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Usability evaluation of the top 10 Universities of Pakistan through Guideline Scoring

S. NIZAMANI[++], K. KHOUMBATI, SARWAT NIZAMANI*, S.MEMON, SAAD NIZAMANI

Institute of Information and Communication Technology, University of Sindh

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Abstract- In this digital era, the website of a university is a doorway to its information and services. Users expect that a university website must be designed professionally with user-friendly interface, which help them to search, navigate and collect information effectively. In this paper, the usability evaluation of the websites of the universities of Pakistan is performed through guideline scoring. In doing so, literature has been reviewed and a set of 77 guidelines divided into 11 categories are developed. Further, these guidelines are then used to evaluate top 10 universities of Pakistan. Based on the results of this study, we provided the scores to the website designs. Through the scores, we identified the top 3 university website designs, and the top designs in the particular categories of guidelines as well. We also identified the common usability issues in the designs of the university websites of Pakistan. The results of this research will help academia, practitioners, website developers and usability specialists to understand the problems of existing websites, which in overall may help them to design more usable websites.

Keywords: Usability Evaluation, Guideline Scoring, University Websites, Pakistan

1. INTRODUCTION

The term usability refers to "capability of being used" (OED, 2015). With respect to domain considerations, usability can be defined as the understandable application of user interface (Bačíková and Porubän, 2014). This property of understandability can be linked to number of guidelines that are needed to be followed for a usable application design.

Design guidelines are the specific advises for the interface design. Guideline scoring is an inspection based usability evaluation technique, that checks the design against defined guidelines and score the design and components of websites accordingly (Andrews, 2016). The total score is produced at the end which represents the degree to which the design follows the guidelines. The guidelines should be domain dependent by considering the specific requirements of that domain (Hermawati and Lawson, 2015).

For university domain, its website is an important source of information dissemination, through which university can compete with other universities in the market. Alongside, the university websites provide required information to the prospective students, for instance, the programs University offers, the fee structures and other related information. For current students, the website provides the listings of the courses offered in a program, the schedules of curricular and extracurricular activities and the information of important events and news. The other possible users of University website include teachers, researchers, and other stakeholders.

In this study, we evaluated the usability of the websites of top 10 universities of Pakistan listed by Times Higher Education rankings (THE, 2018) through guideline scoring. The names of the universities are mentioned in **(Table 1).** For ease in referring the universities, we use the codes instead of names in the rest of the paper.

Table 1. Top 10 universities - THE rankings (THE, 2018)

Code	Name of the university
U1	Quaid-e-Azam University
U2	COMSATS Institute of Information Technology
U3	National University of Science and Technology
U4	University of Agriculture
U5	BahauddinZakariya University
U6	Government College University
U7	University of Lahore
U8	University of Peshawar
U9	PMAS Arid Agriculture University
U10	University of Veterinary and Animal Sciences

The guidelines for the university websites are collected through literature review. We checked the university websites mentioned in Table 1 against those guidelines. The total score of each university is

[++]Corresponding author: sehrish.basir@usindh.edu.pk

*Department of Computer Science, Sindh University Campus Mirpurkhas.

produced at the end by aggregating the individual scores. The results of this study are presented in section 5.

The rest of the paper is organized as follows: Section 2, presents the literature review with the main focus on usability research in Pakistan, along with the guidelines provided in the literature for university website evaluation. In section 3, research methodology is elaborated, while the proposed guidelines are presented in section 4 along with their categories and relative importance in evaluation. The results and discussions are presented in section 5, whereas Section 6 concludes the paper.

2. LITERATURE REVIEW

Literature is reviewed in terms of usability research in Pakistan and the guidelines for the University website evaluation.

2.1. Usability research in Pakistan

The Human Computer Interaction and usability studies originated in the region of Europe and America and further got attention in Asian region in the last 15 years (Lazar *et al.,* 2017). Asia is the fastest growing region by means of population, economy and internet usage (Kotler et al., 2017). The usability research and practices are adopted by countries in Asia are mainly China, India and Japan. In Pakistan, usability evaluation research is in its infancy. (Nawaz and Clemmensen 2013) reported that despite of 29 million users having access of internet, there was not a single evidence of human computer interaction (HCI) research at that time. In Pakistan, HCI research has not completed a decade till now. Ashraf et al. (2018) made a survey in Pakistan about the involvement of usability in IT industry and concluded that there is partial involvement of usability in IT industry of Pakistan.

Through the literature review, it is observed that the work on evaluation of usability of the higher educational websites of Pakistan is very limited (Lodhi, 2010; Saeed and Amjad, 2013; Khan and Khan, 2013). This limited literature requires the attention of researchers in this area of usability evaluation.

Lodhi (2010) adopted Nielsen's 10 heuristics in order to evaluate the usability of university websites of Pakistan. The mix methodology research was adopted including 50 users from each website for survey followed by 4 experts for heuristic evaluation. The research reported the results of survey along with heuristic evaluation of the four universities of Pakistan. The research reports various usability issues in the websites of the universities of Pakistan including visibility of the system status, consistency and standards, error prevention, and flexibility and efficiency of use. These heuristics, although have a very important place in HCI and usability research, but these are not designed for evaluating the websites with users. These heuristics are meant to be designed for experts' evaluation (Nielsen andMolich, 1990). (Lodhi, 2010) also reports in her findings that the target audience faced difficulties in understanding heuristics. The author was unable to clearly explain the differences in the results of both studies, validation of results, and the details of usability issues in the target websites.

Saeed and Amjad (2013) analyzed the common usability issues in Pakistani university websites through a survey using twelve parameters namely user interface, easy navigation, information completeness, easy to learn, meaningful error messages, easiness in locating information, pleasant interface design, updated website, navigation structure, provision of lecture content and provision of student's information. The survey was conducted from two categories of stakeholders (students and teachers) for those websites and 12 responses were collected from three university websites. Although the sample size was comparatively small, but authors were successful in portraying usability problems in Pakistani university websites including problems in design, content, no regular update of websites, and navigation structures.

Khan and Khan (2013) evaluated ten universities of Pakistan based on the general web evaluation parameters including logo, title, search, breadcrumbs, visited and unvisited links, no horizontal scrolling, back button, font size, type face, about us page and site map. With the direct observation, the authors answered the two-point scale questions with the possible values of yes or no. Based on the results the authors reported the issues in the websites.

For the reviewed studies, few gaps are observed which are discussed here. Initially, the above studies include the general website evaluation parameters, with limited features to check, and importance is not given to domain specific design. These studies are unable to generalize the the problems in the design of university websites of Pakistan. It is also observed that the validation of the results is missing in above mentioned studies.

2.2. Guidelines for university website evaluation

For universities, the literature provides numerous guidelines to design a usable and easy to navigate websites.

For effective and usable website design, the United States department of Health and Human Services produced a report with 209 design guidelines (Shneiderman and Leavitt, 2006). These guidelines are taken from 500+ cited publications. This report covers all important issues and parts of website design along

with the ratings of 36 website professionals and 20 web designers. The objective of these guidelines was to provide understandable, meaningful and practical suggestions for website design.

A draft standard ISO/CD 9241-151 also provides 141 recommendations for the website user-interfaces to support user-centered design approach and enhancing usability of websites (ISO, 2008). These two reports provide a central guideline to design effective and usable websites. This standard is still under work in progress.

Sherwin and Loranger (2016) in their report provided the set of guidelines for the design of university websites. They reported that the most university websites around the world are far below the standard usability levels of website designs defined by the expert groups.

WebCredible (2014), (Lang *et al.* 2015) and Sherwin (2016) suggest some important design guidelines for the university websites to compete with other universities in global market and provide ease to the end users of the website.

3. MATERIALS AND METHODS

According to Fernandez et al. (2011), usability evaluation methods are classified into two categories, namely, empirical and inspection. In the evaluation through the empirical method, the actual users of the system are targeted for capturing the data. The captured data is then analyzed, in order to detect the usability problems. In contrast, the inspection method involves the evaluators who may review usability aspects of a website, by using the guidelines provided by usability experts that enlist possible usability attributes.

The complete roadmap of this study is presented in **(Fig.1)** using business process model and notation diagrams (BPMN).

We evaluated top 10 university websites of Pakistan through guideline scoring. For the collection of the guidelines, we have adopted the literature survey as the main research method. A literature survey process consists of two steps that includes literature search and literature review (Fink, 2013). Literature search refers to the mechanics of looking for, sorting, managing and digesting research materials that are available, whereas literature review represents written understanding, critical evaluation, conceptualization and presentation of the materials obtained. Studies related to the topic such as university website design, best university websites, university website evaluation, university website design guidelines have been made.

Three experts performed guideline scoring individually on each university website. The expert selection criteria include usability specialist, domain expert and a professional website developer. All three experts scored websites individually and provided their ratings, which were accumulated and presented in results section.

The list of guidelines is designed and tested first using experts on two university websites. Suggestions provided by the experts after pilot test are incorporated. The final categories and related guidelines are presented in next section.

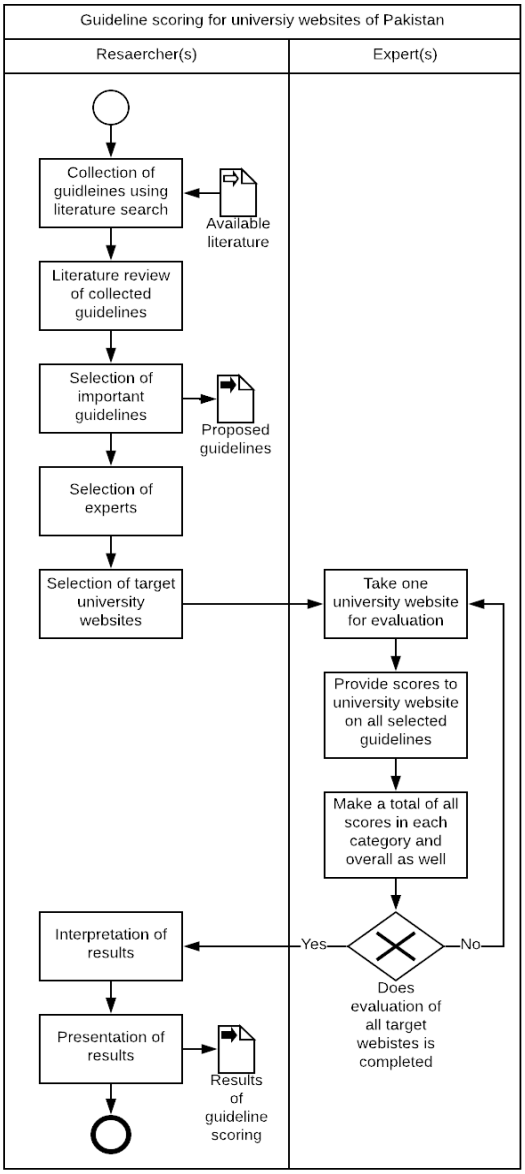

Fig. 1. BPMN diagram representing roadmap of this study

4. PROPOSED GUIDELINES

The focus of this research is to propose a university websites design guidelines set. While not a single set of guidelines can be considered comprehensive, we adopted numerous set of guidelines, and designed a

guideline set consist of 11 categories and total of 77 guidelines specifically considering the university websites of Pakistan. These guidelines are further refined after pilot test.

4.1. Information availability

The guidelines included in this category deal with the availability of important information in the university websites. Initially, a website must mention the name of the university along with the logo (Creative, 2017). The website must also be professional and academic, the content must be clear, divided into meaningful sections and appropriate to audience (Shneiderman and Leavitt, 2006; ISO, 2008; Sherwin, 2016). The website must also provide required information that can be possibly needed by each category of users such as prospective students, current students and teachers/researcher. The required information may include the admissions information, academics information, administration information, faculty information, social life, fee structure and financial aid, latest news, careers page, alumni and donors page, events notifications (Sherwin, 2016; Sherwin and Loranger, 2016) and links to social groups mentioned in the website (WebCredible, 2014; Sherwin and Loranger, 2016).

4.2. Homepage

Homepage of the website provides the first impression and clear starting point to the university website. The homepage must provide the clear message to prospective and current students. All the possible links must be provided through the homepage, so a user can properly navigate through the other contents of the websites. This category deals with the most important information available on homepage that users expect (Shneiderman and Leavitt, 2006; Creative, 2017). The information includes purpose of the website, important links (Shneiderman and Leavitt, 2006), strengths and achievements (Sherwin, 2016), news and events, university stories with appropriate titles, success stories, links to experiences of students (WebCredible, 2014). In the footer of homepage, the university name, address and telephone should be mentioned (Sherwin and Loranger, 2016) along with the last date updated for the website (ISO, 2008).

4.3. About us page

This page adds value to the university website design. This page includes details about university such as university's tag lines (Sherwin, 2016; Creative, 2017), mission statement or Vice Chancellor's statement along with the supplementary text (WebCredible, 2014; Sherwin and Loranger, 2016). It is also important that the names and designations of university's top administrators are also mentioned in the about us page.

4.4. Admission information

The website must provide details regarding possible categories of admissions (Sherwin, 2016) with application deadlines mentioned for each category (Sherwin and Loranger, 2016; Creative, 2017). The admission process must be explained in simplest manner (Sherwin, 2016; Creative, 2017), along with the documents required and eligibility criteria (Sherwin and Loranger, 2016). It is also important for every prospective student to have knowledge of how much it will cost them to study in that university (WebCredible, 2014). A good design of this section must provide the details about the following facilities:

- Accommodation and hostel facilities if provided by the university(WebCredible, 2014)
- Program admission and tuition fees (WebCredible, 2014)
- Scholarship details and eligibility criteria for the scholarship provision (WebCredible, 2014)
- Additional fee structures (Abdallah and Jaleel, 2013; Sherwin and Loranger, 2016)

Online application process is not supported by all universities in Pakistan, and many universities are still supporting the manual procedures of application submission for the programs they offer. Few universities, however support online application procedures or in transition to convert the websites to support online application procedures. In case, if university adopted online admission portal, it should be same in consistency of design as of main website (Shneiderman and Leavitt, 2006).

4.5. Academics and Research

This section of the university website adheres to the huge number of current students and researchers.

An important information in academics is the degree programs offered by the university (Shneiderman and Leavitt, 2006; Fullick, 2016; Sherwin and Loranger, 2016; Creative, 2017). The list of programs must be presented in recognizable manner, categorized by campuses and departments. The current and prospective students are interested in detailed information about the degree program of their interest, including number of semesters, the courses offered in that degree program, credit hours of each course, and other relevant information. In business perspective this page is termed as product page (WebCredible, 2014).The program information page must provide the following features:

- List of programs with description of each (Hasan, 2013; WebCredible, 2014; Sherwin and Loranger, 2016)
- Fee details and entry requirements
- Program outlines breakdown by semester and year details

- A good degree program finder tool (WebCredible, 2014; Sherwin, 2016)

If a website lacks degree program finder, make an easy list of offered programs organized in a way that user may find the programs in which he/she is interested.

Another important information in the category of academics is the faculty information. A faculty directory must be provided in the websites (Hasan, 2013). A well-designed faculty finder tool will help users to search for the required faculty with the first name, last name or department's information (Sherwin and Loranger, 2016).

For researchers website must also provide research areas, centers and journals published by the university (Abdallah and Jaleel, 2013; Sherwin and Loranger, 2016).

In overall, the website must provide an internal search facility along with search filters so information may be accessed with more efficiency (WebCredible, 2014; Sherwin and Loranger, 2016).

4.6. Students Life

A university website provides information about the details regarding campuses, extra-curricular activities and facilities provided to the students such as sports facilities, exhibitions, and libraries (WebCredible, 2014). If a facility is provided for the specific field of study, then the related department's page must provide information on department's page. The images of those facilities can enhance the impression of university and help student to imagine his/her life at campus.

4.7. Help and support

This category of guidelines deals with the provision of information that will aid the users of the websites for better user experience. It is important to provide the frequently asked questions for prospective and current students (Sherwin and Loranger, 2016) for admission and examination related information. It is also important that the user's terminology is used in the overall website design to make it simple and understandable (Shneiderman and Leavitt, 2006). The language used in providing error messages is helpful and understandable (Shneiderman and Leavitt, 2006). The website has a well-designed contact-us page with the facility of online feedback as well (ISO, 2008).

4.8. Multimedia

Users only spend few moments in a homepage of a website (Sherwin and Loranger, 2016) and are not interested in reading in-depth texts but scan the page in general. A good university website uses more images and videos to represent the university. It is also important that text equivalents must also be provided for each multimedia content (Shneiderman and Leavitt, 2006).

The images and videos in a university website should be applied that provides the following reflections:

- The intended message promoted by the university (Shneiderman and Leavitt, 2006; Sherwin, 2016; Creative, 2017)
- Students' activities and life (Shneiderman and Leavitt, 2006)
- University's physical and technological infrastructure (WebCredible, 2014)

4.9. Navigation

Navigation design is an important concern in any usable website design. For a university website the possible navigation structures can be topic based or audience based or both (Shneiderman and Leavitt, 2006; ISO, 2008;Sherwin, 2016; Sherwin and Loranger, 2016;Creative, 2017). The university website designed on separate user paths is simple to access (ISO, 2008) with relevant information provided in each individual path. The website must provide navigation information on each page (WebCredible, 2014) along with the link that gets back to homepage (Shneiderman and Leavitt, 2006).

4.10. Usefulness guidelines

We collected some usefulness guidelines which include:

- Design based on the consideration of promoting recognition rather than recall (Shneiderman and Leavitt, 2006).
- Website must provide appropriate feedback on actions where required (Shneiderman and Leavitt, 2006).
- Website must work properly on heterogeneous devices and web browsers (Shneiderman and Leavitt, 2006).
- Important items in a website must be placed on top-center (Shneiderman and Leavitt, 2006).
- Website must use meaningful page titles and menu titles (Shneiderman and Leavitt, 2006).
- Website forms must distinguish mandatory fields from optional fields (Shneiderman and Leavitt, 2006).
- The website typography must be good, professional, with easily scan able data (WebCredible, 2014)
- The overall website and its campuses pages must be consistent in design (WebCredible, 2014)
- The website is designed with appropriate use of colours for clear visuals (WebCredible, 2014)
- The website must adopt the local cultural formats for currency, date, and time information (ISO, 2008; Daniel *et al*. 2011 Abdallah and Jaleel, 2013).

4.11. Mobile and tablet support

In this current era of development, websites are viewed on multiple devices such as personal computers, laptops, smartphones, tablets, etc. It obviously becomes the responsibility of the website to provide optimal view of it on any diverse device. It is also reported that approximately 50% of user data comes from mobile devices. A website must support its contents including images, animations and videos to provide optimal view on any possible device type.

For simpler tasks prospective and current users prefer to use mobile devices and tablets such as searching for contact information, general overview of degree programs, accessing sitemaps. For long term tasks, suas applying for a degree program, users prefer laptop or personal computers (Lang *et al.*, 2015).

The major objectives of mobile and tablet support in the website includes:

- The tasks of prospective and current students are displayed first on mobile devices (WebCredible, 2014; Sherwin and Loranger, 2016).
- The buttons and links on the web must be of appropriate size so a user can access those easily using touch screen (WebCredible, 2014).
- Design the website in a way, so the functionality of the website must also be clearly viewed in smaller sized screens (tailored design) (WebCredible, 2014)

5. RESULTS AND DISCUSSION

We interpreted the total scores of the guidelines provided by the experts which is presented in **(Table 3).**

Table 3. Estimated scores of the experts for website evaluation

University	Expert A	Expert B	Expert C	Median	Variance
U1	286	277	290	286	44.33
U2	316	322	321	321	10.33
U3	321	312	313	313	24.33
U4	241	238	242	241	4.33
U5	264	268	260	264	16.00
U6	257	257	261	257	5.33
U7	343	340	338	340	6.33
U8	250	250	253	250	3.00
U9	309	305	310	309	7.00
U10	325	322	318	322	12.33

In order to calculate inter-rater reliability for consistency of results, we converted the total scores of all experts into ranked data and calculated Krippendorff's alpha (Krippendorff, 2011). The results showed the reliability of 0.967 with the significance < 0.001 (1-tailed). The high percentage indicates the stability of the judgment process made by the experts.

The **(Table 4)** presents the median of scores of the selected university websites based on the proposed categories.

As observed from the scores, the University U7 leads in Information availability, homepage design, admission's page design, academics and research, help and support and usefulness guidelines, the university U10 leads in about us page, student's life, and mobile and tablet support, the university U4 leads in multimedia design, and university U2 leads in navigational design.

For construct validity and internal consistency, we calculated the Cronbach's alpha for the guidelines under each category. This indicates the degree to which the items can be considered similar in determining usability issues under single category. The results are represented in **(Table 5),** from which, it can be clearly observed that the items under each guideline set have strong internal consistency except the last guideline set name mobile and tablet support which is also categorized under acceptable limits (Kaplan and Saccuzzo, 1993).

Table 4: Cronbach's alpha

Guideline Category	Cronbach's alpha
Information Availability	0.881
Homepage	0.977
About us page	0.884
Admissions	0.799
Academics and research	0.972
Students life	0.837
Help and support	0.910
Multimedia	0.903
Navigation	0.880
Usefulness guidelines	0.703
mobile and tablet support	0.650

We compared the scores given by three experts for all universities based on the given guidelines. For this, a non-parametric Friedman test (Theodorsson-Norheim, 1987) was conducted and rendered a Chi-square value of 1.47. With the result of this test, it can be observed that with the value of 0.479 there are no significant difference between the decisions of the experts in scoring universities.

Based on the decisions of all three experts, the top three university website designs are U7 with total median score of 340, U10 with median score of 322,and U2 with total median score of 321

Table 4. The Scores of Website Design on Various Categories

Category	Total	U1	U2	U3	U4	U5	U6	U7	U8	U9	U10
Information Availability	**75**	59.00	61.67	66.00	56.00	57.00	59.00	68.00	59.00	64.00	58.00
Homepage	**50**	32.00	35.33	34.33	30.00	26.00	20.00	43.00	29.00	42.00	42.00
About us page	**25**	10.33	16.67	19.00	10.00	17.00	18.00	20.00	16.00	21.00	24.00
Admissions	**45**	38.33	39.33	44.00	16.00	26.00	31.00	45.00	14.33	44.00	41.00
Academics and research	**40**	24.00	32.33	24.00	18.33	23.33	26.00	35.00	16.33	24.00	22.00
Students life	**15**	10.33	12.00	11.00	0.00	10.00	6.33	12.33	13.33	2.67	15.00
Help and support	**25**	17.00	18.00	19.00	18.33	17.33	15.33	23.67	2.67	17.67	18.67
Multimedia	**20**	13.33	18.00	15.67	19.00	9.33	11.00	15.00	17.67	14.33	18.67
Navigation	**20**	17.67	19.00	17.67	13.67	18.00	16.67	14.67	18.00	16.00	14.67
Usefulness guidelines	**60**	54.33	54.33	54.67	56.00	46.67	47.67	57.00	53.00	54.00	53.67
mobile and tablet support	**15**	8.00	13.00	10.00	3.00	13.33	7.33	6.67	11.67	8.33	14.00

Through this study, we also identified the usability issues which scored the least in guidelines for all websites. The ten issues with the overall lowest median score up to the average median score are mentioned in **(Table 6).** For university websites of Pakistan, these issues require attention of the designers and university authorities.

Table 6. The identified common usability issues in the website designs of the universities of Pakistan

Issue Id	Common usability issues
UI1	University website has no link to Alumni page.
UI2	University success stories are not mentioned on homepage.
UI3	Student's experiences are not mentioned on homepage.
UI4	Last date updated for the website pages are not mentioned.
UI5	Unavailability of faculty finder tool when university has huge faculty.
UI6	Unavailability of a course finder tool.
UI7	Unavailability of the website search filters.
UI8	Less images of students (so one may find difficulty in imagining life at university).
UI9	Frequently asked questions are either not available or not properly placed.
UI10	Online feedback / Contact us pages are not properly designed.

As this research is a part of an ongoing project, we implemented these common issues in identification of domain specific heuristics for usability evaluation for the universities of Pakistan.

6. CONCLUSION

In this study, we developed set of guidelines for usability evaluation for the university websites of Pakistan. In this regard we collected and developed a guideline set of 77 guidelines divided in 11 categories. We evaluated top 10 universities of Pakistan using these collected guidelines. Through scores of the selected universities, the best three designs are identified. We also provided the results based on the specific categories. Through these guidelines, usability of any university website of Pakistan can be evaluated. These guidelines can also act as the roadmap to help website designers, in order to make more meaningful and user-friendly websites.

Through this study, we tried to identify the common usability issues of the university websites of Pakistan, and reported the issues with the lowest scores. Through the identification of these issues, this research will help in understanding the problems of currently developed designs.

In future, we will use these common issues as a source along with the other studies we made to identify the web design preferences for the users of Pakistan through control experiment (Nizamani *et al.*, 2018a) and survey (Nizamani, *et al.*, 2018b) in creation of domain specific heuristics for heuristic evaluation.

Even though we evaluate the websites with the best of our interests, this methodology comes with few limitations. Initially, this methodology is time consuming as few of the general guidelines are to be checked on every web page individually. There could be a possibility that evaluation of few pages might have been missed by the evaluators.

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