Usability Evaluation of University Library Portals in Zambia

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The Republic of Zambia has a total of 68 Higher Education Institutions (HEI's) 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

Many libraries of Higher Education Institutions (HEI) have created and deployed Library Portals to better serve their patrons. Researchers are becoming more interested in examining the efficiency of these portals in conjunction with the rise in the number of academic colleges using library 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 el. 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.

In their evaluation of the usability of the top 25 universities in India according to the National Institutional Ranking Framework (NIRF), Brahma and Verma discovered that the design of library websites did not consider how users approach the information problem [9]. The writers also provided some suggestions for filling in the gaps in the Library Portal's design and development to improve the usefulness of the portal. In their study, Mane and Panage used twenty selected parameters to evaluate e-portals that offered 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. They found that most respondents gave their library portal's provision of course material and useful

links an average value and that they needed guidance and assistance for the effective use of the resources. The findings also suggested that user-friendliness should come first and that personalization and customisation should receive less attention and resources.

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

3 METHODOLOGY

The study used a mixed-method approach. Through quantitative research, understanding the connections between the different factors was necessary. An interesting property, value, attribute, or behaviour will be a variable. The study also used a survey methodology because it examined a sample of a population to produce a quantitative or numerical account of its trends, attitudes, or opinions.

3.1 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.

3.2 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.
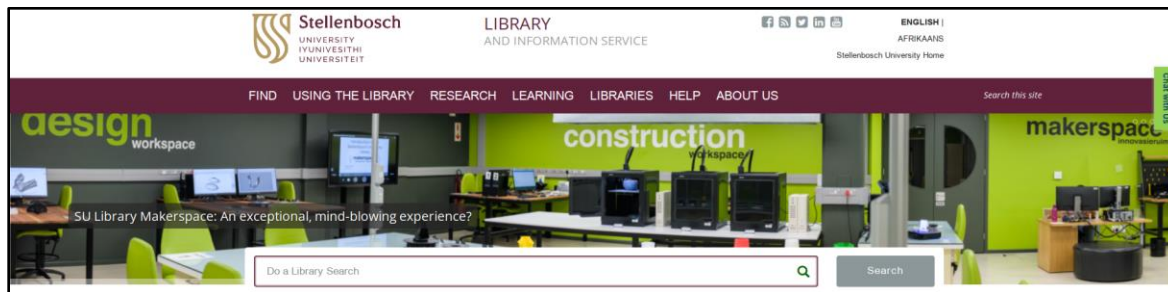
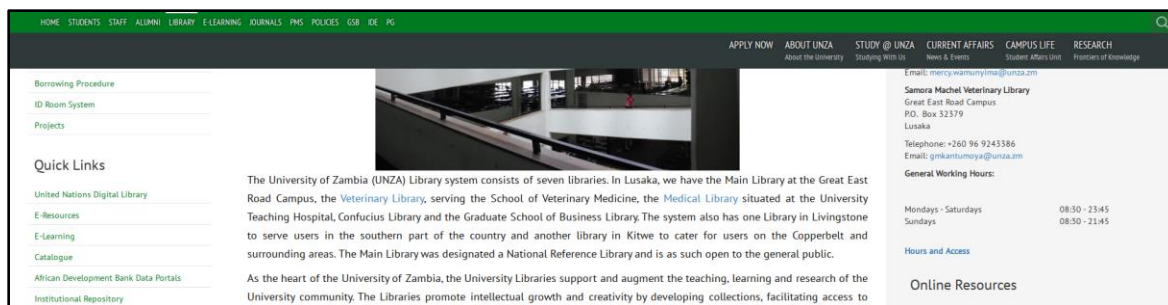Figure 1: Stellenbosch University Library Portal Dashboard

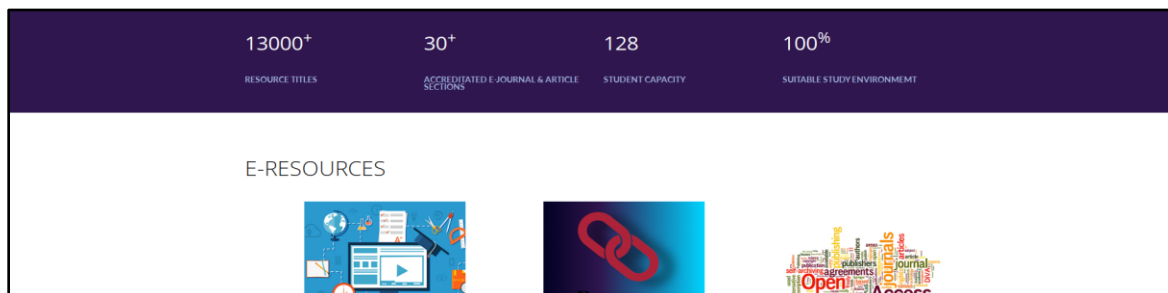Figure 2: University of Zambia Library Portal Dashboard

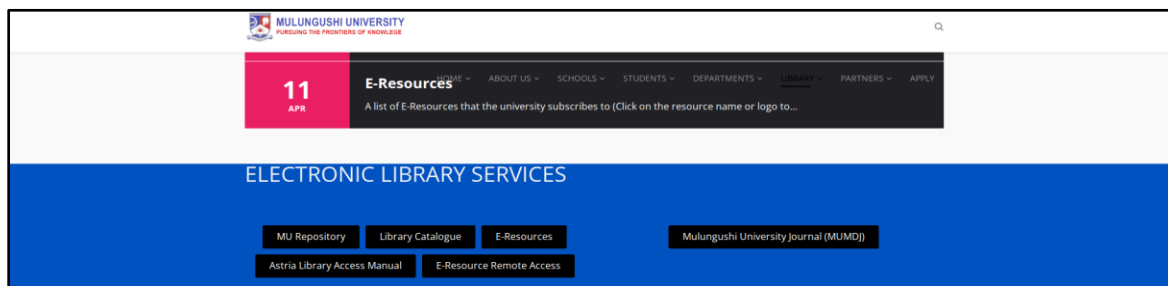Figure 3: ZCAS University Library Portal Dashboard

Figure 4: Mulungushi University Library Portal Dashboard

3.3 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 with 10 items and 5 steps for each, with strongly disagree and strongly agree as the anchors. Its purpose is to evaluate perceived usefulness. The questionnaire has a mixed tone, with the even numbered items having a negative tone and the odd numbered items having a positive 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 obtain (Y) by deducting that total from 25. The final step is to multiply the final score of the new values (X+Y) by 2.5

4 Results

4.1 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.

4.2 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. Stellenbosch[1] 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.

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[1] https://library.sun.ac.za/en-za/Pages/Home.aspx

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)
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)

4.3 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.
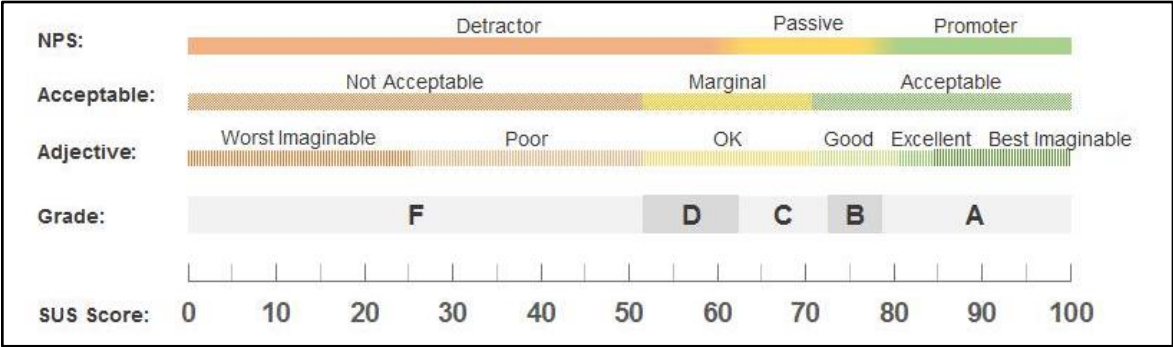
Figure 5: SUS Score Interpretation Using Net Promoter Scores, Acceptable Scales, Adjective Ratings and Grade

4.3.1 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).

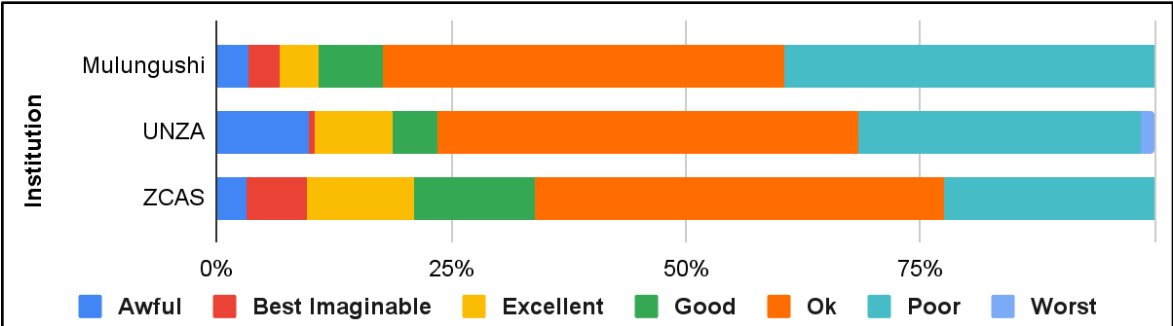### 4.3.2 Student User Perception of Usability of the Portals

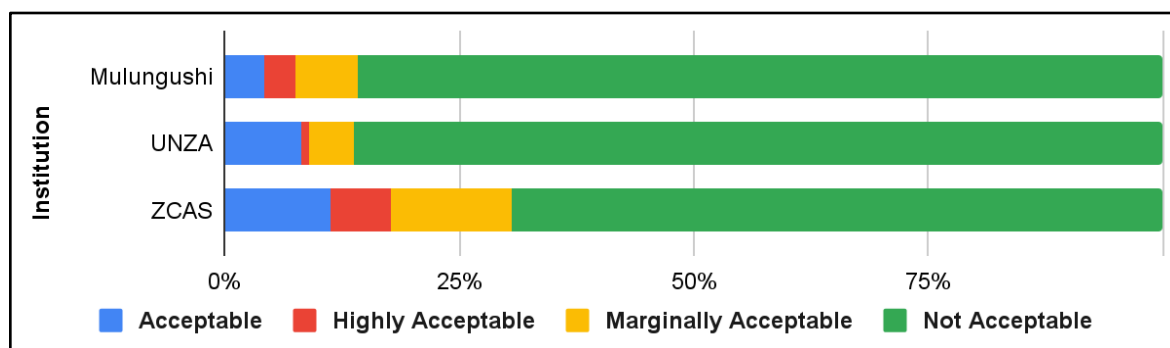Figure 6: SUS Comparison to Adjective Ratings

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.

5 DISCUSSION OF RESULTS

5.1 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.

5.2 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.

5.3 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.

5.3.1 Impact of Demographic Factors on SUS Scores

Neither the study nor its SUS results significantly affected the discipline and year of the study at all three universities. The findings of this study are different from the findings of similar studies, for example, in their study, Ng et al. [18] investigated the impact age, gender, degree of education, and major discipline, type of employment, and years of work experience on the evaluation of safety signs' usability. Additionally, the correlations between colours in sign design and comprehension accuracy were evaluated in relation to SUS score. Three hundred and eight were then invited to complete a modified SUS questionnaire after completing a self-administered questionnaire on safety sign comprehension. The findings revealed that the only demographic element with a significant impact on sign usability was education level. Participants with a higher diploma level than the diploma students rated the sign's usability much higher.

6 CONCLUSION, RECOMMENDATIONS AND FUTURE WORK

6.1 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 with 10 items and 5 steps for each, with strongly disagree and strongly agree as the anchors. Its purpose is to evaluate perceived usefulness. The questionnaire has a mixed tone, with the even numbered items having a negative tone while the odd numbered items have a positive tone. [14].

6.2 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.

6.3 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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