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USABILITY EVALUATION OF PUBLIC SECTOR HOSPITAL WEBSITES OF PAKISTAN

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ABSTRACT

The hospital website should be easy to use and understandable by patients and general public. A hospital website equipped with usability standards can reduce gap between patients themselves and improve user satisfaction level significantly. As more people are turning towards Internet for seeking health information, therefore, health-care websites containing relevant and useful health contents is need of the day. The current study is a part of research which aims to understand and highlight usability issues and propose design rules for developers to produce hospital websites of Pakistan in accordance with usability standards. Four public sector hospitals operational in Pakistan were evaluated with the objective to identify usability issues. These issues have been used to form design rules. Twenty-six participants took part in the study to perform user tasks. Data collected was through questionnaire and direct observation techniques. Average scores calculated against each website and usability component to analyze data. 28.37% responses were "Agree" and 19.55% users remained neutral about the usability of websites revealing a margin of improvement in the websites usability. This study is expected to provide useful insights for website developers to develop more usable hospital websites. The results reveal that public sector hospital lack in specific patient oriented designs. Research findings are aligned with the past researches on the adaptation of usability standards for hospital website development.

Keywords: usability evaluation; healthcare website; hospital website evaluation.

1. INTRODUCTION

Health-care services can improve the quality of human lives [1]. A hospital website is an important contact point between patient and hospital [2]. People are turning towards internet to search health related information [3]. People use internet to search health information at their convenience [4]. Availability of health related and medical information on a hospital website increases the user's positive views about the health institution [5]. Health-care institution website can reduce gap between patients themselves [6]. Health-care has become an important part of online content consumption of general public [2]. The quality of health information available online varies across websites and is often poor [7]. Despite the large number of web sources for seeking health information, little attention is given to providing useful and accurate online health information [8].

Hospitals lag behind in online presence as compared to other industries [5], therefore, health-care institutions need to increase their online presence [6]. The growing number of website users indicates the need to gain an overview of human interacting with these websites [9]. Health-care website should contain relevant and useful health related contents [10].

This empirical research study was planned with the objective to evaluate the hospital's websites for usability operational in public sector in different cities of Pakistan. Four public sector websites were selected for evaluation. The remaining part of the paper is organized as: Section II shows the review of literature. Section III illustrates the method of research like plan, experimental design and procedure. Data analysis is presented in Section IV, while Section V shows results of the research. Discussion is included in Section VI and conclusion is in Section VII.

2. RELATED WORK

Websites are growing in number enormously in this information age. Therefore, websites quality is a greater concern of researchers lately [11]. Website evaluation is popular among researchers in recent years [12]. Usability has been recognized as an important aspect for online behavior and HCI [13].

Internet is used to perform social and professional tasks. Health-care institutions website accessibility was measured for over 80 million European citizens in accordance with WCAG 2.0 guidelines. The evaluation was conducted through ACCESSWEB website evaluation platform. The researchers highlighted that poor website accessibility creates misalignment between patient and health-care institution. The researchers concluded that by not presenting accessible websites, health-care intuitions neglect their chances to transform financial value into business value [6].

Website usability is affected by age. Wagner *et al.* [14] narrated that usability is concerned with both functional and pleasure related aspects. The researchers proposed a website usability model that considers the effect of age by using cognitive antecedents. The authors concluded that age has pronounced impact on the usability of websites. The proposed website usability model was used to examine disorientation which revealed both expected and surprising findings.

User demand for patient oriented tools in US hospital websites was investigated by [2]. Two rounds of online survey were conducted on 21 e-health interactive tools available in US hospital websites with 242 users'

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involvement in the study. It has been identified that hospital websites lag behind the user needs. Users demand for core-business tools to access medical and lab records. The researchers concluded that e-health development efforts are far behind users' expectations.

Evaluation of quality of hospital websites in China was investigated in [12]. The authors stressed that people seeking for online health information are increasing but only a few researches on quality of websites have been exercised. 23 leading hospitals websites were evaluated by expert reviewers. The findings conclude that mostly websites performed well in the category of contents while normal performance was observed in the area of design and functions. Only a few hospital websites showed satisfactory performance. Strengthening of internal search, online consultation and inquiry, language were among the recommended improvement areas. The limitation of research was that it was not users based experiment.

Gallant *et al.* involved 30 users to perform individual usability tests using think-aloud collection protocol. The testing was performed ina teaching hospital located in northeastern United States. The usability test consisted of eight sections having a total of 34 tasks. The feedback from participants was used to develop a user-centered design of hospital website. Grounded theory approach was used to analyze collected data. The researchers found out that users try to judge the trust, ease of use and usefulness as attributes of a hospital website [5]. Hence, the use of user-centered design in developing hospital website for hospital to is becoming widely adopted.

Health related information is greatly available on the websites but the quality is the key problem for the users. The McMaster Optimal Aging Portal was evaluated to find the facts about usability issues [3]. The objective was to share the usability challenges with designers of health information websites. Usability testing with telephonic and videoconferencing method was performed with qualitative content analysis using usability sessions and interviews. 37 participants participated in the research. The study reinforced the end user involvement in the development phase of hospital websites.

Nigerian hospital websites were evaluated by Raji *et al.* [1]. Better design features and contents for better understanding were evaluated in the study. A task based preliminary user study with 20 participants was performed. Trust, awareness, accessibility and credibility were the key considerations of this study. Afterwards, 2nd preliminary usability testing was performed with the objective to access and assess the hospital websites. It was a task based study and the themes related to website usability were identified. A final usability study was performed at the end. The user responses from final study were evaluated on the basis of ten usability heuristics by Nielsen [15]. The researchers emphasized that end user involvement and conducing usability tests are successes of hospital websites.

3. METHOD

A. Design

The selected websites are functional in public sector of Pakistan. The research study was focused to investigate and observe the user's understanding about these websites and propose design rules on the basis of this observation which can lead to better usability of hospital websites.

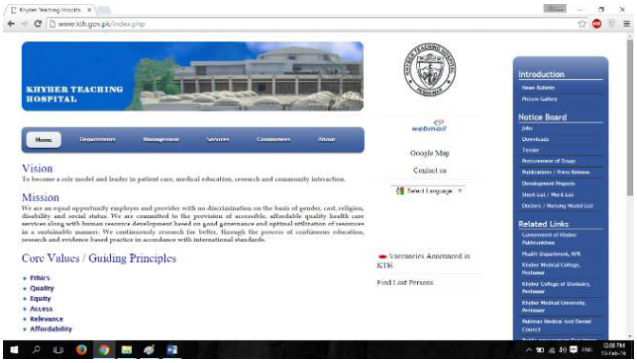

Figure-1. Khyber Teaching Hospital, Peshawar Websites View.

The study focused on the analysis of user data collected after performing representative tasks and filling of post study questionnaire.

Questionnaire method and direct observation method were adopted to record the usability of the websites. The website of the following four hospitals in public sector were selected for evaluation:

a) Khyber Teaching Hospital, Peshawar (http://www.kth.gov.pk/index.php)
b) Civil Hospital, Karachi (http://chk.gov.pk/)
c) Shaheed Zulfiqar Ali Bhutto Medical University, Islamabad (http://www.szabmu.edu.pk/)
d) Mayo Hospital Lahore (http://www.mayohospital.gop.pk/)

Figure-2. Civil Hospital, Karachi Websites View.

A pre-study questionnaire was designed covering the consent of participant and their demographic details. The frequency of internet usage and purpose of usage was primarily focused in it. A query regarding already usage of

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any hospital website was also included. Following representative tasks were chosen carefully keeping in view the user common requirement for accessing the website:

a) Find the contact details of hospital administration
b) Find the geographic location of the hospital on the website
c) Locate the services offered
d) Locate the department of cardiology

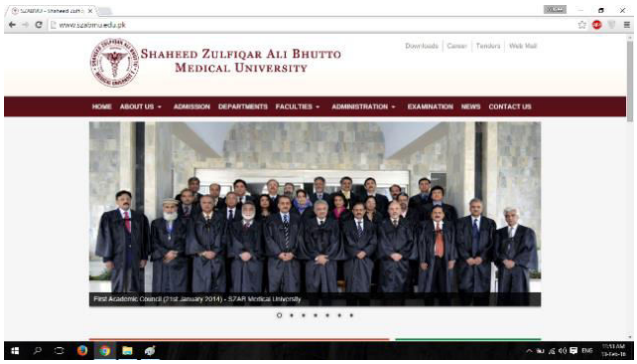

Figure-3. Shaheed Zulfiqar Ali Bhutto Medical University, Islamabad Websites View.

The tasks were of moderate nature to avoid the bar on user memory. A post study questionnaire was designed based on five usability components (learnability, efficiency, memorability, error and satisfaction) as developed in [15]. An additional question for overall impression of the website design was also included in the questionnaire [16].

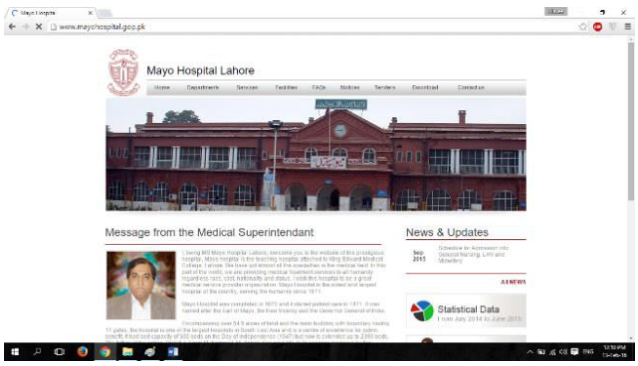

Figure-4. Mayo Hospital, Islamabad Websites View.

A five point likert-scale [17, 18]was used for user compliance having '1' as 'strongly disagree' and '5' as 'strongly agree'.

B. Participants

Twenty-six participants were involved in this user study. 13 male and 13 female participants of different age group were involved in the study. All the participants were volunteers. The participants were of different professions. Two patients were also included in the user study. Only three participants had web usage experience for less than three years, rest had more than three years' experience (Table-1).

Table-1. Web Usage Frequency.

S. No	Description	Frequency
1	No Experience	0
2	Less than 3 years	3
4	More than 3years	23

Nineteen participants had already used a hospital website before. The participants had different educational standards from 10th grade to MS/M. Phil in different fields. Most of the participants (50%) were among the age group of 31-40 (Table-2). Five users were below 20 and 21-30 years' age group each. Two were from 41-50 age group and one participant was above 50.

Table-2. Age Group Division of Participants.

S #	Description	Frequency
1	Below 20	5
2	21-30	5
3	31-40	13
4	41-50	2
5	Above 50	1

C. Experimental Design

A pre-test questionnaire was presented to the participant in order to get the consent and collection of basic information. The study was based on performing representative tasks by the participants. The participants were observed from behind while performing the tasks.

The user task performance and observation methods have been previously adopted by the researchers, some of which have been highlighted in the Section-II. A Twenty-minuteof time was planned for each participant to perform the tasks. Participants, except one, performed the tasks within stipulated time. Websites were already open in the web browser. Participants were free to ask questions about the tasks and websites during the usability testing. After completion of tasks as announced by users, a post-study questionnaire was presented tothem. Users performed tasks on all four websites and post-test questionnaire was filled after performing task on each website.

D. Procedure

Participants were approached at their convenient locations in most of the cases. However, some of them were invited in Federal Urdu University of Arts, Science and Technology, Islamabad labs for conducting the study. Participants were observed from behind while performing tasks. Pictures were also taken from behind in some cases after asking for permission (Figure-5). When the

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participant declared about completion of tasks, they were presented the post study questionnaire. Participants were briefed about the questions on their request.

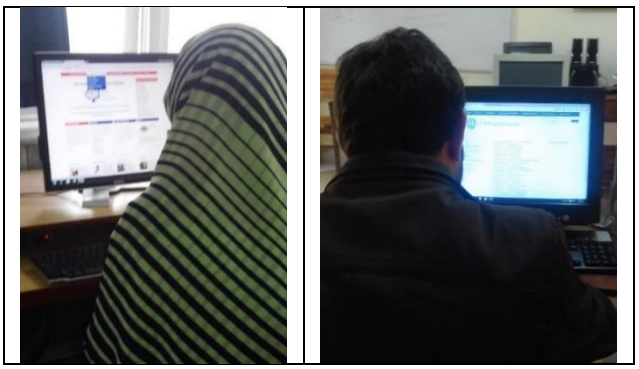

Figure-5. Users performing tasks during user study.

4. DATA ANALYSIS

Liker-scale values for each website have been recorded against each usability component. Average of all four websites score was calculated (Table-3).

Table-3. Average Score of Four Websites.

S. No	Questions	User Responses as per likert-scale values				
		1	2	3	4	5
1	Is the website easy to use?	2.75	2.50	4.50	9.00	7.25
2	I learned to use it quickly.	2.00	3.25	5.00	8.50	7.25
3	It is easy to remember how to use the website.	1.75	2.50	5.00	11.50	5.25
4	Have you found any mistake in the system while performing the tasks?	11.75	6.00	1.50	3.00	3.75
4.1	If so, how easy it is for you to recover from them?	3.00	2.00	1.75	5.00	13.25
5	It is pleasant to use?	3.00	5.50	7.50	7.00	3.00
6	The design of the website is beautiful?	4.50	7.25	7.00	5.25	2.00

The y-axis is used to represent the number of responses whereas x-axis is showing the likert-scale responses in Figure-6. The average results showed that the participants selected 4th Likert-scale value that is "Agree" in most of the cases (28.37%) as shown in Figure-6. Another 19.55% exhibited "Neutral" views about the usability. 18.27% users had "Strongly Agreed" with the usability of websites. However, 17.31% and 16.51% participants shown "Disagree" and "Strongly Disagree" responses respectively.

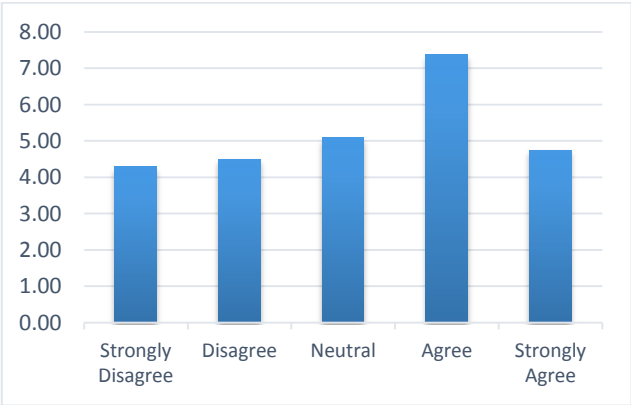

Figure-6. Average likert-scale selection in post study questionnaire.

A weighted mean from the user responses was calculated for the purpose of analysis to compare results of each website. Figure-7 displays the comparison of user responses for all the websites under evaluation. Mayo Hospital, Lahore remained highly usable among all.

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SZABMU, Islamabad was the 2nd, Khyber Hospital, Peshawar at 3rd and Civil Hospital, Karachi had lowest usability.

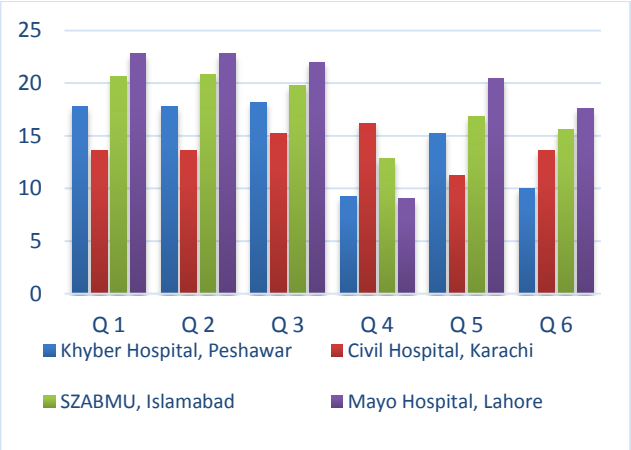

Figure-7. Comparison of user responses for websites under evaluation.

5. RESULTS

The overall results show that the users turn is towards positive usability approach in these websites i.e. "Agree" in our case. Figure-8 portrays the responses of participants for each usability component in post-test questionnaire. The usability components have been evaluated as follows:

a) Learnability

34.62% responses confirmed that learnability factor for websites under evaluation was "Agree". 27.88% responses were "Strongly Agree". 17.31% users remained "Neutral". 9.6% and 10.58% responses were "Disagree" and "Strongly Disagree" respectively.

b) Efficiency

The user response for efficient factor was "Agree" as 32.69% users marked likert-scale value 4. Another 27.88% participants marked "Strongly Agree". 19.23% remained "Neutral". 12.5% "Disagree" with the efficiency. However, 7.69% responses were "Strongly Disagree".

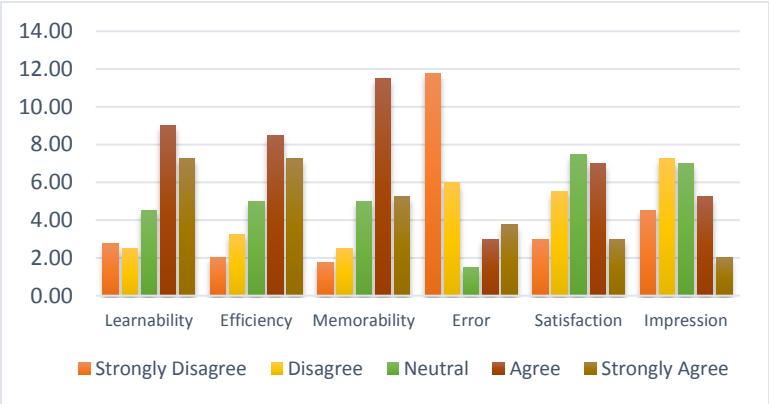

Figure-8. Responses of participants for each usability component.

c) Memorability

44.23% users "Agree" to memorize the websites for later usage. Another 20.19% "Strongly Agree" with the thoughts. But 19.23% stick with "Neutral" views. On the other hand, 9.61% and 6.73% responses were "Disagree" and "Strongly Disagree" respectively. About 16.35% contributors showed their concern about memorizing the websites.

d) Error

While performing the tasks, the users were unable to perform a certain task or either it was not there. In some cases, however, the link was clicked and nothing happened. Users marked it as error in the website. 45.19% users committed such errors while using the websites. However, 23.08% users were able to recover from the reported errors. 14.42% participants did not commit any error. 11.54% user committed fewer errors. 5.77% had "Neutral" views.

e) Satisfaction

28.85% participants (most in this case) remained "Neutral" about their satisfaction level. However, 26.92% users "Agreed" about their satisfaction. Another 21.15% and 11.54% user showed "Disagree" and "Strongly Disagree" views about their satisfaction level of using the websites. Another 11.54% users "Strongly Agreed" with the factor of satisfaction.

f) Impression

Impression was also aimed to measure during the study. As many as 27.88% users "Disagree" that the overall impression of websites is good. Similarly, 26.92% user remained "Neutral" about the impression of the websites. 20% user "Agreed" with the impression. 17.31% showed "Strongly Disagree" opinion and only 7.69% user marked "Strongly Agree" for impression.

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6. DISCUSSIONS

The results have shown that the websites under evaluation have been designed with no user approach. And, there seems a big margin of improvement in some directions.

None of the public sector hospital website had "find a doctor" and "online appointment" features. Similarly, participants had to navigate to home page most of the times to find all menus. Website should be designed in a way that on every page all menu options should be listed.

In some cases, information on the website is available but it is scattered in different areas. The relating information can be grouped closely in order to facilitate the users.

The websites were designed in a manner that they have more blank spaces. Keeping in mind the value of online space, a website should be designed in a way to be neither fully meshed up nor wide space between contents.

The design of the websites was not developed keeping in view a particular format or template. Information on the websites has no specific format in some cases. Hence user satisfaction is ordinary.

The websites contain a lot of irrelevant contents which are of no use to an ordinary visitor. Such information decreases user satisfaction level and overall impression.

Sometimes, users were intending to search certain information which is not easily visible on the website but no search bar was found on the website. To rectify the issue, website should have a "search bar".

The home page should be designed in way to contain most of the important information. In some cases, it has been reported that users have to navigate to other pages to see more information which has no link at the front page.

The operational timing of the hospital department was not mentioned in any of the case. The users reported that timing is essential for their busy day to day life for accessing the hospital for treatment. Operational timing and consultancy days should be reflected on the website for better user satisfaction.

All websites do not have geographical map to be reached in time. The users were happy to respond about those websites which had maps. Website should have road map for users/patients to approach it easily.

The contact details of the websites, in some cases, were not appropriate. Participants were unable to exactly point which contact is useful for them. The contacts should be written clearly with the designation or place to be reached.

The message from the head of the hospital is posted on the public owned websites and is highlighted. Such messages are of secondary importance for the users looking for websites for medical assistance. These messages should be organized in a way that they can be reached by interested persons only.

In case, a public hospital is a university as well, the website depicts the information about academia and promotes its educational expertise. There is either no information for patients or very little is provided to them. Such hospital should characterize the contents on the basis of academia and treatment.

In one case, the website was so badly designed that its background and font color were almost matching. Such contents are barely readable. Hence poor user satisfaction was reported for that. Proper font, font color and font size is of remarkable importance keeping in view the audience of the website and improved usability.

No help to the users were provided on the website in most of the cases. Necessary help, where needed, should be provided to the user in order to avoid interaction complexities.

7. CONCLUSIONS

Hospital websites are clearly a dimension towards spreading health information and treatment towards heathier society. But public hospital websites lack the usability aspects in most of the cases. Usability aspect of the public sector hospital websites has not been addressed in case of Pakistani hospitals.

The current study highlighted that the websites of public sector hospital were designed with no user-centered approach. Usability guidelines had not been adopted in any of the case. There is a margin of improvement in the design of these websites in order to keep user intact with relevant and precise contents. User satisfaction and impression are two areas for which users had mostly negative responses reflecting the scattered contents and bad design of the websites. The aesthetics of the users and their needs can be utilized to improve the usability rating of these websites.

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