

Quality Evaluation of Academic Websites using Fuzzy Approach

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Abstract- In present time as organizations are gaining approval the usage of websites for numerous purposes has increased in different domains such as education, health, government and business. The websites which interact with users are gaining success by maintaining and creating new features in it. The main goal of this paper is to design improved website quality evaluation criteria for academic websites from student perspective. For this purpose, an extensive study of literature on existing quality evaluation methods and fuzzy criteria is used to measure the quality of web.

Keywords: Academic website quality evaluation, website evaluation, quality, criteria, design, web, broken link

I. INTRODUCTION

Websites are used for wide range of purposes in different areas such as education, government, business, entertainment and medical field. There is millions of website available but only a small percentage of these websites satisfy their user requirements and needs. Due to rapid development in web technologies few websites are up to date according to the latest technologies. The design and performance of websites today is different from how websites looked and performed few years back. Each website tries to provide the best performance so that it is user friendly. Therefore, selecting to develop or usage of high quality websites is of high importance in present time. The website design recommendations, quality assurance models and usability evaluation procedures have been developed and used for designing as well as assessing websites [1]. Several websites adopt the design guidelines and use them for the purpose of improving the design and development processes of their websites. Most of the quality models do not directly consider the different viewpoints of users of the website. The quality factor or characteristics particularly focus on usability features of websites. From all these domain areas of website, academic institutions are gaining popularity nowadays. Academic organizations use websites for variety of purposes which includes the educational and research programs, fee structure, online learning facilities, infrastructure and many more. In

general, the regular users of academic websites are students (existing), professors, researchers, non-teaching staff, alumni, parents, students (aspirants) and journalists[2]. Each of this user group has their own specific requirements and expectations from the website. Hence, evaluating the quality of academic websites needs to take into account the needs of these different user groups.

II. PROBLEM STATEMENT

As listed in the introduction section, the evaluation of quality of website helps to assess whether or not the website is meeting its intended purpose for the intended users. The results of the evaluation can help to understand the parts of the website that need modifications to fetch an improvement in the website. Evaluating quality of a product requires a quality factor that describes what is expected from product's characteristics. The set of characteristics and their relationship form a quality evaluation model. To evaluate the quality of websites, it is necessary to study which quality factors should be taken into account, which kinds of evaluation approaches are used and which perspectives of users to consider for evaluation purposes. The users of academic websites expect specific type of information in the website and a short period of time to access the information they want [3]. All the different groups of users have different user experiences, background and need in using the website. From the literature view, most of the users of academic websites are concerned with two basic questions:

- "Can I find the information I am looking for in the website?"
- "Can I find the information in an appropriate manner?"

This indicates that the users of the academic websites are concerned more about whether or not they can find the information they are looking for in the website and how long it would take them to find the particular information. As discussed in the introduction section, there is no particular website evaluation model for academic websites that considers requirements for different users groups. Thus, there is a need to design a framework for evaluating quality of websites from the student's perspective.

III. REVIEW OF LITERATURE

There were several number of previous studies related to specific characteristics of the website. The Educational institution websites were studied from different perspectives.

Lautenbach et al.[4] evaluated usability of a university website using two defined criterion for usability: survey ability and findability, while other studies took specific features of websites.

Mustafa et al. [5] evaluated the nine websites of Jordanian universities. They used two automatic evaluation tools: HTML Toolbox and Webpage analyzer. The result of their study showed that the overall usability level of the studied websites is acceptable.

Akoglu [6] presents a case study of a usability evaluation method for architectural department Websites in the University of Istanbul. The evaluation was based on two environments: traditional laboratory and Internet environments.

Oztekin et al.[7] study presents a new methodology for usability assessment and design of University Web-based Information System (UWIS). It integrates information systems Web-based service quality and usability attributes. Their methodology was applied in the information systems department at Fatih University which proves it can be used for designing more usable and higher quality Web-based information system.

Ivory at al.[8] study presents the experience of Web designer's usage of three tools to evaluate and improve the usability of different websites. They showed that these tools help Web designers to identify a large number of potential problems in the Website.

Mich et al. [9] have developed a 2QCV3Q model to represent weak points for each site in a radar diagram. They used simple quantitative evaluation method that uses crisp values to compare between five economic faculties' sites in northern Italy.

Jati et al.[10] tested the quality of e-government websites in five Asian countries. The researchers conducted some tests to measure the quality of e-government websites in these countries. The results of their study showed low quality and performance of government websites.

Christoun et al. [11] also investigated students overall satisfaction with an academic website with regard to its technology, usability, aesthetics and content using an online questionnaire. The results showed that the website has usability problems related to ineffective search function and difficulty in finding information.

Alexander [12] employed three user testing methods (observation, think-aloud, and questionnaire) in an evaluation of the usability of 15 university websites. The results highlighted six usability problems that were found on the websites including: poor content, ineffective internal search engine, poor page design and broken links.

IV. QUALITY EVALUATION CRITERIA'S FOR WEB

The academic websites relate with the following tasks:

- Learning of research and education courses(Bachelor, Masters and PhD)
- Communication towards the public community
- E-learning provision to students
- Advertising vacancies for different positions in the university

The promotion of research and education programs is the fundamental purpose of academic websites. They can advertise their education programs to future students aspiring to study in one of fields of study the university offers. The main users of the academic website include:

- Students
 - Current students
 - PhD
 - Masters
 - Bachelor
 - Prospective students
 - PhD
 - Masters
 - Bachelors
- Professors
- Researchers
- Alumni's
- Parents
- School
- Journalists
- Companies

The following Fig. 1 gives the criterion and sub-criterion of web quality used by different website A, website B and website C.

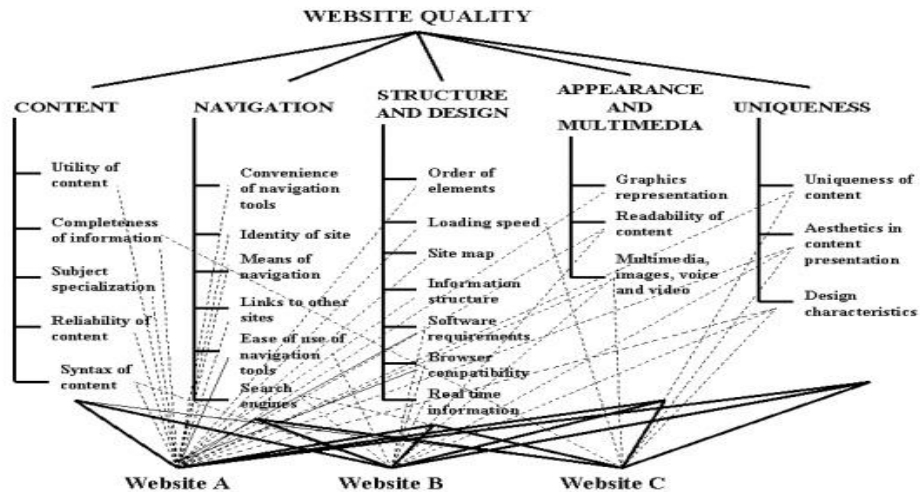


Fig. 1: Criterion and Sub-Criterion of Web Quality [13]

The focus of this paper revolves around the perspectives of student users and specific criteria for evaluating the quality of academic websites based on literature review. The developed criteria consisted of six main categories shown in Table 1. The

fuzzy criteria are used to evaluate the quality factors by assigning weights to sub-characteristics [14].

Table 1 : Website Quality Criteria's

Categories	Sub-Categories
Content	1. Up-to-Date
	2. Relevant Information
	3. Accurate Information
	4. Arrangement of Information -Text -Graphic - Video, if any
Organization	1. Architecture
	2. Logical Structure of a site
Readability	1. Language Used
	2. Flow of language
	3. Ambiguity of Information
Navigation	1. Link Arrangement
	2. Page Arrangement
	3. Loops/Broken link
	4. Link Density
User-Interface Design	1. Aesthetic Design
	2. Input options (Keyboard/Mouse)
	3. Auto filling option
	4. Drop menu
Performance and Effectiveness	1. Mean time to Locate information
	2. Average time spent by each user
	3. No. of pages accessed by users

V. EVALUATION OF QUALITY ATTRIBUTES

In this section, authors considered the home page of Khalsa University (KU) website. The main goal of Academic

assessment is to understand the web quality criteria which are the main focus of this paper. The Fig. 2 shows a snapshot of home page of KU.

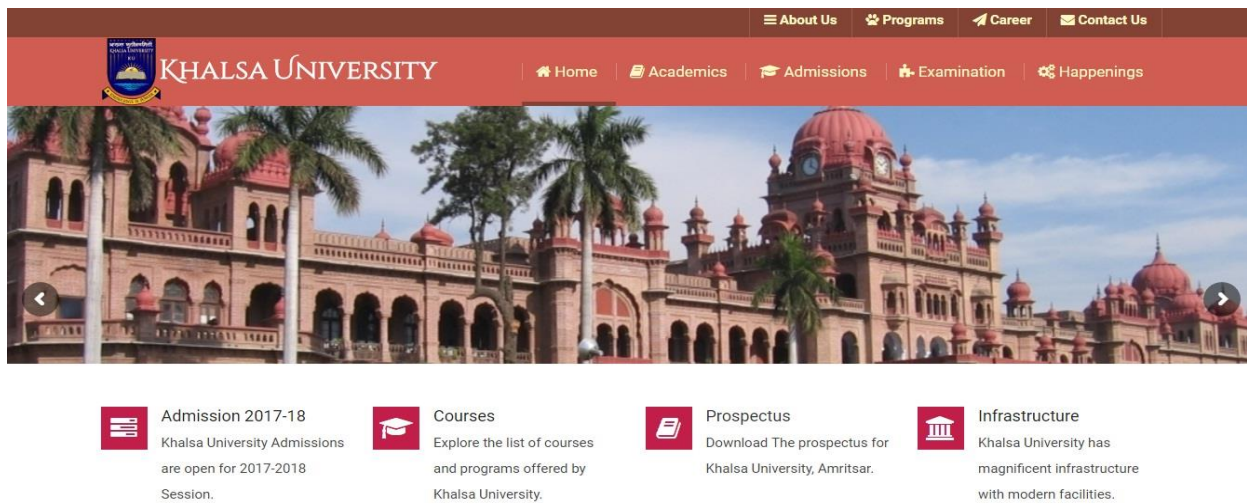
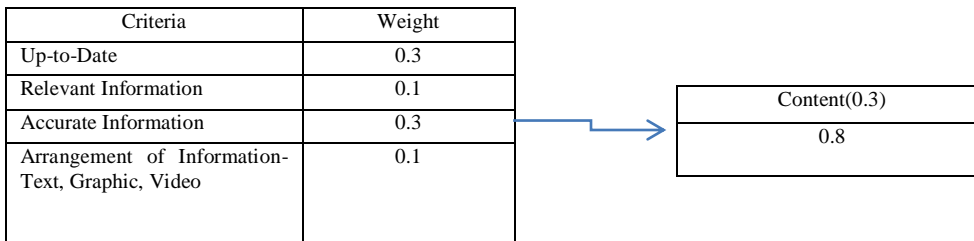


Fig. 2: Snapshot of Home page of Khalsa University website (KU)

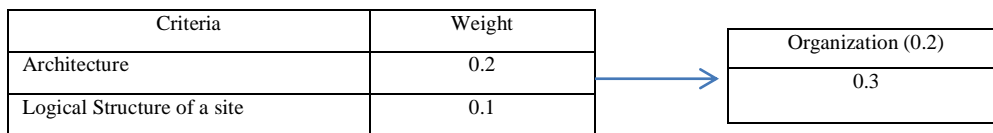
Here authors categorize a wide set of academic quality attributes grouping them into a requirement tree. From these characteristics, this paper derives sub-characteristics, and from these, it specifies the measurable attributes and variables. In addition, the relative importance of characteristics varies depending on the different users. So users can assign weight to each quality characteristics based on its priority. The assigned weights are allocated to six quality characteristics i.e. Content, Organization, Readability, Navigation, User-Interface Design,

and Performance and Effectiveness. The results of the Content, Organization, Readability, Navigation, User-Interface Design, Performance and effectiveness are evaluated in next section. The users of the website assigned weights to each quality attribute and then evaluated the total web quality by proposing a quality metric based on six quality factors. The fuzzy weighted approach is used to evaluate the quality measures of websites [15].

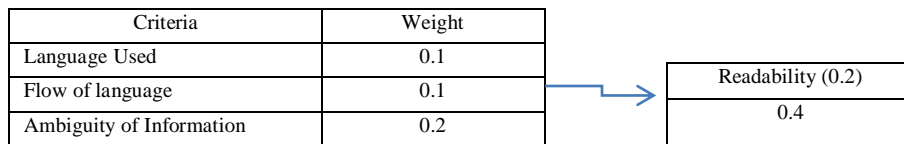
1. Content



2. Organization



3. Readability



4. Navigation

Criteria	Weight
Link Arrangement	0.3
Page Arrangement	0.2
Loops/Broken link	0.2
Link Density	0.1

Navigation (0.3)
0.8

5. User-Interface Design

Criteria	Weight
Aesthetic Design	0.2
Input options (Keyboard/Mouse)	0.1
Auto filling option	0.1
Drop menu	0.1

Design (0.3)
0.5

6. Performance and Effectiveness

Criteria	Weight
Mean time to Locate information	0.2
Average time spent by each user	0.1
No. of pages accessed by users	0.1

Performance and Effectiveness (0.3)
0.4

The proposed formula to evaluate the Total Quality Score=
 $w_c * content + w_o * organization + w_r * readability + w_n * navigation + w_{ui} * user-interface design + w_p * performance$
 where $w_c, w_o, w_r, w_n, w_{ui}$ and w_p are assumed weights and are based on the priority of the six attributes.

These are arbitrary weights assigned to the given quality attributes, in order to drive out a quantitative measure for Web quality. However, in practice, depending upon the situation and the type of websites and users involved, these weights can be adjusted accordingly for driving the corresponding quality measure.

This formula is used to compute the final quality score of website.

Total Quality Score=
 $0.8 * 0.3 + 0.3 * 0.2 + 0.4 * 0.2 + 0.8 * 0.3 + 0.5 * 0.3 + 0.4 * 0.3$
 $= 0.89$

According to this formula, the final Quality Score=0.89
 i.e. quality of Khalsa University website (KU) is 89%.

The detailed results of quality priorities after computing the corresponding aggregated criteria is shown in Table 2.

Table 2: Results of Quality attributes

S.No.	Quality attributes	KU	KU (%age)	Satisfaction level
1.	Content	0.8	80%	Completely Satisfies
2.	Organization	0.3	30%	Partially Satisfies
3.	Readability	0.4	40%	Satisfies
4.	Navigation	0.8	80%	Completely Satisfies
5.	User-Interface Design	0.5	50%	Satisfies
6.	Performance & Effectiveness	0.4	40%	Satisfies

Considering the evaluation in the best and worst quality features, the Content and Navigation is highest quality characteristic and Organization/Architecture is lowest. Using this method the user can see which quality characteristic needs to improve and which are satisfactory. In the end, a final quality score has been calculated. The graphical ranking of quality attributes are shown in Fig. 3.

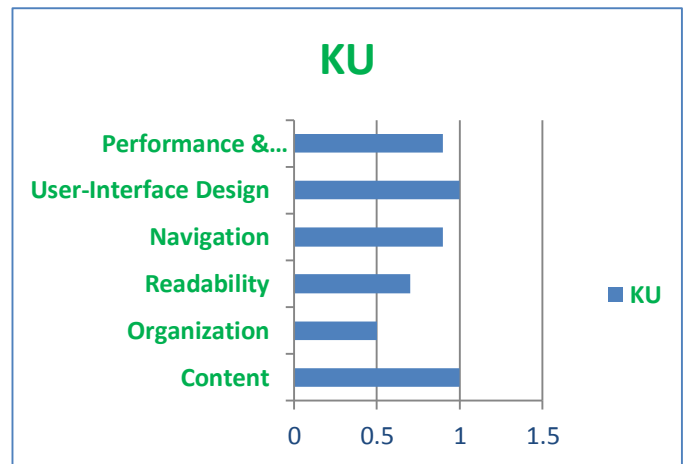


Fig. 3: Graphical Ranking of Quality attribute

VI. CONCLUSION

The importance of the web evaluation has been proposed by three-level structures, which are quality characteristics, quality sub-characteristics and measurable criteria. In the first level, the web evaluation framework proposed six quality characteristics which included Content, Organization, Readability, Navigation, User-Interface Design, Performance and effectiveness. Content and Navigation are highest quality attributes among others. Each

sub-quality attribute is inherited from the parental quality characteristics.

Last, the website quality metrics calculates the meaningful total quality score of website. After the quality criteria have been analyzed, the average formulae are computed based on the aggregate of each quality criteria. The results will be from 0 to 1, also the means of weights is considered in the evaluation process. Observably, the home page is more important than others, so the calculation for the whole quality of the website is defined by the home page. The result is also from 0 to 1, 0 represents poor quality and 1 means excellent quality. The proposed website quality metrics can be used as a website evaluation framework to evaluate existing websites and allocate quality scores.

VII. FUTURE WORK

Websites are continually developing and evaluating the quality of website. It is a continuous research topic that proposed an important issue and by using web evaluation tools which will give accurate results.

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