(RESEARCH ARTICLE)

Usability evaluation of online digital libraries of educational institutions

H. Wajid Ali [1], N. Q. Mehmood [1, *], S. Z. Mahfooz [2] and I. Ali [3]

[1] Department of Computer Science and Information Technology, University of Lahore, Gujrat, Pakistan.
[2] Department of Computer Science and Engineering, University of Hafr Al-Batin, Saudi Arabia.
[3] Department of Mathematics, University of Hafr Al-Batin, Saudi Arabia.

Abstract

Advancement in technology bestowed people with numerous invaluable gadgets and devices. Mobile phone is one of the most distinguished products of modern technology. The researchers, software engineers and scientists have joint venture to explore the possibility of mobile phone technology. Their toiling efforts are being consumed in broadening the application and usability of mobile phone. Many applications have been programmed to assist the process of learning for the convenience of teachers and learners. In this research, we aim at evaluating the usability of Online Digital Libraries of different Pakistani Universities. Indeed, there are different ways to evaluate the usability of online library applications, such as interviews, card sort and Shneiderman's Eight Golden Rules, and Heuristics Nielson 10 golden rules etc. To evaluate and enhance the usability of mobile app, we used Nielson 10 golden rules. These set of rules and guidelines provide right direction and allow us to identify major usability issues. We have found the main usability issues in the mobile App libraries; if they are fixed, they can become more effective for the users to search their required materials.

1. Introduction

With the rapid growth of mobile technology, more and more people use mobile devices to carry out activities in their daily routine life. They use their mobile device to take photos, listen to music, and watch videos for recreational as well as educational purposes. According to Pakistan Telecommunication Authority (PTA) web site, there are 193 million mobile cellular subscriber, and 123 million are mobile broad band subscribers (March 2023) [1]. Usability is a process to evaluate an application. In this research we evaluate it in the light of Nielson golden rules. Usability also measures the effectiveness, efficiency and satisfactory performance of an application. Specific users can get specific goals in a particular environment. Poor usability results in higher error rates and better usability increases your popularity, expertise and good image. Before we proceed to implement usability rules on online web library application, we explore some standards for online web library. Online library means web-based library management system, including the total stock of books, issued books, availability, or status of books, searching books by title name or author name or course code numbers. This information system also provides the facility of books reservation. HEC (Higher Education Commission) of Pakistan established a digital library which provides access to all universities in Pakistan. This facility is available in university library or computer labs. Main purpose of the university mobile library application is to facilitate students inside or outside university premises to reserve their required books and take it from library. No doubt, library is the most essential block of educational institutions. It is the most authentic source of knowledge and information. Students can search their required information from different relevant books available and accessible in the library.

* Corresponding author: N. Q. Mehmood

In Section II, we describe our methodology. Section III provides details for usability evaluation of different online libraries. Results are described in Section IV. Finally, in Section V, we conclude this research work.

2. Material and methods

In this research, the library apps of Allam Iqbal Open University (AIOU), Government College University Faisalabad (GCUF), and Bahauddin Zakariya University (BZU) are selected as case study, and we evaluate to come up with the recommendations for improvement. All the recommendations and improvements will be research oriented, hence, based on the evaluation of applications. In this research, we are going to implement the Nielsen heuristics golden rules [2-3]. In figure 1, we show the methodology that consists of survey, design guidelines, evaluation, and result.
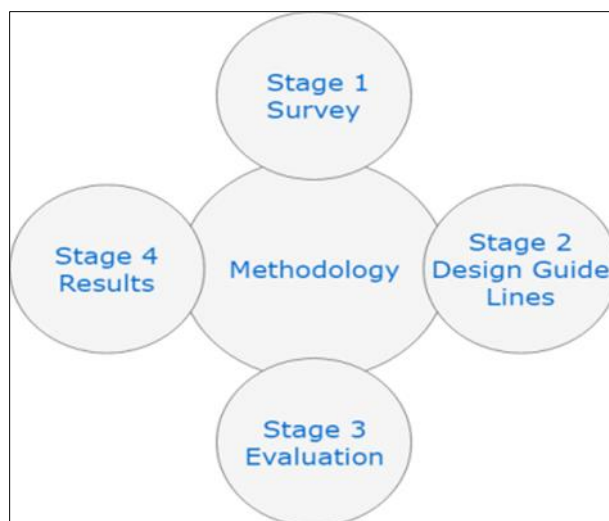

Figure 1 Methodology

2.1. University online library app survey

HEC (Higher Education Commission) is a supreme organization to control and monitor all universities and degree awarding institutes. HEC, by its policy, has made it compulsory for all degree awarding institutes and universities to have their own websites. So, for our research, we searched 129 government universities websites. Surprisingly, there are few universities out of our searched 129 that provide online web library facility to their students. It shows a wide gap existing in the system. On the other hand, almost all the western universities provide online library systems. There is no denying the fact that online libraries have assumed the basic intrinsic part of higher education system. So public and private sector should focus on promoting online library management system as well as online education system. They must adopt latest technology and make mobile application library system ensuring updated education services to the people on their threshold. A few of those universities which provide online library management system are shown in table 1.

Table 1 Selected universities offering online web-based libraries

University	Location	Govt.
Allama Iqbal Open university [6]	Islamabad	Public
Govt College University, Faisalabad [7]	Faisalabad	Public
Bahauddin Zakariya University (BZU) [8]	Multan	Public

2.2. Heuristic Guidelines for Design

Heuristics rules of Nielsen (1994) came after deep research of Nielsen on Human Computer Interaction (HCI). Nielsen conducted 249 usability problems and derived simply ten guidelines in 1994. Nielsen rules are known as "Rules of Thumb" in the history of HCI. The objectives of these rules are to quickly identify design problems of an application's interface. Because of its simplicity and lower cost, it is preferred as evaluation technique at the earliest design stages by

HCI professionals [2, 4, 5]. In fact, we may say that a good systematic process of evaluation for an application's interface is heuristics evaluation. Heuristic evaluation helps to inspect interfaces for possible usability issues [9-11]. Nielsen heuristic evaluation mechanism consist of a small set of evaluators inspecting the front end of an application and determining its implementation with recognized usability rules such as Nielsen's ten usability rules [2]. These ten rules are listed below.

2.2.1. The visibility of the status of system

Visibility of the system status means that the application or system should always keep in touch with its users to inform them what is going on and give them proper feedback within suitable time frame.

2.2.2. The system design should match real-world

This point is related to the communication language of the system. It defines that system should adopt a language which can be understandable by the user, otherwise it follows the real world compact and produce information in a natural and logical sequence.

2.2.3. Users with good freedom and control

Frequently users select the system functions accidently and will need a clearly marked "Emergency Exit" and user do not want to stay here anymore and leave this stage without using another option.

2.2.4. System standards and consistency

According to this point users should follow the system rules step by step and avoid breaking these rules, to maintain consistency and standards.

2.2.5. Error prevention

If any error occurred during the execution of the system, it shows the dialogue box and prevents from errors and eliminates that condition or checks for them. It shows the dialogue box for the confirmation to the users when they commit to this action.

2.2.6. Recognition is preferred over recalling

User's memory load should be reduced by creating objects, actions and visible options. Proper instructions should be available to guide the users about the system.

2.2.7. System flexibility and usage efficiency

It means that speedup the interaction between users and the system regardless of that the users are experienced or inexperienced. This phase allows users to tailor frequent actions [2].

2.2.8. Minimalist design

According to this rule, system dialogues should not have the irrelevant information. It must try to give the relevant or to the point information.

2.2.9. User's guidance to recognize and recover from errors

It displays the error message in plain text. It indicates the problems and suggests the solution of the occurred message.

2.2.10. Help and documentation available for guidance

The best option is that if the system is used without documentations and help option, it is necessary to provide such type of information as user follow these guidelines to search and focused on the user's task.

2.3. Evaluation

We tried to evaluate AIOU, BZU and GCUF mobile website interfaces. These universities are trying to facilitate their students with Library Information System (LIS). Basically, the purpose of this evaluation is to point out any possible drawbacks and discrepancies in the web applications and to help the stakeholders to review their web applications. Resultantly, better services will be provided to their students. The usability evaluation survey details are given in the table-2 below.

Table 2 Evaluation Survey Details

		Count
Gender	Male	40
	Female	20
Computer knowledge & experience	< One year	0
	From one to five	35
	More than five	25
Internet Knowledge & experience	< One year	0
	From one to five	38
	More than five	22
Evaluation Score	1: Strongly Agree 2: Agree 3: Neither 4: Strongly Disagree	

2.3.1. The visibility of the status of system

The application of AIOU, BZU and GCUF should be kept in touch with their users to inform updates, feedbacks and other additional enhancement showing its availability within given time.

2.3.2. The system design should match the real-world match

According to this rule, the AIOU, BZU and GCUF also using the communication language that the user can easily understand and can interact to this system. System should be real world convection.

2.3.3. Users with good freedom and control

This feature tries to minimize the use of memory by providing better visualization of objects, actions, and options. It enables user not to remember information from one dialogue to another. Instructions for use are visible or can be easily retrievable whenever required. AIOU and GCUF library interfaces fulfill this rule, but BZU lacks conformance.

2.3.4. Systems standards and consistency

According to this rule online library web apps of AIOU, BZU and GCUF are able to produce consistent contents layout e.g., searching result should be display on the same layout, it includes title, author, and location.

2.3.5. Error prevention

The AIOU, BZU and GCUF online library apps make sure to prevent input errors. The user may enter any wrong input, so, a "Clear" button is available to remove it. Nielsen rules emphasize that system should be carefully designed in order to prevent problems.

2.3.6. Recognition is preferred over recalling

Online web library of the BZU, AIOU and GCUF provide the clear and visible contents buttons and other interactive options for this purpose.

2.3.7. System flexibility and usage efficiency

The mobile websites of BZU and GCUF do not offer advanced search function for experts. But AIOU, BZU and GCUF are user friendly and both experienced and inexperienced people can easily operate it.

2.3.8. Minimalist design

All three mobile websites of BZU, GCUF and AIOU have simple design with relevant information. Simple wordings and classification of subjects are utilized.

2.3.9. User's guidance to recognize and recover from errors

According to this rule, if any error occurred in the system, it should suggest the solution or fix it automatically. However, web app libraries of BZU, GCUF and AIOU, are unsatisfactory in this aspect. For instance, when misspelled word like "Moberile" is entered, these mobile websites do not inform user to correct spelling. They will show "no result" in this case.

2.3.10. Help and documentation available for guidance

It is very essential and important functionality of the system to provide helping documents for searching easily. The mobile websites of the BZU, GCUF and AIOU make sure to provide their contact numbers and email IDs in case any type of problem occurred.

3. Results and discussion

We apply the designed criteria for the evaluation of online digital libraries that is based on Nielson heuristics. According to these rules, we have discussed the functionalities and characteristics of the web applications. These rules are very important and useful to design interfaces of applications. Our survey team consisting of different participants who are experienced in computer and internet usage, and having the knowledge of Nielsen rules evaluated library interfaces. We provide them a Performa and collect related information. We also provide them a college computer lab to open the above universities online libraries and evaluate them according to the Performa.

According to the above Performa we get the usability evaluation information and mention the weak areas of the web applications (Table 3).

Table 3 Evaluation Results I

University Library	Visibility of System statues	Match between system and the real world	User control and freedom	Consistency and standards	Provision of Help and documentation
BZU	20%	20%	20%	20%	0%
GCUF	20%	20%	15%	20%	0%
AIOU	20%	20%	13%	20%	0%
University Library	Error prevention	Recognition rather than recall	Flexibility & efficiency of use	minimalist design	Help user to recognize/recover errors
BZU	18%	0%	20%	20%	20%
GCUF	0%	0%	20%	20%	20%
AIOU	0%	0%	10%	20%	20%

4. Conclusion

We used Nielson Heuristic Rules for the evaluation of online digital libraries. According to this method, the usability of BZU, AIOU and GCUF performance is normal in majority. First five rules are mostly obeyed by these applications. There is much space to improve their usability and enhance their interaction with users. We suggest that the mentioned universities keenly follow the usability rules and get better results related to the website evaluation. The theoretical and practical implementation of the heuristic Nielson (1994) is discussed with the case study of online libraries offered by some Pakistani universities. This type of study or evaluation suggests better opinions and directions to improve the interfaces and provide thoughtful approaches for the further research in this area.

Compliance with ethical standards

Disclosure of conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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