

**Developing and Implementing a tool
'PH.WUQT: ACADEMIC'
to measure 'Quality in Use' for
Websites developed in Punjabi and Hindi of Academic Domain**

ABSTRACT: India has more than 460 million internet users and is the second largest online market, next to China. A website is a cover page of the academic institute. Considering the role of websites most of the websites of Academic institutes have a version in local languages also. In this research a tool 'PH.WUQT-ACADEMIC' has been developed and a case study has been performed on websites of Punjabi and Hindi version of Indian Universities. 69 participated in the study. It is apparent from the results that maximum of the evaluators have score between 53% to 84%. Among 69 evaluators, 18 comments are received and among them only 2 appreciated the websites, rest all gave the comments for improving these websites.

KEYWORDS: PH.WUQT-Academic, 'Quality in Use', Punjabi Websites, Hindi websites, Academic domain, Quality, Case Study.

1. INTRODUCTION

According to [1] India have more than 460 million internet users, India is the second largest online market next to China. By 2021, there will be about 635.8 million internet users in India. Kurt Schimmel et. al. [2] has discussed the importance of websites of academic institutes. A website is a cover page of the institute. Taking into consideration the role of websites for stakeholders most of the websites of Academic institutes have a version in local languages also. Rupinder Kaur and Vishal Goyal [3] prepared a list of Indian Universities whose websites have been developed in Hindi and Punjabi languages in addition to English language. The tool, PH.WQT was developed and validated to evaluate the external quality of these websites.

Now, in this research efforts have been made to measure the 'Quality in Use'. Hence a tool 'PH.WUQT-ACADEMIC' has been developed and implemented on websites of Indian Universities.

The paper is structured as follows. Following the introduction is related literature is presented and analyzed in Section II. Section III outlines the strategy for the data collection and Section IV discusses about the results and analysis. Finally, Section V presents conclusion and future work.

2. RELATED LITERATURE

Olsina et al. [4] include results of a case study about academic sites. Six internationally well-known academic sites from four different continents are selected to carry out the case study. More than a hundred characteristics and attributes for the domain of academic sites are outlined. Zihou Zhou in his MPhil thesis [5] proposes the website quality metrics and methods to measure the website quality factors. Zihou Zhou considered five quality characteristics: Aesthetics, Ease of Use, Multimedia, Rich Content and Reputation. A website evaluation tool is provided to analyse and measure website quality automatically. A case study is performed to evaluate a website: www.dmu.ac.uk which is the official website of De Montfort University. Finally, a validation process is applied by using the questionnaires to verify the web evaluation tool. Ten universities websites were selected in this evaluation process, i.e. Cambridge, St Andrews, College London, Warwick, Exeter, York, Leicester, Birmingham, Manchester, and De Montfort.

Priyanka et al. [6] propose usability metrics for Academic web sites. Priyanka et al. have discussed the usability characteristic as described by ISO 9126 model and applied by various researchers. They conclude that usability requirement varies for websites of different domains and hence to evaluate usability common set of metrics cannot be used. They modified a model proposed for Luis et al. and identified four characteristics (Global Site Understandability, On-Line Feedback and Help Features, Interface and Aesthetic Features and Miscellaneous Features) further divided these into 32 measurable attributes based on the small experiment with the help of students of Master of Computer Applications in 3 Indian Universities.

Again, the ISO 25010 discusses about the 'Quality in Use' for software and no guidelines have been issued for web quality. Nigel Bevan is one of the members of the team who designed ISO 25010 guidelines. Nigel Bevan [7] in his paper discusses of the characteristics and sub-

characteristics of 'Quality in Use' that have been included in ISO/IEC 25010 and also discusses new challenges for measurement.

Divya Singhal and V.Padhmaanabhan [8] employs primary data as well as secondary data. Secondary data was collected from different published sources while primary data was collected by structured survey. A questionnaire was prepared based on various factors which contribute to the customer's perception such as convenience, reliability, time factor, easy to use, user friendly, security etc. were taken for the study.

Alexander et al. [9] aim at determining the effect of subjective measures of web service usability on its objective measures. The authors have done usability evaluation of web services in West Indies. A case study with university student information system including 179 students was carried out. Using these results by appropriate design of web system its usability can be improved.

Mohammed et al. [10] study aims at evaluating the service quality of internet banking (i-banking) services in India from customer's perspective. The questionnaire containing 44 quality items was administered for various groups.

Aladwani A.M. and Palvia P.C [11] developed an instrument that captures key characteristics of web site quality from the user's perspective. The 25-item instrument measures four dimensions of web quality: specific content, content quality, appearance and technical adequacy. The items were measured using a seven- point scale ranging from (1)"extremely not important" to (7) "extremely important"

Arno et al. [12] research used 328 web sites of hotels in the German-speaking Alpine region to test their web site adoption model. A questionnaire was developed to gather success measures and sent to each hotel which was completed by managers of 144 hotels.

Lotfollah Najjar and Marc J. Schniederjans [13] in their paper present an application of an information quality measuring methodology adapted and applied for the first time in the US banking industry. The information quality questionnaires were prepared and sent to 278 employees of the five branch bank facilities that used to serve internal or external customers. Results of the study reveal that the proposed methodology can be used to identify quality differences between different banking institutions and different dimensions of information quality as well as a quality benchmarking procedure.

Stuart J.Barnes and Vidgen Richard T [14] describe the use of WebQual 2.0 to evaluate Internet Bookshop Web Sites. Initially applied in the domain of information-intensive Web sites, WebQual 2.0 has been extended and refined to encompass an interaction-quality perspective on e-commerce Web sites. Its development draws on an analysis of the service-quality literature. WebQual assesses Web site quality from the "voice of the customer" perspective, an approach adopted in quality-function deployment. It is used to assess customer perceptions of on-line bookshops, one of the more mature areas of Internet commerce. Three UK-based Internet bookshops are assessed using a natural experiment. Data are collected from students using an on-line questionnaire. Analysis of the results demonstrates considerable variations in the offerings of the Web sites. The findings and their implications for e-commerce are discussed, and conclusions and directions for further research are provided.

The method opted by JCPenney [15] was very efficient. In order to increase the person's desire to participate in the study, JCPenney presented a small gift to all respondents. The respondents were asked to visit the JCPenney website in their respective countries (jcpenny.com for the US and jcpennykorea.com for Korea). Respondents were then asked to browse the site for 15–20 min, scrolling up and down the pages, clicking on links and using any features that interested them on the site. After reviewing the site, the participants were asked to fill out the questionnaire.

Mayte et al. [16] propose a model for 'Quality in Use' for web portals. Mayte et al. have analyzed and selected the quality characteristics and sub-characteristics defined in the 'Quality in Use' Model, defined by the ISO/IEC 25010.

Rupinder Kaur and Vishal Goyal developed a tool PH.WUQT [17] for the websites of Punjabi and Hindi Newspapers for evaluating the 'Quality in Use'.

3.0 PH.WUQT : ACADEMIC

The attributes that affect the usability quality of websites are recognized and the items are selected and are placed in a questionnaire format in preparation for data collection. The questionnaire prepared consists of questions each covering various quality attributes like Usability (e.g. I find the site easy to navigate). Among these questions, almost forty percent questions are those that are from references [3-18] with little or no changes while others have been specifically prepared for this study. A closed ended questionnaire has been designed as the quality of websites has to be measured quantitatively. In a closed questionnaire the subcategories, items and scales are considered. The questionnaire's items are designed to represent attributes, and then specified them in a satisfaction requirement tree. Each questionnaire's item is quantified by a metric (regarding the user questionnaire scale), and in turn elementary indicators are derived accordingly. The users are asked to browse the Hindi/Punjabi version of these websites to perform some tasks.

3.1 Pilot Study of Developed Tool

As A.K. Abd El-Aleem et al. [19] mentioned that following Churchill's recommendation the tool developed should be subjected to a two-stage data collection and refinement procedure. Similarly, in this research also the first stage is used for design and the second stage for normalization. A pilot study is carried out beforehand to validate the questionnaire and to make sure that the subjects would use no more than 15-20 minutes to assess the website(s) and fill the questionnaires.

Initially, the fifty five item (attributes) instrument was administered by a Professor and Assistant Professor from Department of Computer Science (Punjabi University, Patiala) but was ultimately finalized with thirty one questions. The screenshot of the first page of questionnaire used for pilot study is shown in appendix A.

The pilot study was performed. Three websites of academic domain considered were Punjabi University (Punjabi language), IIM Ahmedabad (Hindi Language) and Delhi University (Hindi Language). The questionnaire includes three sections. The first section consists of questions about the respondents' physical and academic details (i.e. age, education qualification, gender, etc.) Additionally, they were asked to provide information about the frequency of the Internet use as also the information about the websites other than English language.

Second section consists of performing six tasks. The evaluators have to browse and perform tasks from the given three websites (one of Punjabi and two of Hindi. All the questions are to be answered on a five-point Likert scale. Users are asked to rate the site for each quality using a scale ranging from 1(Strongly Disagree) to 5(Strongly Agree) Further, open comments are also invited.

The questionnaire was pretested using a small population of faculty from Sri Guru Gobind Singh College, Chandigarh and computer professionals working for the advancement of Punjabi language from Punjabi University, Patiala. The pilot study was done to find out the limitations in the design of questionnaire and to improve it in order to achieve the objectives formulated. The evaluators made valuable suggestions about phrasing, formatting and classification of the web objects. This led to further rejection of ten web objects. This modified questionnaire was then used for the final survey. Another purpose of the pilot study was to find out how much time each subject needed to finish a series of tasks. Instead of browsing three websites and then rating for the quality attributes for each website which was time consuming as well as confusing also now only one website had to be browsed and rated. Thus, based on pilot study results, it was determined that 5-6 simple tasks for one website could be accommodated within the 15-20 minute target for the experiment.

3.2 PH.WUQT:ACADEMIC

The final questionnaire was named "Punjabi and Hindi Website User Quality Tester: PH.WUQT:ACADEMIC" that was used for data collection. The PH.WUQT: ACADEMIC begins with a covering letter that briefly explained the research topic and assured the respondents that the information provided would be confidential and used for research purpose only. Further, the PH.WUQT:ACADEMIC consists of two parts.

In the PH.WUQT:ACADEMIC the user has to enter the information in text boxes like name, while for others the evaluator has to select from the given list of options like country and also a radio button is provided for options like gender etc. First part includes the personal information.

3.3 PH.WUQT: ACADEMIC

The second section of 'PH.WUQT:ACADEMIC' consists of 21 questions each covering various qualities attributes like Usability e.g. 'I find the site easy to navigate'. Among these 21 questions, 7 questions have been taken from other research papers with little or no changes and others have been specifically prepared for this research. The evaluator is requested to browse any one website (Punjabi or Hindi) from the following websites and perform the tasks mentioned below:

Punjabi : *Punjabi University, Patiala* (<http://punjabiversity.ac.in>) or *Baba Farid University of Health Sciences* (http://bfuhs.ac.in/index_punjabi.asp)

Hindi : *Jawaharlal Nehru University, Delhi* (<http://www.jnu.ac.in>) or *Indian Institute for Management, Ahmedabad* (<http://www.iimahd.ernet.in/>).

The evaluators need to perform the following tasks:

- 1 Find the Prospectus of the University from the website
- 2 Look for the programmes run by the institute.
- 3 Check for the phone number/email id of the Vice-Chancellor/Director from the website.
- 4 Using the Search facility of the website find the placement details of the students.
- 5 Find the Road map directions to reach the institute.
- 6 Locate for the FAQ

After performing the above mentioned tasks the evaluator is requested to rate the website for each quality attribute using a scale ranging from 1(Strongly Disagree) to 5 (Strongly Agree). Open Comments are encouraged.

3.4 IMPLEMENTATION OF PH.WUQT

To perform the usability testing so as to cover more demographic area the PH.WUQT, a tool in the form of a questionnaire has been implemented online [20]. The PH.WUQT has been designed and developed in PHP.

TABLE 3.0 Details of the respondents

Measure	Items	Academic Domain
		n, (%)
Age (in years)	Less than 25	18, (26.1%)
	26-35	25, (36.2%)
	36-45	24, (34.8%)
	46-55	02, (02.9%)
	Total	69, (100%)
Gender	Female	30, (43.5%)
	Male	39, (56.5%)
	Total	69, (100%)
Internet usage	Once a month	01, (1.4%)

Qualification	Under graduate	5, (7.2%)
	Graduate	4, (5.8%)
	Postgraduate	45, (65.2%)
	Doctorate	15, (21.7%)
	Total	69, (100%)
Profession	Student	10, (14.5%)
	Teaching	21, (30.4%)
	Non-teaching	16, (23.2%)
	Research	17, (24.6%)
	Govt. Official	3, (4.3%)
	Any other	2, (2.9%)

	Once a fortnight	02, (2.9%)
	Once a week	0, (0.0%)
	2 or 3 times a week	06, (8.7%)
	Once a day	12, (17.4%)
	More than once a day	48, (69.6%)
	Total	69, (100%)
Surfing time	Less than ½ and hour	8, (11.6%)
	Less than an hour	7, (10.1%)
	Less than two hour	18, (26.1%)
	More than 2 hours a day	36, (52.2%)
	Total	69, (100%)

	Total	69, (100%)
Browsed sites other than English	Yes	45, (65.2%)
	No	19, (27.5%)
	Often	5, (7.3%)
	Total	69, (100%)
Country	Australia	1, (1.4%)
	Austria	0, (0.0%)
	Canada	0, (0.0%)
	India	67, (97.1%)
	New Zealand	0, (0.0%)
	Not Mentioned	1, (1.5%)
	Total	69, (100%)
Browsing time(in minutes)	<15 minutes	44, (63.8%)
	15-30	20, (29.0%)
	31-45	5, (7.2%)

Lot of care has been taken for developing the user friendly online questionnaire (PH.WUQT) so that the user fills the questionnaire in minimum time and with minimum efforts. As discussed in the development of tool, the PH.WUQT consists of two tabs. First tab consists of the questions related to personal information as shown in figure 1.0. Second tab consists of the name and link of some Punjabi/Hindi websites that have to be selected for testing. Further, tasks are displayed that the user has to perform which are followed by the questions. Further, open comments are invited and finally the time taken for the entire task by the respondent has been asked before he/she submits the form. For the convenience of the user the questions have been rated from strongly disagree (set as default i.e. rating one) to strongly agree with five radio buttons. Similarly, for personal data also wherever possible drop down lists (like selecting a country) or radio buttons (like in Male/Female) have been used. First tab is for

personal information while second tab displays a list of selected Punjabi/Hindi websites. The evaluator is asked to select one out of his choice website for testing.

3.5 PH.WUQT:ACADEMIC

Figure 2.0 shows the implementation of PH.WUQT for academic domain. On the top the links are provided to open the website for testing. Further the user has to select the website to be tested by clicking on the radio button. All the twenty one questions are again provided with five radio buttons that the user has to click to rate the quality attributes from strongly disagree to strongly agree. Further, a text box is provided for any comments and in the end a drop down menu is provided to select the time spent for filling the questionnaire before pressing the submit button.

Personal Information

Survey Form

Dear Sir/Madam,
I am pursuing my Ph.D programme titled "Qualitative Performance Analysis of Websites Developed in Punjabi and Hindi" under the esteemed guidance of Dr. Vishal Goyal, Punjabi University, Patiala. You are one of the valuable respondents chosen for the study. I request you to kindly complete the questionnaire given below and return to the undersigned at your earliest convenience. The information provided by you will be kept confidential and will be used only for the academic purpose. Thank you for your valuable response and with regards.
Yours Sincerely,
Rupinder Pal Kaur,
rsandhu_18@yahoo.com
Please Enter information about yourself:

Name	<input type="text"/>
Gender	<input checked="" type="radio"/> Male <input type="radio"/> Female
Age	Less Than 25 ▾
Internet Usage	Once a month ▾
How much time you spent on surfing Internet a day?	Less than half an hour ▾
Qualification	Under Graduate ▾
Profession	Student ▾
Have you ever browsed the website having the contents other than English language (Like in Punjabi, Hindi)	Yes ▾
City	<input type="text"/>
Country	Select Country ▾
Email Id	<input type="text"/>
Phone No	<input type="text"/>
Office Address	<input type="text"/>

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Personal Information Survey Form

The **evaluator** is requested to browse any one website (Punjabi or Hindi version) of **Academic** domain from the following websites and may perform the tasks mentioned below :

- **Punjabi:** **Punjab University**, Patiala (<http://punjabiversity.ac.in>)
- **Punjabi:** **Baba Farid University of Health Sciences** (http://bfuhs.ac.in/index_punjabi.asp)
- **Hindi:** **Jawaharlal Nehru University, Delhi** (<http://www.jnu.ac.in>)
- **Indian Institute for Management, Ahmedabad** (<http://www.iimahd.ernet.in/>)

Website selected for Testing :

Punjabi

☐ Punjab University, Patiala (<http://punjabiversity.ac.in>)

☒ Baba Farid University of Health Sciences (http://bfuhs.ac.in/index_punjabi.asp)

Hindi

☐ Jawaharlal Nehru University, Delhi. (<http://www.jnu.ac.in>)

☐ Indian Institute for Management, Ahmedabad (<http://www.iimahd.ernet.in/>)

The tasks are:

1. Find the Prospectus of the University from the website.
2. Look for the programmes run by the institute.
3. Check for the phone number/email id of the Vice-Chancellor/Director from the website.
4. Using the **Search facility** of the website find the placement details of the students.
5. Find the **Road map directions** to reach the institute.
6. Locate for the FAQ.

The evaluator is requested:

- Rate the following websites for each quality attribute using a scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).
- Open Comments will be appreciated.

S.No.	Questions	Rating of Website					Strongly Agree
		Strongly Disagree	1	2	3	4	
1	The general layout of the web site is good.	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2	Easy to switch from English version to Punjabi/Hindi version of website and vice versa.	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3	The homepage of Punjabi/Hindi version of website creates same meaningful visual interest as of English version.	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4	The color contrast used in the website is pleasing.	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5	The Punjabi/Hindi font face and font size used in the website are satisfactory.	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6	The Punjabi/Hindi language used is sound and understandable.	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7	Spacing between Punjabi/Hindi language lines, characters, matras is sufficient.	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8	All the major services are easily reachable from the home page and it is easy to go back to Home Page from anywhere in the website.	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9	I found easily what I was looking for	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10	All the information required is either present on the site or through external links.	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11	You don't need to switch to the English version of website for any information. .	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12	You don't need to install Punjabi/Hindi language fonts to view any contents in the website.	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13	No link is terminating to English version of Website.	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14	Sufficient facilities are provided by the website like saving, printing, downloading etc.	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15	Sufficient queries are answered in FAQs provided in the website.	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
16	While browsing the website no Errors/Page Not Found/Server Error encountered.	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17	Terminology used in the Punjabi/Hindi version of the website is correct and appropriate to the corresponding English version.	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18	The file downloaded from this site uses Unicode encoding and is easily legible.	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
19	No specific browser is needed to view the website. .	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
20	The Punjabi text from the website can be easily copied into clipboard.	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
21	Overall satisfied with the website	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Any Suggestion about the website

Approximate Time Taken to Browse Site: **less than 15 minutes**

[New Page](#) [Submit](#)

Figure 1.0 Screen Shot of the PH.WUQT (Academic Domain)

4.0 PH.WUQT: :ACADEMIC'- RESULTS AND ANALYSIS

Figure 3.0 shows the distribution of the websites selected for evaluating quality by 69 evaluators for academic domain.

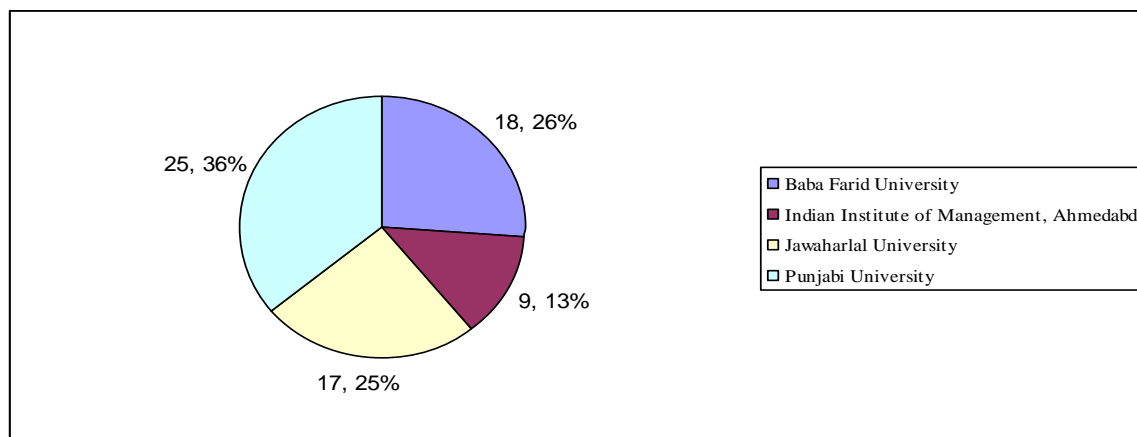


Figure 3.0: Distribution of Academic sites browsed by study population

Table 2.0 shows the number of the respondents according to the personal details. As discussed earlier, the evaluators rate each of the quality attributes of the website on a 5 point likert scale from Strongly Disagree to Strongly Agree where Strongly Disagree represents 1 and Strongly Agree represents 5. The agreement levels of evaluators for academic,. There were 20 questions for each domain, indicating each quality attribute and the last question was to rate the website according to the individual satisfaction of quality of website. So, the maximum score was 100 and the minimum score is 20. Accordingly, the score of all the evaluators is calculated and categorized in table 3.0. It is evident from the table that maximum of the evaluators have score between 53% to 84% i.e. maximum of their answers were neutral (as 3 is for neutral, $3 \times 20 = 60$) for academic domain which means that they are neither satisfied nor they are against the quality of websites for academic domain.

TABLE 1.0: OVERALL AGREEMENT LEVEL (SCORE WISE) OF EVALUATORS

Agreement level Score	(Maximum Score is 100)	Strongly Disagree(Score between 20-36)	Disagree(Score between 37-52)	Neutral(Score between 53-68)	Agree(Score between 69-84)	Strongly Agree (Score between 85-100)	Total
Academic (n-69)		5, (7.2%)	6, (8.7%)	25, (36.2%)	16, (23.2%)	17, (24.6%)	69, (100%)

Twenty first question or the last question of the questionnaire was to rate the website according to the individual satisfaction for quality of the website. Appendix B analyzes the satisfaction level for quality of websites by the evaluators for websites according to the personal details of evaluators.

TABLE 2.0: ANALYSIS OF OPEN COMMENTS

Domain Name	Satisfied	Comments for Improvement	Total
Academic Domain	2, (11.11%)	16, (88.89%)	18, (100%)

In the last section of the questionnaire, open comments are invited. Among the 69 evaluators, open comments were received from 18 evaluators as, shown in table, 2.0 . Comments are received and among them only 2 appreciated the websites, rest all gave the comments for improving these websites as shown in Appendix C..

5.0 FUTURE WORK AND CONCLUSION

'PH.WUQT:ACADEMIC' developed for measuring 'Quality in Use' can be used for websites developed in other languages. In the next phase, domain dependent indicators for other domains can be identified and subsequently, quality models can be developed for measuring and evaluating website of other domains for websites developed in Punjabi and Hindi language. After that data can be collected for them. Accordingly, quality can be measured quantitatively and comparison among websites of those domains can be performed consistently. Consequently, the tool developed to measure 'Quality in Use' can be used for the websites developed in other languages with little changes and for websites of Punjabi and Hindi language for other domains as well.

REFERENCES

- [1] <https://www.statista.com/topics/2157/internet-usage-in-india/> [Accessesed on 20th September, 2018]
- [2] Kurt Schimmel Robert Morris University Darlene Motley Robert Morris University Stanko Racic Robert Morris University Gayle Marco Robert Morris University Mark Eschenfelder Robert Morris University , The importance of university web pages in selecting a higher education institution., Research in Higher Education Journal,
- [3] Rupinder Pal Kaur, Vishal Goyal, "Qualitative Performance Analysis of Punjabi and Hindi Websites of Academic Domain- A Case Study" Information Systems Design and Intelligent Applications. Advances in Intelligent Systems and Computing. 435. DOI: 10.1007/978-81-322-2757-1_63.pp no. 635-643. **Springer India 2016**(As book Chapter).
- [4] Luis Olsino, D Godoy, G.J. Lafuente and Gustavo Rossi, **Assessing the Quality of Academic Websites: a Case Study**, In New Review of Hypermedia and Multimedia(NRHM) Journal, Taylor Graham Publishers, UK/USA, ISSN 1361-4568, Vol. 5, pp.81-103. (1999).
- [5] Zihou Zhou , **Evaluating Websites Using a Practical Quality Model**, MPhil Thesis, Software Technology Research Laboratory, De Montfort University, (2009).
- [6] Priyanka Tripathi, Manju Pandey and Divya Bharti, **Towards the Identification of Usability Metrics for Academic Web-Sites**, Proceedings IEEE Volume2, pp. 394-397.(2010).
- [7] Nigel Bevan, **Extending Quality in Use to Provide a Framework for Usability Measurement**, In Proceedings of HCI International, San Diego, California, USA. LNCS 5619, pp.13-22 (2009).
- [8] Divya Singhal and V.Padhmanabhan, **A Study on Customer Perception Towards Internet Banking: Identifying major contributing factors**, The Journal of Nepalese Business studies Volume 1, pp. 101-110. (2008).
- [9] Alexander Nikov, Selim Zaim and Asil Oztekin, **Usability Evaluation of Web services by Structural Equation Modeling**, SEM WebServUse-CMAIA (2006). In Proceedings of CMAIA. pp. 1-6. (2006).
- [10] Andre P. Freire , Thiago J .Bittar and Renata P.M. Fortes, **An Approach Based on Metrics for Monitoring Web Accessibility in Brazilian**. In Proceedings of the 2008 ACM symposium on Applied computing. pp. 2421-2425. (2008).
- [11] Mohammed Sadique Khan, Siba Sankar Mahapatra and N. A. Sreekumar, **Service quality evaluation in internet banking: an empirical study in India**, International Journal of Indian Culture and Business Management, Issue 1, Volume 2, pp. 30-46. (2009).

- [12] Aladwani, Adel .M. and Palvia, P.C, **Developing and validating an instrument for measuring user-perceived web quality**. Journal of Information and Management. Elsevier. Issue 6, Volume 39, pp. 467–476 (2002).
- [13] Arno Scharl ,Karl W.Wober and Christian Bauer, **An Integrated Approach to Measure web Site Effectiveness in the European Hotel Industry**, Journal of Information Technology and Tourism, Volume 6 . pp. 257-271. (2004).
- [14] Lotfollah Najjar and Marc J. Schniederjans, **A Quality Information Benchmarking Methodology : A US Banking Industry Empirical Study**, Journal of Quality and Quantity, Springer. pp. 419-433. (2006).
- [15] Stuart J.Barnes and Vidgen Richard T., **An Evaluation of Cyber-Bookshops: the WebQual Method**, International Journal of Electronic Commerce. Issue 1, Volume 6, pp. 11-30. (2001).
- [16] <http://www.jcpenney.com> (Accessed on 8th May, 2014).
- [17] Mayte Herrera, M Angeles Moraga, Ismael Caballero and Coral Calero, **Quality in use Model for Web Portals (QiUWeP)**, In Proceedings of International Conference on Web Engineering, LNCS 6385, Springer-Verlag Berlin Heidelberg. pp. 91-101. (2010).
- [18] Rupinder Pal Kaur, Vishal Goyal, “A Tool for measuring ‘Quality in Use’ for Websites of Punjabi and Hindi Newspapers: PH.WUQT”. **International Journal of Engineering and Sciences**. Issue December 2014, Vol. 2 ISSN: 2229-6913 (Print), ISSN: 2320-0332. Pp 185-190. (Online) Web Presence: <http://www.ijoes.vidyapublications.com> © **2014** Vidya Publications.
- [19] A.K. Abd EI-Aleem, W.F. EI-wahed, N.A. Ismail and F.A. Torkey, **Efficiency Evaluation of E-Commerce Websites**. International Journal of Computer, Information Science and Engineering. Issue 4, Volume 1. pp. 969-972. (2007).
- [20] <http://exexams.in/ar/pasurvey/acadsurvey.php> (Last Accessed on 10th May, 2018).

APPENDIX A

QUESTIONNAIRE USED FOR PILOT STUDY (ACADEMIC DOMAIN)

The evaluator is requested to rate each of the following questions between 1 to 5 where 1 stands for Strongly Disagree and 5 for Strongly Agree.

S.N o.	Questions	Punjabi University	Delhi University	IIM Ahmedabad
1	The general layout of the web site is good.			
2	The homepage of website creates meaningful visual interest.			
3	Easy to switch from English to Punjabi/Hindi website and vice versa.			
4	The graphics and animation effects used in the website are remarkable.			
5	Text and numbers are easily legible.			
6	The color contrast is pleasing.			
7	The language used is sound and understandable			
8	The typography (lettering, headings, titles) is attractive.			
9	Information is well organized.			
10	Latest news and notices are attention-grabbing in the website.			
11	Contents are latest.			
12	All the major services are easily reachable from the home page			
13	The font face and font size used in the website are satisfactory.			
14	No broken links found.			
15	Sufficient facilities are provided to share the website with friends.			
16	I found easily what I was looking for.			
17	Easy to go back to Home page from anywhere in the site.			
18	Almost all queries are answered in FAQs provided in the website.			
19	The website provides information upto the right level of detail.			
20	The website provides facilities like typing in Punjabi/Hindi etc.			
21	Search facilities available are satisfactory.			
22	All the information required is either present on the site or through external links			
23	The site map is easily found and is available in Punjabi/Hindi up to sufficient level of depth.			
24	It is clear how screen elements (e.g., pop-ups, scrolling lists, menu options, etc.) work.			

S.No.	Questions	Punjabi University	Delhi University	IIM Ahmedabad
25	Interline spacing is sufficient in the website.			
26	There is no overlapping of characters.			
27	Easy to find "where I am " in the website			
28	You don't need to open the English website for any information.			
29	All the contents in the site are in Punjabi/Hindi only.			
30	No link is terminating to English Website.			
31	All the contents in the website uses Unicode encoding.			
32	Easy to locate the contact details of top authorities.			

Any comments about the websites:

1 Punjabi University

2 Delhi University

3 IIM Ahmedabad

APPENDIX B
'PH.WUQT: ACADEMIC' RESULTS

Item for Academic	SD	D	N	A	SA
The general layout of the web site is good.	6	8	19	21	15
Easy to switch from English version to Punjabi/Hindi version of website and vice versa.	7	5	13	23	21
The homepage of Punjabi/Hindi version of website creates same meaningful visual interest as of English version.	9	10	18	27	5
The color contrast used in the website is pleasing.	9	9	16	24	11
The Punjabi/Hindi font face and font size used in the website are satisfactory.	8	5	16	29	11
The Punjabi/Hindi language used is sound and understandable	7	3	16	31	12
Spacing between Punjabi/Hindi language lines, characters, matras is sufficient	5	6	13	25	20
All the major services are easily reachable from the home page and it is easy to go back to Home Page from anywhere in the website.	6	8	16	26	13
I found easily what I was looking for.	7	10	15	24	13
All the information required is present on the site or through external links.	8	8	17	24	12
You don't need to switch to the English version of website for any information.	13	7	21	17	11
You don't need to install Punjabi/Hindi language fonts to view any contents in the website.	5	4	12	23	25
No link is terminating to English version of Website.	9	3	17	28	12
Sufficient facilities are provided by the website like saving, printing, downloading etc.	10	6	15	27	11
Sufficient queries are answered in FAQs provided in the website.	18	5	18	21	7
While browsing the website no Errors/Page Not Found/Server Error encountered.	11	7	15	21	15
Terminology used in the Punjabi/Hindi version of the website is correct and appropriate to the corresponding English version.	6	4	18	36	5
The file downloaded from this site uses Unicode encoding and is easily legible.	8	7	12	29	13
No specific browser is needed to view the website.	4	3	12	30	20
The Punjabi text from the website can be easily copied into clipboard.	17	5	10	25	12
Overall satisfied with the website.	9	5	19	21	15

(Number of Evaluators=69)

(SD-Strongly Disagree, D-Disagree, A-Neither Agree nor Disagree, A-Agree, SA-Strongly Agree)

APPENDIX C

APPENDIX C

COMMENTS by the evaluators

Name of the Institute	Comments by the Evaluators
Punjabi University Punjabi University	It is good.
	<ul style="list-style-type: none"> The website of Punjabi University Patiala is extremely good both in terms of English and Punjabi Versions of this website. I am quite satisfied with this.
	<ul style="list-style-type: none"> Punjabi version of the site is not completely in Punjabi. Top menu bar remains in English. On clicking home button from the Punjabi version, goes to the home page in English. That should not be, it should navigate to the home page in Punjabi version. Search facility should be provided. Upcoming events and photographs are visible in scrolling only. Link should be provided to see the complete list.
	Color combinations need to be worked out.
	<ul style="list-style-type: none"> By this our native language can be promoted. The site should be in a pool of browser e.g more explore to the kids especially
	<ul style="list-style-type: none"> Website Graphics are not reflecting professionalism. Font size should be big. No drop down list available in the menu headers for easy accessibility.
	FAQ not found.
	Punjabi university website could not open and others opened in English
Baba Farid University	When I click on link it does not work.
	Punjabi notice board shows 2009 entries.
	Contents of Punjabi web pages are displayed in English.
	<ul style="list-style-type: none"> Unprofessional Punjabi website. English and Punjabi version not look alike they are different.
Indian Institute of Management, Ahmedabad	<ul style="list-style-type: none"> Both the websites Hindi versions are very elementary and incomplete in information content. Seems as if basic pages are converted and other conversion still waited. Starting from Hindi version link sometimes end into English version. Terminology can be well judged by the actual Hindi users as certain translations in Hindi of terminology were not known. Wished that the site had complete information to do justice to the questionnaire.
	<ul style="list-style-type: none"> IIM site is better designed as compared to Baba Farid University Website. All links should be clickable on Punjabi version site.
Jawaharlal Nehru University	<ul style="list-style-type: none"> Website is good but design of the English and Hindi website is not same. No FAQ found.
	Not bad
	Please try jquery plugin for make website little bit attractive & make the website responsive so it is easily open in smart phones
	There is lot of difference in Hindi and English version

