

Usability evaluation of University of Colombo library website: A case study

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The usability of the website of the main library, University of Colombo was measured for its effectiveness, efficiency and satisfaction through usability testing technique and post-test questionnaire. The study found that overall effectiveness of the library website was 88.69% while efficiency was 1.35 minutes/task. Overall, the users were very satisfied (3.94) with the library website.

Keywords: Usability evaluation, Library websites

Introduction

A university library website is expected to facilitate time and place independent services and information to the clientele. Regular updating, monitoring and evaluation of library websites are necessary to provide intuitive, effective, and efficient interface for users to acquire information and services without any difficulty. Website usability enhances the site's credibility and increases the usage. In European countries, numerous studies have been carried out on library website usability evaluation and redesign projects¹⁻⁹. However, the Asian countries are far behind their Western counterparts in this regard¹⁰.

The University of Colombo (UoC) is the oldest university of the country and the university library acquires, organizes and disseminates information resources and services to its user community. In 2001, the university library website was created. Over the years, the library website has become a platform that provides a wide-spectrum of digital resources and services including Online Public Access Catalogue (OPAC), subscribed e-journals and databases, subject gateways, 'Ask a Librarian' and Inter Library Loan (ILL) services. Patrons can access the website via the URL <http://www.lib.cmb.ac.lk>. Even though, usability is a key issue, no attempt has been made to evaluate the usability of the UoC library website. Hence, this study aims at carrying out an in-depth analysis of the usability of UoC library website.

Review of literature

Usability is a concept which is constructed of multi attributes and has a multidimensional view, which meant different things to different people^{6,11}. Although the concept of usability is vital in user-centred design, the term has not been well defined and has no universally accepted definition. Dubey and Rana have carried out an in-depth review on different usability definitions and attributes used in literature¹¹. They found 37 definitions of usability which produced 152 attributes.

International Organization for Standardization (ISO) has defined usability as "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use"¹². ISO 9241-11 definition of usability has a user focus and emphasis that the usability of a product is not only affected by its product features, but also with the specific circumstances in which the product is used (context of use). According to the ISO standard, usability is measured by three attributes of effectiveness, efficiency and satisfaction.

There are several approaches to evaluate usability. Shackel categorized the available measurements for evaluation into three: dimension, performance and attitude¹³. Blandford *et al* categorized usability evaluation into two groups as empirical and analytical¹⁴. Empirical approach tests systems with users, whereas in the analytical methods usability experts assess systems using established theories and

methods. Website usability evaluation techniques can be divided into three categories; inquiry (users' perceptions and opinions); inspection (techniques that examines usability aspects of an interface); testing (techniques involved direct observation of users)^{2,15}.

Among the techniques of usability evaluation, the usability testing is widely used and VandCreek⁸ highlighted the importance of conducting usability testing in the libraries as;

Website usability testing is something that should be done by every library. Even small-scale and informal testing is within the means of most academic institutions, and would provide invaluable information, feedback, and insight. Incorporating what is learned through usability testing into website modification or redesigns leads to user-centered websites, which lead to more successful researchers (p.189).

When reviewing literature, it was found that usability test "Thinking aloud protocol" has been typically applied in many studies^{4,6,17,8}. In this method, users are given tasks to perform by using the website. While accomplishing the tasks, the users are encouraged to speak aloud throughout the test, verbalizing their opinion regarding their decision. Think aloud protocol has become the de facto standard for evaluating the usability of a system and thus, the present study incorporated this method for data collection. Table 1 reviews some studies on usability evaluation of library websites.

Although, McGillis and Toms⁷ stated that there are few published assessments on library websites, over the last decade numerous studies were carried out in western countries on library website usability evaluation, which has significantly widened the literature-base on usability. Besides, this confirms that the library community realizes the importance of usability evaluation.

Objective of the study

To evaluate the usability of the library website of UoC.

Methodology

In an academic environment, the principal users are the undergraduates who represent the majority of the community¹⁶. The target population of this study was the undergraduate students from the four faculties of arts, education, law, and management & finance. One hundred and fifteen undergraduates

belonging to four faculties were selected through convenience sampling method. A usability testing questionnaire was administrated as the main method of data collection.

The 115 respondents were given tasks that were to be carried out by using the library website. The present study designed 11 task questions for usability testing based on the findings of Battleson, Booth and Weintrop². The usability testing questionnaire is at Annexure 'A'.

While performing the tasks, all users are encouraged to speak aloud, verbalizing their opinions, process and the justification behind the decision. If the respondents were unable to complete any task in five minutes, they were to move on to the next task. After testing the website, users were provided with a post-test questionnaire to collect data on demographic characteristics such as age, gender, ethnicity, faculty, subject area, frequency of using the website etc. Furthermore, respondents were requested to indicate the level of satisfaction for each task by using five point Likert scale ranging from unsatisfied to very satisfied and to comment on each task. Finally, the respondents were requested to indicate the overall satisfaction with the library website of UoC and to comment on the website. Data analysis was done using SPSS (Version 18).

Analysis

Among the 115 respondents, 52.2% were females and 47.8% were males. The majority (79.1%) of the respondents were between 21 to 23 years of age and 50.4% pursued their degree programme in Sinhala medium and 44.3% in English (Table 2).

Effectiveness and efficiency

The definition given by ISO for effectiveness which is "accuracy and completeness with which users achieve specified goals" was used in the present study. Thus, effectiveness is measured by the number of correctly completed tasks during usability testing. Descriptive statistics were used to analyse the data obtained in the usability testing to identify the level of effectiveness of the library website.

Table 3 indicates the average amount of time spent to complete each task correctly. If the answer is incorrect, the time spent was not considered. The average amount of time spent on each completed task was 1.35minutes.

Table 1—Selected reviews of library website evaluations

Author/s	Site	Method of data collection	Respondents/ Test audience	Usability attributes	Findings
Battleson, Booth and Weintrop ²	University of Buffalo library website	Usability test	11 undergraduates	Ease of learning Ease of remembering Pleasant to use Errors	Problems with the links “web search” and “Need help” and with terminology, text-heavy presentation, identification of most appropriate choice
McGillis and Toms ⁷	Library website of MUN	Usability test Post-test questionnaire	33 undergraduates, graduates and academics	Effectiveness Efficiency Satisfaction	Participants completed 75% of the tasks in 2 minutes per task and were satisfied with the site’s clarity, organisation and the ability to carry out tasks. Users encountered problems with categories and their labels, understanding the terminology and in choosing from the list of menu options
Augustine and Greene ¹	Library website of UIC	Usability test	12 students		Study revealed problems with online catalogue interface, terminology, lack of knowledge of library resources
Jeng ⁶	Library websites of Rutgers University and Queens College	Usability test Pre and post-test questionnaire	41 graduates and undergraduates	Effectiveness Efficiency Learnability Satisfaction	Discovered an interlocking relationship between efficiency, effectiveness and satisfaction. Use of library jargons, non consistent in navigation links, over sensitive drop- down menu in Queens College site were some usability problems. Studied demographic characteristics and effectiveness of the system had no significant relationship.
VandeCreek ⁸	Northern Illinois University Library website	Usability test Focus group discussion	62 participants 4-8 participant	Sussfulness	Over 50% success rate reported for tasks except on ILL and librarian contact information. Problems identified were as library jargon, a homepage like a “wallpaper” screen, complicated pop-up menus, misleading words, lack of site search and site map.
Manzari and Trinidad-Christensen ¹⁷	Library website of C.W. Post Campus of Long Island	Heuristic evaluation Usability test	3 experts 10 Master’s and doctoral students		Experts recommended menu changes as some options were unclear, and additional text was required. Both test revealed the link to the homepage should always be the first menu option. Usability test findings suggested to provide a search engine.
Sawetrattanasatian ¹⁶	Centre of Academic Resources website of University of Chulalongkorn Thailand.	Heuristic evaluation Usability test Post-test questionnaire	10 undergraduates 10 undergraduates	Usefulness Effectiveness efficiency Learnability Meomarability Likability	Heuristic evaluation revealed website is not providing clear feedback of system status for user’s action and design is not supportive to complete tasks. Both techniques revealed problems with the use of English language, navigation, searching and terminology.
Zimmerman and Paschal ⁹	Digital collections of Colorado State University Library and the Western Waters Digital Library	Usability test Post-test questionnaire	18 participants	Ease of use Use perception	25% and 36% of the respondents were unable to complete all tasks and required more than a minute. Problems were identified with the use of small fonts, navigation, and lack of consistency across web pages.
Wijayaratne and Amarasekera ¹⁰	Library website of the Open University of Sri Lanka	Usability test Focus group discussion Survey	6 students 8 members of library staff and 11 academics 524 students		Users encounter problems on readability of the question papers, problems in terminology as “new arrivals”, font colour, organization and structure of the site. In addition, poor usage and low awareness on library services and resources were identified.

Similar findings for overall effectiveness was reported in the study conducted by Sawetrattanasatian¹⁶ for the library website of the University of Chulalongkorn in Thailand. The study reported 88% overall effectiveness while the efficiency was 1.03 minutes/task¹⁶. A study conducted by Jeng⁶ for Rutgers and Queens University library websites in USA reported that the overall effectiveness for both sites were as 87% and 78%, whereas efficiency was 3.49 minutes and 1.54 minutes respectively. Furthermore, the study conducted by McGillis and Toms⁷ on the usability of the library website of the Memorial University of Newfoundland (MUN) reported that studied subjects completed 75% of tasks in approximately 2 minutes per task and reported a less level of effectiveness and efficiency than findings of the present study.

Table 2—Demographic information of respondents

Demographic factor	Variable	Frequency	Percentage (%)
Gender	Female	60	52.2
	Male	55	47.8
Age	21-23 years	91	79.1
	24-26 years	20	17.4
	27-29	4	3.5
Medium of the degree	Sinhala	58	50.4
	English	51	44.3
	Tamil	6	5.2
Computer usage	Less than 2 years	3	2.6
	2-4 years	34	29.6
	5-7 years	43	37.4
	8-10 years	23	20.0
	More than 10 years	12	10.4

In the present study all the respondents were able to correctly complete five tasks (Task 5, 6, 7, 8 and 10) in less than 1 minute for each task (Table 3). However, majority of respondents failed to complete Task 11 on institutional repository of UoC and spent the longest average amount of time (4.10 minutes) on it.

Satisfaction

Satisfaction is defined as the “freedom from discomfort, and positive attitudes towards the user of the product” (ISO¹², p.2). Figure 1 depicts the distribution pattern of respondents’ satisfaction for the performed tasks and it was found that the respondents were not satisfied with the access to the institutional repository (Task 11) where as they were very satisfied with availability of contact information (Task 08).

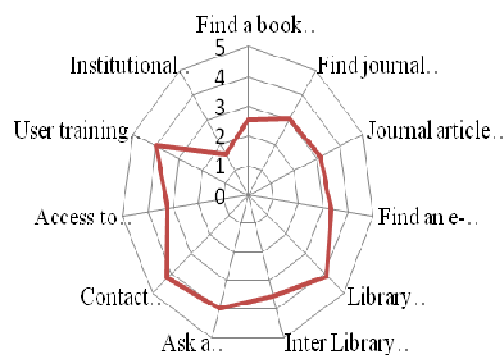


Fig. 1—Distribution pattern for satisfaction

Table 3—Effectiveness and efficiency

Task number	Task and area	Percentage of correctly completed tasks (%)	Average amount of time spent (minutes/task)
Task 1	Find a book (OPAC)	83.5	2.14
Task 2	Find a journal (OPAC)	85.2	1.94
Task 3	Find a journal article (OPAC)	93.0	1.51
Task 4	Find an e-journal database(E- resources)	96.5	1.25
Task 5	Find opening hours (Information on Library)	100	0.32
Task 6	Inter Library Loan (Services)	100	0.94
Task 7	Ask a Librarian (Services)	100	0.58
Task 8	Contact information (Information on library)	100	0.24
Task 9	Access to external links	93.9	1.28
Task 10	User training programmes (Services)	100	0.52
Task 11	Institutional repository	23.5	4.10
Average		88.69	1.35

Problems encountered by users when interacting with the website

Based on Sawetrattanasatian's¹⁶ study to identify the problematic and non-problematic tasks and areas of the library website by considering the number of completed tasks and average amount of time, present study revealed five non-problematic (Task 5, 6, 7, 8 and 10) and six problematic (Task 11, 1, 2, 3, 9, 4) areas of the library website of UoC.

Among the non-problematic tasks, Tasks 5 and 8 were formulated on general information (library opening hours, contact information) whereas Tasks 6, 7, and 10 emphasised on library services (ILL, Ask a Librarian, user training programmes). Thus, all the respondents were able to correctly complete the above tasks within the least average time (Table 3) and access to general information and services of the library website of UoC were considered as non problematic. Respondents were highly satisfied with Tasks 5, 6, 7, 8 and 10 (Figure 1). Augustine & Greene¹ and Sawetrattanasatian¹⁶ also reported similar findings whereas the findings of VandeCreek⁸ contradict the present study. The author reported that in the studied context (Northern Illinois University Library website), users reported problems when using ILL services due to the unfamiliar terminology and poor design.

Institutional repository, OPAC, external links and electronic journal databases were areas with usability problems in the UoC library website. Similarly, Augustine & Greene¹ and Sawetrattanasatian¹⁶ discovered that users encountered problems when using the library catalogues in finding books, journals and journal articles. Sawetrattanasatian¹⁶ revealed that users came across problems when accessing external links. Similarly, usability testing conducted by Jeng⁶, Sawetrattanasatian¹⁶ and VandeCreek⁸ also found problems during user interactions with the e-journal databases.

In the present study, the usability testing revealed a few issues in the of UoC library website as discussed below.

1. Lack of meaningful labels for some links

This was the main problem which led to the lowest completion percentage and spending highest time for Task 11 on institutional repository. The website used the label "Digital Library" on the home page for institutional repository which the respondents did not understand.

Problems related to labels were discussed in the studies conducted by Battleson, Booth and Weintrop², Jeng⁶, McGillis and Toms⁷ and Sawetrattanasatian¹⁶. To make labels meaningful, inclusion of additional text was proposed by Manzari and Trinidad-Christensen¹⁷. Similarly, in the present study users proposed additional text to describe the link label for institutional repository.

2. Use of library terms and abbreviations

Use of library terms is also a problem. The present study revealed that respondents were not aware the terminologies "OPAC", and "Periodicals". As respondents did not easily understand the meaning of OPAC, they spent more time on it.

3. Presence of long, cluttered web pages

Lengthy web pages affected usability. In this study, this was a problem with Task 4 related to locating e-journals. The webpage that provides links to the licensed electronic journals was more than two full screens in length and cluttered with information. This confirms previous finds that users are reluctant to scroll through lengthy web pages^{2, 16}.

4. Lack of online help

Lack of online help was a problematic issue. When respondents navigated the site and were unable to complete tasks, especially Tasks 1 and 4, they looked for guidance. Sawetrattanasatian¹⁶ also reported that the library website of the University of Chulalongkorn lacked the online help.

5. Lack of consistency in layout and placement of navigational components

As revealed in usability testing, the library website of UoC is inconsistent in its layout and placement of icons which was reported when performing Task 11 related to institutional repository. The entire layout and design of the webpage of institutional repository is different from the other web pages on the website. Users also encountered problems due to inconsistencies in placement of navigational components. Manzari and Trinidad-Christensen¹⁷ recommended the link to the homepage should always be the first menu option.

6. Lack of a proper internal search engine

A site search tool facilitates searching relevant information, especially when the information they are seeking is not on the homepage. It was found that when users attempt to use the search tool powered by Google they ended up with irrelevant information. This

problem led the users to navigate through the webpage rather than using the search option. An internal search engine which is more user friendly is needed to facilitate the patrons to better navigate the site.

7. Differences between user and usability contexts

Two sample proportion tests were conducted to find out whether the proportions of the correctly completed tasks differed significantly for the studied faculties, medium of the degree, age, gender, ethnicity, library website usage, computer and

the Internet experience (independent variables). Table 4 gives the significant values of the two sample proportion tests. One way ANOVA was conducted to find out whether the time spent for each task differed significantly within the independent variables. Obtained p-values are gives in Table 5.

Results from the two sample proportion tests and one way ANOVA revealed that in the study context, respondents' faculty, medium of the degree, age, ethnicity, frequency of library website usage, computer and the Internet experience showed

Table 4—Significant values (p-values) of the two sample proportion test

			Task 1	Task 2	Task 3	Task 4	Task 9	Task 11	
Faculty	Arts	Education	0.765	0.288	0.302	0.709	0.302	0.618	
		Law	0.549	0.783	0.371	0.804	0.804	1.000	
		Management	0.020*	0.051	0.459	0.048*	0.838	0.813	
	Education	Law	0.460	0.229	0.673	0.807	0.255	0.641	
		Management	0.258	0.052	0.179	0.294	0.258	0.731	
		Management	0.102	0.141	0.151	0.307	0.941	0.834	
Medium of the degree	Sinhala	Tamil	0.646	0.119	0.688	0.458	0.458	0.000*	
		English	0.005*	0.131	0.059	0.038*	0.872	0.544	
	Tamil	English	0.160	0.052	0.338	0.273	0.488	0.000*	
Age	21-23 years	24-26 years	0.000*	0.066	0.154	0.583	0.910	0.599	
		27-29 years	0.001*	0.699	0.062	0.293	0.069	0.000*	
	24-26 years	27-29 years	0.536	0.367	0.182	0.367	0.077	0.025*	
Gender	Male	Female	0.583	0.945	0.899	0.930	0.913	0.687	
Ethnicity	Sinhalese	Tamil	0.456	0.434	0.282	0.250	0.282	0.086	
		Muslims	0.034*	0.099	0.086	0.418	0.609	0.000*	
	Tamil	Muslims	0.697	0.922	0.842	0.396	0.228	0.294	
Library website usage	Very frequently	Frequently	0.008*	0.004*	0.011*	0.035*	0.035*	0.001*	
		Occasionally	0.000*	0.007*	0.003*	0.044*	0.033*	0.000*	
		Rarely	0.000*	0.002*	0.002*	0.024*	0.022*	0.000*	
	Frequently	Occasionally	0.163	0.853	0.112	0.888	0.465	0.002*	
		Rarely	0.209	0.051	0.052	0.132	0.173	0.002*	
	Occasionally	Rarely	0.153	0.054	0.121	0.142	0.288	1.000	
Computer experience	Less than 2 years	2-4 years	0.227	0.318	0.310	0.267	0.375	0.015*	
		5-7 years	0.037*	0.657	0.148	0.295	0.295	0.008*	
		8-10 years	0.037*	0.574	0.063	0.221	0.293	0.002*	
		More than 10 years	0.014*	0.378	0.121	0.221	0.211	0.000*	
	2-4 years	5-7 years	0.012*	0.052	0.693	0.693	0.474	0.926	
		8-10 years	0.017*	0.195	0.184	0.310	0.488	0.166	
		More than 10 years	0.000*	0.784	0.218	0.310	0.070	0.123	
		8-10 years	0.934	0.725	0.277	0.148	0.955	0.132	
	5-7 years	8-10 years	0.056	0.213	0.285	0.148	0.148	0.152	
		More than 10 years	0.139	0.420	0.778	1.000	0.307	0.068	
		Less than 2 years	2-4 years	0.366	0.085	0.053	0.645	0.502	0.378
		5-7 years	0.196	0.145	0.366	1.00	0.544	0.106	
Internet experience	Less than 2 years	8-10 years	0.009*	0.009*	0.023*	0.303	0.134	0.093	
		2-4 years	5-7 years	0.470	0.075	0.285	0.645	0.968	0.053
		8-10 years	0.132	0.897	0.151	0.151	0.051	0.191	
	2-4 years	8-10 years	0.134	0.210	0.134	0.303	0.303	0.819	

Table 5—Significant values (p-values) of one way ANOVA

	Task 1	Task 2	Task 3	Task 4	Task 5	Task 6	Task 7	Task 8	Task 9	Task10	Task 11
Faculty	0.041*	0.834	0.112	0.035*	0.051	0.707	0.185	0.364	0.981	0.822	0.434
Medium	0.006*	0.393	0.064	0.028*	0.064	0.496	0.340	0.782	0.316	0.533	0.256
Age	0.003*	0.179	0.129	0.406	0.155	0.058	0.380	0.683	0.373	0.660	0.632
Gender	0.231	0.852	0.339	0.412	0.430	0.718	0.788	0.686	0.475	0.051	0.901
Ethnicity	0.000*	0.089	0.493	0.108	0.828	0.065	0.162	0.279	0.202	0.266	0.659
Website	0.000*	0.000*	0.000*	0.000*	0.091	0.058	0.345	0.054	0.008*	0.070	0.031*
Computer	0.000*	0.265	0.476	0.990	0.301	0.630	0.854	0.197	0.780	0.321	0.994
Internet	0.000*	0.012*	0.009*	0.238	0.062	0.209	0.384	0.332	0.068	0.382	0.485

*p<0.05

Table 6—Effect of user context on overall satisfaction

	Source	Sum of Squares	df	Mean Square	F	Sig.
Faculty	Between Groups	5.890	3	1.963	6.283	0.001*
	Within Groups	34.684	111	0.312		
	Total	40.574	114			
Medium of the degree	Between Groups	2.547	2	1.273	3.751	0.027*
	Within Groups	38.027	112	0.340		
	Total	40.574	114			
Age	Between Groups	0.020	2	0.010	0.027	0.973
	Within Groups	40.554	112	0.362		
	Total	40.574	114			
Gender	Between Groups	0.015	1	0.015	0.041	0.839
	Within Groups	40.559	113	0.359		
	Total	40.574	114			
Ethnicity	Between Groups	0.298	2	0.149	0.415	0.661
	Within Groups	40.275	112	0.360		
	Total	40.574	114			
Library website usage	Between Groups	4.518	3	1.506	4.637	0.004*
	Within Groups	36.055	111	0.325		
	Total	40.574	114			
Computer experience	Between Groups	8.523	4	2.131	7.313	0.000*
	Within Groups	32.051	110	0.291		
	Total	40.574	114			
Internet experience	Between Groups	3.861	3	1.287	3.892	0.011*
	Within Groups	36.713	111	0.331		
	Total	40.574	114			

*p<0.05 df- Degree of freedom F- F statistics Sig- Significance

a significant difference for both effectiveness and efficiency for some of the selected tasks. (Tables 4 and 5). The findings of the present study contradict with that of Jeng⁶ who revealed that the subjects studied discipline and frequency of library website usage have no relationship on user performance. Overall satisfaction towards the library website of UoC differs significantly with respondents' faculty, medium of the degree, frequency of library website usage, computer and the internet experience, while age, gender and ethnicity have no impact on the users overall satisfaction (Table 6).

Conclusion

As shown in this study, library website usability studies have to be carried out to understand users' experiences and enable improvements of library websites. Use of meaningful labels to identify and link resources, user friendly internal search tool, online help information, category or cascade menus and links in the home page for all important areas have to be provided to make the website navigational and easy to use. Furthermore, it is important to provide alternative language options in the website.

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