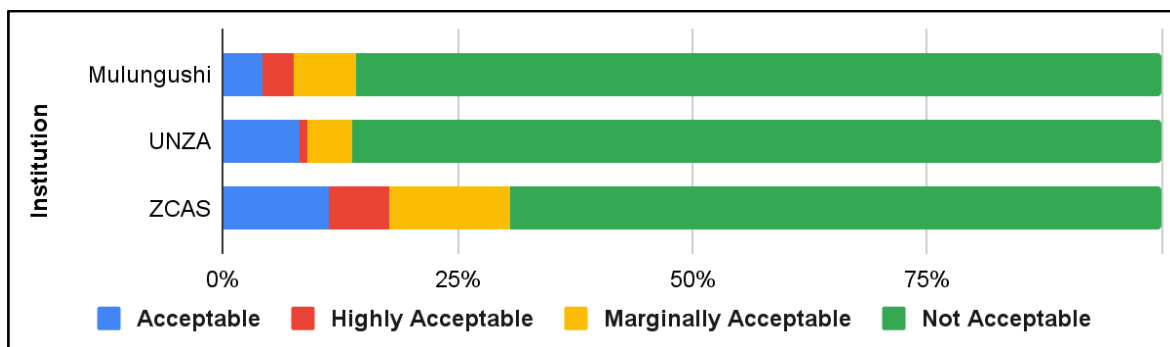


Figure 7: SUS Comparison to Acceptability Ratings

Figures 6 and 7 show the students Adjective Ratings and Acceptability Ratings for the three HEIs, while Table 3 shows a summary of participants' demographic details associated with student participants, including the corresponding average SUS scores for each demographic factor.

Table 3: Demographics and SUS Scores for Student Study Participants

		Mulungushi		UNZA		ZCAS	
		Count	μ SUS	Count	μ SUS	Count	μ SUS
Gender	Male	54	54.5	63	53.3	40	60.1
	Female	65	52.2	60	49.1	22	58.0
Level of Study	Undergraduate	105	52.1	115	50.2	49	59.3
	Postgraduate	14	61.8	8	65.3	13	59.2
Programme Study Area	Business	74	56.1	10	54.0	35	57.9
	Social Science	8	50.9	75	51.1	20	60.8
	STEM	36	47.8	37	50.5	7	62.1
	Unclassified	1	57.5	1	62.5	0	—

Out of the 304 students that responded to the study, 48% of these were female while 52% were male. Of the 304 respondents, 88% were enrolled in undergraduate programs while 12% were enrolled in postgraduate programs. The average SUS scores were 53.2 (n=119, p=0.01981), 51.3 (n=123, p=0.01221) and 59.3 (n=62, p=0.8435) for Mulungushi, UNZA and ZCAS, respectively. The SUS scores indicate that the Library Portals for all the three (3) HEIs were rated as “Ok” on the Adjective Rating scale and “Marginal” on the Acceptability Scale. In addition, the average NPS scores suggest a higher proportion of “Detractors” amongst the participants, indicating a lower level of satisfaction and a decreased likelihood of recommending the system to others.

4 DISCUSSION OF RESULTS

4.1 Adoption of Library Portals in Higher Education Institutions in Zambia

The findings established that to a larger extent, many university libraries had not adopted Library Portals. The results showed that out of the 26 universities which had fully functional websites as verified through their Universal Resource Locator (URL), only three libraries had adopted Library Portals.

4.2 Portal Feature Integration into Existing Library Portals

Six features or characteristics namely federated search, user authentication, resource linking, interactive services, electronic version of traditional library services as well as information about the library were determined.

From the findings, despite the three Universities having functional Library Portals, there were challenges related to how the information was accessed by patrons. A similar study was conducted on website usability and content accessibility of the top 50 United States of America Universities. Factors used to investigate were accessibility and usability. Findings revealed that most of the university websites' usability rating was very low, while in the case of the website content accessibility guide, the complaint rate was very low [15].

Valenti supports the assertion that a library interface and how to surf it plays a role in usability [16]. The study on usability testing in a library observed that website redesign projects revealed that users are overwhelmed and confused with the initial interface and that there are too many resource choices offered from the first screen with no explanation about their use. However, usability should refer to the extent to which a website is easy to exploit, resourceful in performing a specific task, and satisfactory for end users.

4.3 User Perceptions of the Usability of the University Library Portals

The study established that most students had average usability of the Library Portals. Furthermore, lecturers also had an average perception towards the usability of the Library Portals. Therefore, from the (SUS) scale the 3 universities fall under ‘ok’ and ‘good’ termed as marginal on the acceptability scale. These findings can be attributed to the orientation of both students and lecturers towards available information on the Library Portal. Furthermore, other attributing factors could be the time taken for the portal to respond to the need of patrons as well as the limited internet bandwidth that inhibits many libraries from meeting the needs of its patrons. The findings on average perception towards usability are attributed to an observation made by Matusiak [17]. She noted that limited utilization of digital libraries is linked to the perceptions such as library systems being viewed as not being user-friendly, which

in turn discourages potential users from exploring digital Library Portals provided by academic libraries. She further observed that academic libraries are perceived as places of primarily textual resources; perceptions of usefulness, especially regarding the relevance of content, coverage, and currency, seem to harm user intention to use Library Portals, especially when searching for visual materials.

4.3.1 Impact of Demographic Factors on SUS Scores

The discipline and year of the study did not have any significant influence on the SUS scores at all three universities. The findings of this study are different from the findings of similar studies, for example, Ng et al. in their study undertaken to investigate the effects of demographic factors of age, gender, education level, major discipline, work nature, and years of work experience on the usability assessment of safety signs [18]. The relationship between SUS score and comprehension accuracy and the colour associations for sign design was also assessed. Three hundred and eight were first asked to complete a self-administered questionnaire on safety sign comprehension and then a modified SUS questionnaire. The results showed that education level was the only demographic factor that had a major effect on sign usability. Participants with a higher diploma education perceived the sign usability significantly better than the diploma students.

5 CONCLUSION, RECOMMENDATIONS AND FUTURE WORK

5.1 Conclusion

From the study conducted, it is evident that, many university libraries have not adopted Library Portals and that this remains a far-fetched dream as many universities are still lagging with non-functional websites. The results showed that out of the 26 universities that had fully functional websites as verified through their URLs' only three libraries had adopted Library Portals. Secondly, the study established issues focusing on the six characteristics of portals. All three portals had challenges related to the six characteristics that they were subjected to ranging from cosmetic to catastrophic on the Likert scale and need to be worked on.

The last objective established that most of the lecturers and students had average usability of the Library Portals. Furthermore, lecturers also indicated an average perception towards the usability of the Library Portals. Therefore, from the System Usability Scale the three Universities fell under 'ok' and 'good' termed as marginal on the acceptability scale. The SUS is a standardized questionnaire designed to assess perceived usability and has 10 items each with 5 steps anchored with strongly disagree and strongly agree. It is a mixed tone questionnaire in which the odd numbered items have a positive tone, and the even numbered items have a negative tone [14].

5.2 Recommendations

From the results obtained in the study, only three (3) universities had Library Portals. There is a need for the 68 universities to take a keen interest in developing their Library Portals as this increases the provision of information and removes the distance barrier.

The three universities that have Library Portals should take a keen interest in improving their existing portals so that they possess all the necessary characteristics that comprise Library Portals by understanding what the needs off the users are through a survey. Once this is done the patronage of the portals will increase if their services are also advertised and benefits shown

to users. An increase in resource allocation by the respective University Management is required to improve the current existing portals in the 3 universities as this will enable them to procure powerful search tools and purchase various resources such as eBooks, articles and databases. Library portals need to be mobile phone friendly so that users can access them easily.

The SUS scores show that the level of use of the Library Portals is low with the general SUS score for all three universities being ok to poor (adjective rating), marginal to marginally accepted (acceptability rating scale) and Detractors (NPS) scores. This shows that there is a need for improvement in the design and content of these portals to attract larger patronage.

5.3 Future Work

The study was carried out to evaluate university library portals in Zambia. It identified that all the universities in Zambia need to effectively adopt portals as a means of information provision. Therefore, it has brought out reason for future research that could involve study of the impact of usability on the use of university library portals, development of a usability testing tool specifically for university library portals, the development of guidelines for designing and developing user-friendly university library portals and also the study of the usability of university library portals for different tasks, such as searching for information, finding books and articles, and using electronic resources.

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