International Journal of Emerging Trends & Technology in Computer Science (IJETTCS)
Web Site: www.ijettcs.org Email: editor@ijettcs.org
Volume 3, Issue 6, November-December 2014 **ISSN 2278-6856**

An Assessment of the Usability of the Africa University Digital Library, Mutare, Zimbabwe

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Abstract

As numbers of digital library users increase, issues pertaining to interaction with the interface and utility of its collection also arise. In responds to the above, this study sought to facilitate the development of user centered digital libraries through user participation and involvement. An evaluation research design was used for the accomplishment of the research objectives. The research population consisted of 30 undergraduate students, 18 graduate students, 12 academic staff and 2 electronic resources staff. Questionnaires, interviews, and indirect observations were used to collect data. The results obtained led to conclusions that there was general dissatisfaction of users regarding the usability evaluation of the Africa University digital library, especially in terms of the adequacy of the collection and the system responds time. Bandwidth problems, lack of user training, and lack of cooperation from faculty librarians were noted as the main inhibitors to the attainment of the highest degree of usability for the digital library in terms of satisfying user needs and expectations. Recommendations were thus given for the digital library development team to involve user views and Faculty Librarians together with the Information and Communication Technology staff in the digital library development process.

Keywords:-Digital libraries, institutional repositories, usability studies, electronic resources

1 INTRODUCTION

Africa University, through the Jokomo/Yamada library, is one of the few academic communities in Zimbabwe that have implemented the digital library technology. Witten and Bainbridge (2003: 24) [1] pointed out that academic digital libraries mainly focus on research and education. Additionally, they emphasised that digital libraries facilitate innovation, but must be stable, reliable, and permanent. The researcher gauged the performance of academic digital libraries in the context of user perspectives, fulfilment of their needs, and the usefulness of the digital library to the user. Africa University Library (Jokomo/Yamada) is committed to providing access to electronic and print resources to support the research and curricula. As such, the Library has effectively and consciously utilised IT applications leading to the rise of a digital library within the entity of its conventional library. Library users are no longer obliged to visit the library at regular open hours to meet all their information needs. Digital libraries enable users to search the library online catalogue; use a subject guide or database to access a citation from the Internet or access a full text article from Web-based journals; browsing e-resources through remote access. Blandford (2004: 1) [2] asserts that the motivations for building digital libraries are premised on cutting costs, reducing the storage problem, preserving precious historical documents (the originals can be better cared for if people can access digital surrogates), and a fuzzy perception that digitization will improve access. Blandford (2004: 1) [3] is quick to note that "none of these motivations tell us much about how digital libraries should be designed if they are actually to be useful, usable and used repositories of digital documents." The need for usability assessment becomes a priority, especially when one considers the costs that are involved in the management of digital libraries. As Theng at...el (2000: 238) [4] point out, "Little work is being done to understand the purpose and usability of digital libraries." Borgman et al. (2000: 229) [5] also state, "Relatively little work has been done on evaluating the usability of digital libraries in any context." The same observations are also made by Blandford (2001: 179) [6] as well as Brogan (2003: 12) [7]. Everything about digital libraries is explosive, except one thing: evaluation." This prompted the researcher to conduct an assessment. Marchionini et al. (2001: 304) [8] emphasized that users and their information needs are central to all libraries, digital or otherwise. They added that all designing, implementing, and evaluating of digital libraries must be rooted in the information needs, characteristics, and contexts of the people who will or may use those libraries. Thus usability aspect in evaluating digital libraries is important to understand the capability of systems in meeting users' information needs and, an appreciation of how the system supports their needs. The study is also prompted by the

researcher's experience as the e-Resources librarian both in developing the digital library and user training.

1.1 Statement of the Problem

When developing a digital library, users should participate more so that its design makes it usable. However, user participation in the development of the Africa University Digital Library collection and the design of the user interface through user-based surveys is not being given priority.

1.2 Objectives of the Study

The study was guided by the following objectives;

i. To determine the usefulness of the Jokomo/Yamada digital library;
ii. To determine the efficiency of the Jokomo/Yamada digital library;
iii. To deduce the effectiveness of the Jokomo/Yamada digital library;
iv. To determine the learnability of the Jokomo/Yamada digital library; and
v. To establish the level of user satisfaction with the Jokomo/Yamada digital library.

2. Literature Review

2.1 Usability Assessment of Digital Libraries

In the context of digital libraries, Reeves et al. (2005: 43) [9] defined usability as the effectiveness, efficiency, and personal satisfaction with which people are able to access and make productive use of the resources in a digital library. Marchionini et al. (2003: 333) [10] emphasized that information needs of users are central to all libraries, digital or otherwise. They added that all designing, implementing, and evaluating digital libraries must be rooted in the information needs, characteristics, and contexts of the people who will or may use those libraries. Thus usability aspect in evaluating digital libraries is important to understand how far the systems are capable of meeting users' information needs. Further, Arms (2000: 11) [11] argues that usability comprises of several aspects; including interface design, functional design, data and metadata, and computer systems and networks. Jeng (2005: 97) [12] believes that usability is a property of the total digital library system where all the components should work together efficiently in producing effective and convenient digital library service. Digital libraries are powerful tools if they are usable, useful and users benefit from them. User-based measure of evaluation for digital libraries is imperative in understanding how well the system serves and fulfils the needs of its targeted users. Long (2002: 64) [13] admitted that evaluation aims to identify users and their information needs. Interface usability dimension has been widely defined as the core form of digital libraries usability.

2.2 Usability Assessment Criteria

Several usability attributes have been variously proposed to guide measurement. Nielsen (1993: 24) [14] notably proposed learnability, efficiency, memorability, errors, and satisfaction, while in more recent studies, Abran et al. (2003: 325) [15] propose effectiveness, efficiency, satisfaction, security, and learnability. Further, Jeng (2005: 120)) [16] in his usability model given below, illustrates that usability can be viewed in terms of effectiveness, efficiency, learnability, and satisfaction. He further highlights that satisfaction can only be achieved if the system is easy to use, has well organised information, clear labelling, an attractive visual appearance, appropriate content, and error correction;

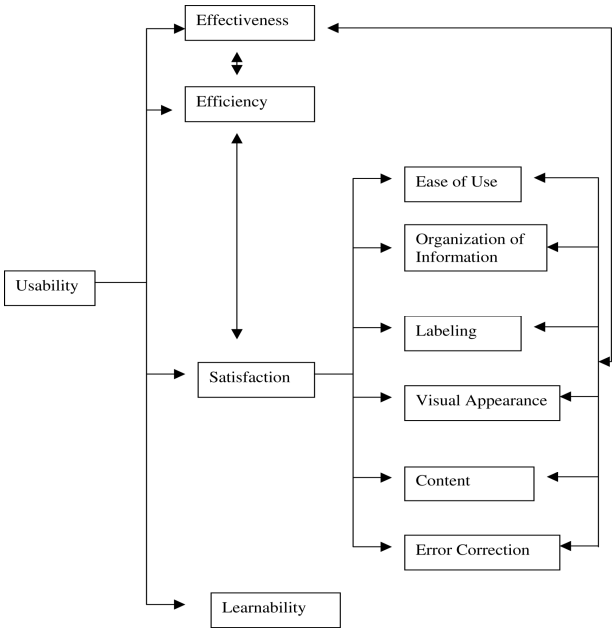

Figure 1 A Model for Usability Evaluation of Digital Library, From Jeng (2005:102)

2.2.1 Usefulness

The content and services offered by a system, and how closely they meet user requirements, are considered key aspects of system usefulness (Savolainen, 2008: 274). [17]

2.3 Relevance

Relevance, is one of the most fundamental aspects of information retrieval (Tombros et al., 2004: 344) [18]. It is a multi-dimensional concept, because when it relates to content, it can be considered objective, and subjectivity relates to experience and needs of the user (Thornley and Gibb, 2007: 755) [19]. Within the context of system usefulness, relevance is associated with how well the system enables the accomplishments of user tasks and in particular, how well information retrieved contributed to the user requirement.

2.4. Reliability

Reliability refers to the accuracy, dependability, and consistency of information (Yang et al., 2005: 589) [20], and is associated with credibility (Tsakonas and Papatheodorou, 2006) [21]. Credibility will, to a large extent, determine whether or not the resource is accepted and put to further use (Burgoon et al., 2000: 553) [22].

2.5. Currency

Currency considers the extent to which the information is sufficiently up-to-date for the task it is to be used for (Pipino et al., 2002: 211) [23]. Although currency is relative to domain and task, users generally attach high value to current information (Xie, 2006: 434) [24], with

information retrieved from out-of-date collections no longer considered accurate.

2.6. Efficiency

Efficiency is concerned with task completion in relation to user productivity, in particular time expended (Dicks, 2002: 29) [25]. Task completion time is considered a valid measure (Petrelli, 2008: 38) [26]. It has been suggested that task completion time is not suitable for web-based systems as external factors such as connection speed and network traffic could adversely affect the time taken to display a web page or process a request (Benbunan- Fich, 2001: 151) [27], and that task completion time defeats the purpose of browsable web-based systems (Smith, 1996: 365) [28].

2.7. Effectiveness

Effectiveness is concerned with task completion in relation to user goals, in particular success rates. According to ISO 9241 [29], related attributes are accuracy and completeness.

2.8. Learnability

Learnability refers to the capability of the system to enable users to feel that they can productively use the system right away and quickly learn new functions (Seffah et al., 2006: 159) [30]. It is often considered the most fundamental aspect of usability, since learning how to use the system is the first user experience (Nielsen, 1993: 26) [31]. It evaluates how easily and effectively the user learns to accomplish tasks.

2.9. Satisfaction

According to Rogers (2009:201) [32] user satisfaction involves users' attitude and perception with regards to how enjoyable it is to use the digital library. Jeng (2005: 101) [33] adds that satisfaction is concerned with areas of ease of use, organization of information, clear labelling, and visual appearance, contents, and error corrections and is measured by Likert scales and questionnaires. The following are the various facets that users consider when determining the satisfactoriness of a digital library;

3.Research Methodology

3.1. Research Design

In this study the researcher opted for the evaluation research design. The researcher also chose the evaluation research because it allows for the provision of needs assessments and user perception studies hence its suitability in providing an assessment of user views about the Africa University Digital Library.

3.2. Population, Sample and Sampling Technique

The population for this study were patrons for the Africa University Library. The sample for this study was divided into four main strata which are undergraduate students, graduate students, academic staff, and library staff responsible for the development of the digital library. The undergraduate students, graduate students and academic staff strata were further segmented according to faculties. Respondents were then selected randomly in each stratum. Five undergraduate students and three graduate students were picked from each faculty respectively. Two academic staff selected from each Faculty. The researcher also involved the 2 library staff responsible for the ongoing development of the digital library. This would give an overall sample population of 62 respondents which is a reasonable representation of the entire population.

3.3. Data Collection Procedures

Questionnaires, interviews and indirect observations were used in this study as research instruments.

3.4. Data Presentation and Analysis

Feuerstein (1986:129) [34] states that "tables and graphs help to show key information quickly, make it easier to show comparisons; show patterns and trends and take up less room", hence the researcher would utilise this advantage of data presentation methods in the study.

4.Data Presentation and Interpretation

4.1. Data Presentation

Table 4.1. Summary of Results by Usability Criterion

Usability Criteria	Strongly Disagree = 1	Disagree = 2	Neutral =3	Agree = 4	Strongly Agree =5
Useful	15 %	34 %	25 %	22 %	3 %
Efficiency	17 %	33 %	21 %	29 %	
Effectiveness		7 %	30 %	41 %	19 %
Learnability	13%	24 %	23 %	26 %	10 %
Satisfaction	10 %	33 %	27 %	27 %	4 %

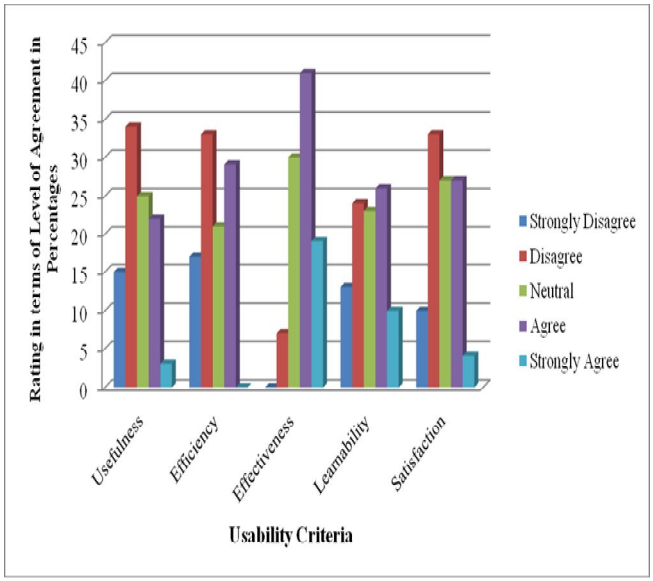

Figure 1. Summary of Usability Criteria Results.

4.2. Data Interpretation

4.2.1 Digital Library Usefulness

Relevance, reliability and currency were the main attributes of usefulness used for this study. Though subjective, Barry and Schambler (1998: 219) [35] noted that relevance is concerned with the information retrieved matching the query and information needs of the user. With this in mind, it can be noted that the Jokomo/Yamada digital library fall short of relevance as reflected by the user ratings and comments on relevance attributes. About 71 per cent disagreed that the information retrieved contributed to the requirement, versus only 2 per cent who agreed. One respondent

actually commented that: "The system does not have enough information.'' Further, it is also important to note that the percentage of users who agreed to the state that the information retrieved fulfilled their information requirement were form the Faculty of Health Science. This might reflect the fact that the digital library collection is biased towards health issues. Yang et al. (2005: 577) [36] defines reliability in terms of credibility, accuracy, dependability, and consistency of information. To that end, it can be observed that the majority of the users find the information contained in the digital library reliable because 60 per cent of the users agreed to the statement that says "Information retrieved was from a credible source" against only 13 per cent that disagreed. The extent to which the information is sufficiently up-to-date for the task it is to be used for (Pipino et al., 2002: 212) [37], was considered to be the main indicator of currency for this study. With the results showing that 36 per cent against 11 per cent agreed to the statement that the information retrieved was current, it would be fair to say the digital library contains up-to-date sources of information as demonstrated by the building of the collection by the e-resources team basing on e-books and scholarly e-journals.

4.2.2 Digital Library Efficiency

Task completion time in relationship to response time, error or delay and the number steps required to complete a tasks were the main indicators used to rate the efficiency of the digital library. Of these attributes, respondents showed great concern about the response time, with 47 per cent noting that the system has a slow response rate against 13 per cent who were satisfied with the response rate. The use of response time as an important measure for system efficiency is supported by a study by Yu and Kaufman (2007: 330) [38] in which he observed that users (in this case physicians) spent on average 2 min or less seeking an answer to a question and if a search took longer, it was likely to be abandoned, suggesting that time expended is a valid consideration. It is thus interesting to note that most of the respondents testified to the fact that few steps were required for one to complete a task on the digital library (51 per cent of the respondents agreed that "Few steps were required to complete the task", against 8 per cent who disagreed). It is, therefore, imperative for one to consider other external factors that might have on the efficiency of the digital library, especially those that are likely to promote the increase in errors and delays in completion of tasks. This is in light of the evidence that 64 per cent of the respondents thought that the digital library was prone to errors and delays when used to locate information.

4.2.3 Digital Library Effectiveness

Frokjaer et al. (2000: 351) [39] proposed quality of solution as the primary indicator of effectiveness. For the purpose of this study, quality of solution was measured in terms of accuracy and completeness of information retrieved. Results showed that the information contained in the digital library collection is accurate and complete as shown by 51 per cent respondents who agreed that "information located was accurate", versus none who disagreed and 51 per cent who considered that "information located was complete", against only 9 per cent who disagreed. Considering the above evidence, it can, therefore, safely be mentioned that the digital library for the Jokomo/Yamada Library have got an impressive overall effectiveness rating due to the nature of the collection. As noted from the interview responds from the e-resources librarians and students, the collection is mainly past exam papers, thesis, and dissertations of which the faculty librarians have successfully collected from the various departments and the e-resources librarians have scanned them into the digital collection. Thus the digital library is most effective in as far as exams and project writing are concerned.

4.2.4 Digital Library Learnability

Nielsen (1993: 21) [40] asserts that learnability evaluates how easily and effectively the user learns to accomplish tasks, and can be extended to include the contribution of help documentation to the learning process. The study measured learnability in terms of understandability of steps required to complete tasks, time required to know how to begin searching, helpfulness of how to search instructions, and memorability of the user interface. It was noted that while the issues of interface memorability and understandability of the steps required to complete tasks were rated high, it was not easy for users to learn how to begin and accomplish tasks and use search instruction. Basing on the responds from e-resources staff, it can be noted that lack of adequate user instruction from the Faculty Librarians was the main hindrance to individual learning on how to use the digital library. This is supported by the fact that results show that of the 13 per cent (6) respondents who agreed to the statement "It did not take much time to know how to begin searching," 9 per cent (4) were students from the Faculty of Health Science. It also goes without noting that the issue of language barrier, as noted by the e-resource librarians, was also a contributing factor to some of the users failing to comprehend the how to search instruction on the digital library home page. This is proven by the fact that of the 51 per cent (23) who disagreed with the statement "The how to search instructions were helpful," 20 per cent (9) were international students from non-English speaking countries. Thus it can be said that while the issue of lack of user training on how to use the digital library is the main contributor to the poor performance of the digital library in terms of learnability, one gets the impression that even if there was intensive user training, there was still going to be a considerable number of users who will find it difficult to learn the system, until the issue of language gap is addressed.

4.2.5 Digital Library Satisfaction

It was observed that the users liked the visual appearance of the digital library as it uses a combination of appealing text type and font size which are engaging and readable, attractive university colours, and appropriate use of graphics and icons. According to the findings by Jeng (2005: 121) [41] in a study of the usability of Rutgers and Queens sites, it was also found that subjects evaluate

"attractiveness" from the perspectives of "appropriate graphics," "readability," "appropriate colour," "not too complicated," and "appropriate size of font." Thus the Jokomo/Yamada digital library can be said to be doing well in terms of aesthetic appearance. However, the digital library's navigability attributes were rated very low, thus suggesting that there is still more to be down by the system designers. Aitta et al. (2008: 41) [42] observed that navigability relates to how aware users are of their current location and the ease with which the user can traverse the interface using the navigation tools available. Therefore, the Jokomo/Yamada digital library must have its navigational tools improved so that users do not get lost which will, in turn improve user satisfaction. Overall, the satisfaction levels of the Africa University Digital Library still fall short of the desired functionality. This can be supported by the fact that only 31 per cent of the user who agreed to the statement that **"On the whole, the digital library satisfies me"** which is way below the 50 per cent performance level suggested by Jeng (2005: 119) [43] as the minimum level that can be reached by an average digital library. It is, therefore, imperative that the system developers address the issues of navigability, usefulness, efficiency, learnability and terminology which have the lowest satisfaction levels.

5.Conclusions

The digital library was not useful to the bulk of the university community because the digital library only scored high in terms of credibility and currency of the information contained. It was concluded that although the digital library scored high in terms of effectiveness indicators like accuracy and completeness of information retrieved, it is not useful in actual sense. This is so because comments on what suggestions users had about the digital library reveal that the collection is biased towards past exam papers and dissertations, thus lacking the depth and coverage of an effective collection. Judging from the research findings, the researcher came to a conclusion that the Jokomo/Yamada digital library users felt satisfied with the text type and font size used as they found it engaging and readable. The colours, graphics, and icons also meet user expectations as they were used appropriately.

6.RECOMMENDATIONS

1. Africa University (Jokomo / Yamada) Digital Library team should work toward improving the coverage, depth, representativeness, and comprehensiveness of the digital collection. This is in light of the fact that the collection, at present, has got some gaps and is biased towards exam preparation material.
2. Library management can play an important role in lobbing for more network bandwidth from the Information and Communications Technology Department. This will improve the Internet connectivity speed, thereby facilitating quicker access to online databases through the digital library.
3. The digital library development team should strive to improve the learnability and user friendliness of the Digital Library user interface. Results show Jokomo/Yamada digital library system interface is not user friendly which means links should be written in such wordings that shows perceptible information in front of users. The main benefit for this information is that users can quickly get what they are looking for.

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