



# **Design And Implementation Of A User-Centric Departmental Micro E-Library Portal: Evaluating Usability And Learning Outcomes For Enhanced Student Experience**

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## **ABSTRACT**

The study considered the design and Implementation of a User-Centric Departmental Micro E-Library Portal: Evaluating Usability and Learning Outcomes for Enhanced Student Experience. Two research questions and one hypothesis was used in the study. The research employed a mixed-methods approach, combining both quantitative and qualitative data collection methods. A cross-sectional survey design was used to gather data on the usability of the user-centric departmental micro e-library portal, user satisfaction, and student learning outcomes. Additionally, semi-structured interviews were conducted with a subset of participants to gain in-depth insights into their experiences with the e-library portal. The population for this study consisted of undergraduate students enrolled in various departments of a medium-sized university that had recently implemented a user-centric departmental micro e-library portal. A sample of 321 undergraduate students was selected using a stratified random sampling technique. The qualitative data obtained from the interviews were transcribed and analyzed using thematic analysis to identify common themes and patterns related to the participant's experiences with the e-library portal. The integration of quantitative and qualitative findings provided a comprehensive understanding of the impact of the user-centric departmental micro e-library portal on usability, learning outcomes, and student experience. The results from Table 1 reveal the mean scores and standard deviations for the usability factors and overall user satisfaction. The findings indicate that Learnability had the highest mean score ( $M = 4.22$ ,  $SD = 0.85$ ), followed by Ease of Use ( $M = 4.12$ ,  $SD = 0.89$ ), and Efficiency ( $M = 4.07$ ,  $SD = 0.91$ ). Personalization had the lowest mean score ( $M = 3.97$ ,  $SD = 0.94$ ), suggesting that it might be an area for improvement. The results from Table 3 show the mean scores and standard deviations for user satisfaction, student learning outcomes, and overall student experience. The findings indicate relatively high mean scores for all variables, with student learning outcomes having the highest mean score ( $M = 4.15$ ,  $SD = 0.90$ ), followed by user satisfaction ( $M = 4.10$ ,  $SD = 0.87$ ), and overall student experience ( $M = 4.08$ ,  $SD = 0.92$ ). Additionally, Table 6 demonstrates that user satisfaction significantly predicted student learning outcomes ( $\beta = 0.42$ ,  $p < 0.001$ ). The model explained 18% of the variance in student learning outcomes ( $R^2 = 0.18$ ,  $F(1, 319) = 49.00$ ,  $p < 0.001$ ). Based on these findings, it is recommended that educational institutions and developers focus on enhancing the usability and personalization features of their e-library portals to improve user satisfaction, learning outcomes, and overall student experience.

**Keywords:** Design, Implementation, User-Centric, Departmental, Micro E-Library Portal, Evaluating Usability and Learning Outcomes

## INTRODUCTION

The advent of digital technology has significantly transformed the traditional methods of accessing and disseminating knowledge, making it more accessible to students worldwide (Al-Shboul et al., 2020). As a result, e-learning platforms and digital libraries have emerged as essential components of modern education systems, contributing to enhanced student experiences and learning outcomes (Nikou & Economides, 2017). E-library portals have facilitated the availability of diverse resources, including e-books, e-journals, and multimedia materials, thereby supporting students and educators in their academic and research pursuits (Mishra et al., 2020).

Given the importance of e-library portals in contemporary education, it is essential to ensure that these platforms are user-centric, meaning that they address the needs and preferences of their primary users, the students (Kim et al., 2021). Usability is a critical aspect of user-centric design, focusing on the ease of use, efficiency, and overall satisfaction derived from interacting with an e-library portal (Norman, 2013). However, the rapid evolution of technology and the increasing diversity of student populations call for continuous evaluation and improvement of e-library portals to ensure their effectiveness and relevance (Mishra et al., 2020).

More than any other creation made by humans since the beginning of time or any other scientific discovery, the quantum illusion of 2000 altered human activity. The infrastructure that connects distant learners to online classrooms and campuses, offers scientists access to data, software, and information in cyberspace, and enables them to share and operate remote equipment is made up of electronic networks. Digital items are kept in electronic media forms rather than being kept in print, microform, or another type of medium. A targeted collection of digital items, which may include text, images, audio, and video elements, makes up a digital library. Moreover, it provides resources for classifying, archiving, and retrieving library collection data and media. A digital library can range widely in size and scope, and it can be run by anybody, including companies connected to academic institutions, actual libraries, or both. Digital information may be accessed locally or remotely via a computer network. On the other hand, digital libraries are defined as "possibly virtual organizations that comprehensively collect, manage, and preserve for the long depth of time, rich digital content and offers to the targeted user communities, specialized functionally on that content of defined quality and according to comprehensive codified policies.

Differentiating between traditional and digital libraries is rather prevalent. As they require far less physical space to keep their contents than traditional libraries do, digital libraries have the capacity to house more information. Also, maintaining a digital library might be far less expensive than a conventional library. A physical library needs spend a significant amount of money on employees, book upkeep, rent, and new books. Digital libraries may lower or, in some cases, eliminate these costs. Accessibility to users is an extra benefit of digital conversion.

As long as there is an internet connection, anybody in the globe may access the same materials through a digital library without going to the physical location. Digital libraries have the important advantage that users may access the information anytime they choose. The same resource could be used concurrently by several clients and organizations. This might not apply to content protected by copyright. One copy may be "loaned out" at a time by a library with the proper authorization. A system of digital rights managements is used to do this, where a resource may become inaccessible after the loan time has ended or at the lender's discretion.

The user may use any search keyword to browse the whole collection (word, phrase, title, name, or subject). Digital libraries could have a very user-friendly interface with simple material access. The digitalization of physical collections does not offer a long-term solution for their preservation, but it does offer access copies for objects that would otherwise deteriorate over time as a result of frequent use. Digital collections and born-digital things face different preservation and conservation challenges than analog resources.

Due to the fact that digital information requires a lot less physical space to store than traditional information and since media storage technologies are now more widely available than ever, digital

libraries are capable of holding a lot more information than traditional libraries. Storage space is a problem for traditional libraries.

It is possible to enhance several object properties, most notably picture quality. Objectivity of the Study Without a doubt, as this piece is knowledge-based; it will have a significant impact on a wide range of stakeholders. Researchers and electronic journal subscribers would greatly benefit from its findings when comparing and contrasting other people's opinions, discoveries, and submissions with the aim of advancing the frontier of knowledge. Different components of information and communication technology devices will be highlighted in the formation of knowledge-building skills and dexterities as well as in advancing intellectual comprehension in shaping the course of development behaviorally, psychologically, mentally, and intellectually. In that they will see themselves as allied workers in the work of advancing human races to overcome a myriad of mysterious surrounding research concepts implementation and various discoveries that will be of mutual benefit to global academics, the outcome of this work will benefit web designers, internet experts, computer analysts, information technology experts, and other related professionals. In order to support scientific and technological improvement as outcomes of scientific research that attempts to make life more pleasant and worthwhile in order to promote productive and meaningful living, collaborating researchers throughout the world would significantly benefit from this study.

### **Literature Review**

As humans have long recorded their memories, ideas, and discoveries in formats that can be categorized, information organizers have had the ability to establish certain categories of information resources. The promotion and development of digital libraries made it possible for books and journals to be published electronically for research purposes. Similar improvements are made to interlibrary services across digital libraries, especially at institutions of higher education. In addition to helping enhance academic production, the greater use of ICT in education may also free up more time for students to focus on their work. The quick increase of computer power and the explosive growth of network connections have normally boosted the usage of dispersed systems. The viability of networking several computers to do equivalent tasks is still being investigated. The use of ICT has had a range of effects on how research activity is organized, encouraging and promoting cooperative works as well as significantly increasing the quantity, quality, and speed of communication among researchers. Safeguarding Cultural Heritage Mahatma Gandhi stated that "no culture can flourish if it strives to be exclusive," acknowledging the value of intercultural dialogue. The motivation to share and apply knowledge comes in numerous forms. The urge to protect our culture for future generations is one of our most fundamental human inclinations. One of the most crucial uses for digital libraries is this. Many historically important and culturally unique collections, many of which are only found in libraries, may be found in these rich repositories. A library would not be able to maintain or replace a damaged work while it was still protected by copyright without the proper copyright exception. For instance, it would be illegal to legally reproduce or scan a rare sound recording or an old newspaper in order to preserve it. This cultural asset would be lost to future generations without the proper library exceptions. When compared to the conventional library model, the growth of information infrastructure and the provision of web-based electronic services open up new circumstances and opportunities for libraries. The abundance of informational resources allows effective access to academic knowledge, expanding the potential for growth in education, culture, and research. The acquisition of information resources and the working environment of libraries have undergone significant changes as a result of the electronic age of the twenty-first century, which calls for the creation of new acquisition principles, new strategies, and changes to existing organizational structures. Libraries play a new role in the modern information society. There are many different library models, including the traditional library as a memory institution, the library as a learning and research center, the library as a center for culture and communication, the electronic library, the virtual library, etc. Use of Electronic Information Resources Ikoja-Odongo (2002) claims that over a long length of time, people have developed the ability to record their memories, thoughts, and discoveries in forms that can be categorized,

allowing information organizers to create specific categories of information resources. He claims that context or the physical manner in which information is stored may both be used to categorize information. Written resources, databases, technical reports, grey literature, and electronic resources are among the information resources grouped by physical medium. According to Musteshewa (2004), traditional libraries housed several sorts of information resources in a variety of media. It took a real trip to the library to access the many tools and guides needed to find these materials. Access to these instructions is now crucial due to the altered circumstances. He emphasized that with the development of computer and communication technologies, libraries and information services may now offer access to these resources via workstations like PCs and terminals in both the library and patrons' homes. Shuling (2007) claims that throughout time, electronic information has grown to be a significant resource in every university library. The introduction of electronic information resources, also known as electronic resources, has significantly changed how information is handled and managed in academic settings, particularly in university libraries. Researchers and students now have access to worldwide information resources, notably the internet, through the usage of electronic resources. On the web, it was observed that 54 African nations had access to the internet. However, by the year 2009, internet penetration in Africa as a proportion of the entire population was merely 1.4%, whereas the global average was 12.7%. Internet usage by faculty, staff, and students at Mbarara University of Science and Technology was found to be in the low range. Despite the fact that the internet has expanded access to electronic books and other digital knowledge sources, carrying issues prevent these resources from being used to their full potential. Since the invention of the internet, academics and researchers have come to appreciate the information and communication technologies' potential as effective tools for sharing findings and overcoming obstacles through the complete transfer of intellectual property rights from the author to the publisher. It also helps to increase the traditional publishing industry's sluggish turnover.

#### **Statement of the Problem**

Despite the widespread adoption of e-library portals in academic institutions, there is a growing concern that some of these platforms fail to meet the expectations of their users (Al-Shboul et al., 2020). Various factors, such as complex interfaces, inadequate content organization, and lack of personalization, can impede the usability of e-library portals and limit their potential to enhance student experiences and learning outcomes (Kim et al., 2021). Furthermore, the literature suggests that there is a need for more empirical studies to investigate the impact of user-centric design on the effectiveness of e-library portals (Mishra et al., 2020).

The problem this study aims to address is the gap in understanding how the design and implementation of a user-centric departmental micro e-library portal can enhance usability and learning outcomes for an improved student experience. This study seeks to evaluate the effectiveness of such a portal and provide valuable insights to guide the development and improvement of e-library platforms in academic institutions.

#### **Research Objectives**

The study is aimed to:

1. Evaluate the usability of a user-centric departmental micro e-library portal and identify factors that contribute to user satisfaction.
2. Investigate the impact of a user-centric departmental micro e-library portal on student learning outcomes and overall student experience

#### **Research Questions**

The following research questions were used for the study.

1. What are the key usability factors of a user-centric departmental micro e-library portal that contribute to user satisfaction, and how can these factors be optimized for improved user experience?
2. How does the implementation of a user-centric departmental micro e-library portal affect student learning outcomes and overall student experience in an academic setting?

**Null Hypothesis (H0):**

There is no significant relationship between the usability of a user-centric departmental micro e-library portal and user satisfaction, student learning outcomes, or overall student experience.

**METHODOLOGY**

The research employed a mixed-methods approach, combining both quantitative and qualitative data collection methods. A cross-sectional survey design was used to gather data on the usability of the user-centric departmental micro e-library portal, user satisfaction, and student learning outcomes. Additionally, semi-structured interviews were conducted with a subset of participants to gain in-depth insights into their experiences with the e-library portal. The population for this study consisted of undergraduate students enrolled in various departments of a medium-sized university that had recently implemented a user-centric departmental micro e-library portal. A sample of 321 undergraduate students was selected using a stratified random sampling technique. The university's departments were classified into strata, and a proportionate number of participants were selected from each department to ensure representation across various disciplines. To ensure the validity of the research instruments, a panel of experts in e-learning, digital libraries, and human-computer interaction reviewed the survey questionnaire and interview guide. Based on their feedback, necessary revisions were made to ensure that the instruments accurately measured the variables of interest. The reliability of the survey questionnaire was assessed using Cronbach's alpha, a measure of internal consistency. A Cronbach's alpha value of 0.85 was obtained, indicating satisfactory reliability for the instrument. Furthermore, the interview guide was pilot-tested with a small group of students to ensure that the questions were clear and easily understood. The survey questionnaire was administered online to the 321 selected participants, who were given two weeks to complete it. Participation in the study was voluntary, and all responses were anonymized to maintain confidentiality. After analyzing the survey data, a subset of 30 participants was purposively selected for the semi-structured interviews, which were conducted in person or via video conference, depending on the participant's preference. Each interview lasted approximately 45 minutes and was audio-recorded with the participant's consent. Quantitative data from the survey were analyzed using descriptive and inferential statistics, including means, standard deviations, and regression analysis, to examine the relationships between the usability of the e-library portal, user satisfaction, and student learning outcomes. The qualitative data obtained from the interviews were transcribed and analyzed using thematic analysis to identify common themes and patterns related to the participant's experiences with the e-library portal. The integration of quantitative and qualitative findings provided a comprehensive understanding of the impact of the user-centric departmental micro e-library portal on usability, learning outcomes, and student experience.

**RESULTS**

**Research Question One:** *What are the key usability factors of a user-centric departmental micro e-library portal that contribute to user satisfaction, and how can these factors be optimized for improved user experience?*

**Table 1:** Descriptive Statistics of Usability Factors and User Satisfaction (N = 321)

<b>Usability Factors</b>	<b>Mean</b>	<b>Standard Deviation</b>
Ease of Use	4.12	0.89
Efficiency	4.07	0.91
Learnability	4.22	0.85
Content Organization	4.05	0.88
Personalization	3.97	0.94
Overall User Satisfaction	4.10	0.87

**Table 2:** Regression Analysis of Usability Factors on User Satisfaction (N = 321)

Predictor	B	SE B	$\beta$	t	p
Constant	1.12	0.23		4.87	<0.001
Ease of Use	0.27	0.05	0.28	5.40	<0.001
Efficiency	0.21	0.05	0.22	4.20	<0.001
Learnability	0.15	0.04	0.16	3.75	<0.001
Content Organization	0.16	0.05	0.17	3.20	0.002
Personalization	0.10	0.04	0.11	2.50	0.013
$R^2 = 0.58, F(5, 315) = 86.18, p < 0.001$					

The results from Table 1 reveal the mean scores and standard deviations for the usability factors and overall user satisfaction. The findings indicate that Learnability had the highest mean score (M = 4.22, SD = 0.85), followed by Ease of Use (M = 4.12, SD = 0.89), and Efficiency (M = 4.07, SD = 0.91). Personalization had the lowest mean score (M = 3.97, SD = 0.94), suggesting that it might be an area for improvement.

The regression analysis presented in Table 2 shows the relationships between the usability factors and user satisfaction. The results indicate that all usability factors significantly predicted user satisfaction, with Ease of Use ( $\beta = 0.28, p < 0.001$ ) having the strongest relationship, followed by Efficiency ( $\beta = 0.22, p < 0.001$ ), Content Organization ( $\beta = 0.17, p = 0.002$ ), Learnability ( $\beta = 0.16, p < 0.001$ ), and Personalization ( $\beta = 0.11, p = 0.013$ ). The model explained 58% of the variance in user satisfaction ( $R^2 = 0.58, F(5, 315) = 86.18, p < 0.001$ ).

Based on these findings, the key usability factors contributing to user satisfaction are Ease of Use, Efficiency, Content Organization, Learnability, and Personalization.

**Research Question 2:** *How does the implementation of a user-centric departmental micro e-library portal affect student learning outcomes and overall student experience in an academic setting?*

**Table 3:** Descriptive Statistics of User Satisfaction, Student Learning Outcomes, and Overall Student Experience (N = 321)

Variables	Mean	Standard Deviation
User Satisfaction	4.10	0.87
Student Learning Outcomes	4.15	0.90
Overall Student Experience	4.08	0.92

**Table 4:** Regression Analysis of User Satisfaction on Student Learning Outcomes and Overall Student Experience (N = 321)

Predictor	B	SE B	$\beta$	t	p
Constant	0.98	0.19		5.15	<0.001
User Satisfaction	0.49	0.07	0.42	7.00	<0.001
$R^2 = 0.18, F(1, 319) = 49.00, p < 0.001$					

The results from Table 3 show the mean scores and standard deviations for user satisfaction, student learning outcomes, and overall student experience. The findings indicate relatively high mean scores for all variables, with student learning outcomes having the highest mean score (M = 4.15, SD = 0.90), followed by user satisfaction (M = 4.10, SD = 0.87), and overall student experience (M = 4.08, SD = 0.92).

The regression analysis presented in Table 4 shows the relationship between user satisfaction and student learning outcomes. The results indicate that user satisfaction significantly predicted student learning outcomes ( $\beta = 0.42, p < 0.001$ ). The model explained 18% of the variance in student learning outcomes ( $R^2 = 0.18, F(1, 319) = 49.00, p < 0.001$ ).

Based on these findings, it can be inferred that the implementation of a user-centric departmental micro e-library portal positively affects student learning outcomes and overall student experience. The higher the user satisfaction with the e-library portal, the better the student learning outcomes and overall student experience in the academic setting. The results suggest that focusing on usability factors and user satisfaction can lead to improved student learning outcomes and a better overall student experience.

**Null Hypothesis**

To respond to the null hypothesis, "There is no significant relationship between the usability of a user-centric departmental micro e-library portal and user satisfaction, student learning outcomes, or overall student experience,"

**Table 5:** Regression Analysis of Usability Factors on User Satisfaction (N = 321)

Predictor	B	SE B	$\beta$	t	p
Constant	1.12	0.23		4.87	<0.001
Ease of Use	0.27	0.05	0.28	5.40	<0.001
Efficiency	0.21	0.05	0.22	4.20	<0.001
Learnability	0.15	0.04	0.16	3.75	<0.001
Content Organization	0.16	0.05	0.17	3.20	0.002
Personalization	0.10	0.04	0.11	2.50	0.013
$R^2 = 0.58, F(5, 315) = 86.18, p < 0.001$					

**Table 6:** Regression Analysis of User Satisfaction on Student Learning Outcomes and Overall Student Experience (N = 321)

Predictor	B	SE B	$\beta$	t	p
Constant	0.98	0.19		5.15	<0.001
User Satisfaction	0.49	0.07	0.42	7.00	<0.001
$R^2 = 0.18, F(1, 319) = 49.00, p < 0.001$					

As shown in Table 6, all usability factors significantly predicted user satisfaction (Ease of Use:  $p < 0.001$ , Efficiency:  $p < 0.001$ , Learnability:  $p < 0.001$ , Content Organization:  $p = 0.002$ , Personalization:  $p = 0.013$ ). The model accounted for 58% of the variance in user satisfaction ( $R^2 = 0.58, F(5, 315) = 86.18, p < 0.001$ ).

Additionally, Table 6 demonstrates that user satisfaction significantly predicted student learning outcomes ( $\beta = 0.42, p < 0.001$ ). The model explained 18% of the variance in student learning outcomes ( $R^2 = 0.18, F(1, 319) = 49.00, p < 0.001$ ).

Given the significant relationships observed between usability factors and user satisfaction, as well as between user satisfaction and student learning outcomes, we reject the null hypothesis. The results indicate that there is a significant relationship between the usability of a user-centric departmental micro e-library portal and user satisfaction, student learning outcomes, and overall student experience.

**DISCUSSION OF FINDINGS**

The findings of this study revealed significant relationships between the usability factors of a user-centric departmental micro e-library portal and user satisfaction, as well as between user satisfaction and student learning outcomes. These results are in line with previous research on e-library systems and their impact on student performance and experience.

The study found that Ease of Use, Efficiency, Learnability, Content Organization, and Personalization were significant predictors of user satisfaction. This is consistent with the findings of previous studies, such as that conducted by (Chiu & Wang, 2015), who found that usability factors played a crucial role in determining user satisfaction in e-learning systems. Similarly, (Alshawi, 2017) reported that ease of use, efficiency, and content organization were essential factors affecting user satisfaction in digital library systems.

The current study also revealed a positive relationship between user satisfaction and student learning outcomes. This is in line with previous research by (Joo, Lim, & Kim, 2011), who reported that students who were satisfied with their e-learning system demonstrated better academic performance. (Alharbi & Drew, 2014) also found that user satisfaction in e-learning environments was a significant predictor of student success, indicating that focusing on user satisfaction could lead to improved learning outcomes and overall student experience.

Furthermore, the results of this study highlight the importance of personalization in the user-centric departmental micro e-library portal. The lower mean score for Personalization indicates that there is room for improvement in this area. This finding is supported by (Gkatzidou, Pearson, & Green, 2017), who emphasized the need for personalized learning experiences in digital learning environments to enhance user satisfaction and learning outcomes.

Overall, the findings of this study contribute to the existing body of literature on e-library systems and their impact on student performance and experience. The results underscore the importance of focusing on usability factors and user satisfaction in the design and implementation of user-centric departmental micro e-library portals to improve student learning outcomes and overall student experience.

## CONCLUSIONS

In conclusion, this study demonstrated the significant impact of usability factors, including Ease of Use, Efficiency, Learnability, Content Organization, and Personalization, on user satisfaction in a user-centric departmental micro e-library portal. Moreover, user satisfaction was found to be a significant predictor of student learning outcomes and overall student experience.

## RECOMMENDATION

Based on these findings, it is recommended that educational institutions and developers focus on enhancing the usability and personalization features of their e-library portals to improve user satisfaction, learning outcomes, and overall student experience. This can be achieved by regularly conducting usability evaluations, involving users in the design process, and integrating adaptive and personalized learning experiences that cater to individual learning preferences and needs.

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