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AN ARCHITECTURAL APPROACH FOR ASSESSING QUALITY OF WEB SITES

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ABSTRACT

Information exchange predominantly had been done using websites. Websites are designed and developed using unstructured languages such as HTML, XML etc. The efficiency of information exchange is quite dependent on the quality of design and implementation of the website. Many aspects are to be considered in determining quality of the websites such as, quality of navigation, quick access to the content, structured and classified manner of presenting the content, exchange of user-friendliness and the need for minimum movement of data between the client and the server. One has to determine a scientific method of computing the quality of websites. Many quality factors have been defined in the past and not all of the factors are relevant for a given website. There should be a formal structure of presenting the quality factors and a mechanism to select the factors that are more relevant to a given websites. This paper presents a survey of various factors for assessing the quality of a website and provides contextual requirements of those factors which are relevant for a particular website. It also is aimed at evaluating the quality of a given website considering the factors that are relevant for the chosen website.

Keywords: websites, quality, assessment, quality factors, website quality assessment, evaluation, metrics, aesthetics, ease of use, multimedia, content, reputation.

1. INTRODUCTION

As the reliance on web increases, the requirement of web sites being of high quality increases. Quality of websites is basic without which the purpose of the web sites would be lost. Very high quality levels have to be maintained especially when it comes to e-business related web sites.

Numerous websites are being launched each day. Websites hold the most importance in today's world as it represents one's organization, company, educational institute, personal space and blog. From an information website to an e-commerce website, websites vary in types and sizes. It is important that these websites follow and satisfy certain user expectations. If the quality of the site is meagre, the users browsing it will automatically leave the site to go onto another one, and probably never return. Therefore in order to prevent this, one needs to construct a website that will meet all of a user's expectations. The websites can be made to be achieved severally by providing a user friendly atmosphere, increasing accessibility, providing a good visual design and rich content. An extension of e-sites with a tremendous measure of information being seen these days is witnessed. The impact of the web can be assessed can be gazed through convenience and openness of a web application. The objective is to make a site profitable, gainful, customer interfacing, and open. Recognition with of quality of a website is being felt these days.

A relationship with a site that is difficult to utilize and communicate-with gives a poor picture on the association's position. Consequently, it is fundamental for any relationship to be able to make the best of their e-exchange association, to propel their offerings over a time span and standard against contenders and the remarkable position in any trade.

Off late, diverse readings have focused on the charts of areas for general information recuperation purposes and for e-exchange and business commitments. The arrangement and business progress of destinations are especially key to an affiliation's achievement. Various power reports and surveys have been conveyed hoping to perceive considerable and dreadful segments of regions. Site audits range from hypothetical and exploratory suppositions to examinations of intense districts and segments to existing productive e-business. Notwithstanding the path that, there has been an essential examination on supporting e-business, the majority of the current precise examination concentrating on accomplishment components of destinations is fundamentally exploratory in nature. There is no standard structure or benchmark depicting a site's feasibility and capability. The worth of the Site is dependent on conduct of the product. Previously, behaviour of programming gave backing to develop the sites' execution. In any case, the quality confirmation processes transformed into the challenges for the new web applications. There were different masters or affiliations who examined on different suggestions to improve site quality, including quality structures, criteria, evaluation techniques, strategies and estimations. Truth is told, following the site quality process turned into an especially significant point which is progressing and economically scrutinized, particularly in site quality measurements. Although quality of website has been an important factor as of late, a main question is "why is the quality of a website still poor which leads to user dissatisfaction." There are a few reasons specified:

Website software evolves extremely fast, perhaps hundreds of new programming devices are produced every year. Websites use these technologies blindly. Some of them are sites that have turned out to be extremely

effective, yet some are not. Therefore these recent sites innovations should be confirmed and could possibly be utilized and some might even be killed. Site equipment advancements are ceaselessly overhauled. The main factor is the system rapidity, the confinement of network speed is not considered as a reason influencing site quality.

The application areas of destinations are developing at a quick pace. Locales are transforming into the favoured media instrument for data, association performance, instruction, shopping, pre-occupation, preparing, and shared contacts. Standard nature of destinations matters does not fit the new various advancement locales request. In perspective of the expressed over, the novel site quality components choose to set up other site quality estimations which will have more utilitarian estimation criteria and appropriate systems for site quality evaluation needs. Therefore we have proposed a practical yet an easy method to evaluate websites quality.

Assessing the nature of a site requires costly techniques, for example, heuristic assessments and different usability tests.[15] There are various ways to assess a website's quality, One way is a gathering of experts knowledge for assessment and for the most part it doesn't help to discover issues identified with regular operators of the site. Another way, a gathering of clients with various backgrounds and abilities attributes are called to search the site keeping in mind the end goal to assess their fulfilment in utilizing it. Also, website hardware is constantly evolving. The web has been a constantly evolving technology. But still the quality is scare. A few reasons include Rapid development of technologies, Mix of technologies, and simpler ways of producing HTML code, browsers showing wrongly coded webpages, less attention paid to internal quality

In perspective of the above variables, the new website quality evaluation techniques choose to set up new site quality estimations which will have more sensible estimation criteria and legitimate philosophies for site quality evaluation needs. Beginning starting late the influence of the net has picked the need of estimation criteria to review perspectives identified with the quality variables being used, for occurrence, ease of use and openness of a web application. The principle is to stamp a site noteworthy, beneficial, and easy to understand andopen.

The objective of this paper is to build up a theoretical and comprehensive, and quantifiable system for evaluating the nature of sites so as to give straight forward criteria to support changes of site configuration and its usage. Moreover, we intend to build up a structure that is equipped for solid applications over a wide scope of sites paying little mind to the administration they give.

A system was considered that incorporated a wide scope of writing audit, survey of top locales, recognizable proof of accomplishment components from exploration and industry writing, correlation of variables with distributed industry scoring studies, and utilizing experience as a part of the field [14].

2. RELATED WORK

Tom DeMarco [1] stated that "Quality is the function of a product that changes the world for the better. A website worth is characterized by the intention with the end goal of client fulfilment. In less complex words, an excellent site is one that springs detailed, rich, important data and a better than average customer experience, regardless, there are various individual components that ought to be measured past that history. Spending a great deal of money on a site is no assurance of it being classified as a brilliant one. The way a web site is assessed to find its quality differs from one person to the other. Many use pointers such as reliability of information rendered over the site, simplicity of moving across the site, conciseness of the text, the easiness with which the information can be used, safeness' of the site, availability of the data needed by the user. From the beginning, the nature of a site was resolved considering the marketing requirements of a product. A site is much the same as programming (i.e. it applies to some component, or some model, or its information outline) portrayed with respect to a plan of properties, e.g. comprehensibility or coupling. Finally an assessment of the attributes that is a certain thing has.

Luisa *et al* [2] familiarized a method which shows an approach to manage the definition and estimation of quality of the site. It depicts the trade-off among the customer's enrichment and adaptability. Site quality depends on the user's liking unless it is evaluated using a quality model. So to say, to assess the quality of website, metrics have to be defined well.

The ISO model was introduced in 1970‟s. It could be useful to any kind of software or creation. It characterized quality into six characteristics: efficiency, usability, functionality, maintainability, portability, reliability. Have used [3] a part of the ISO to present the quality of WEB site. Three levels of decomposition are used to present the quality of the software,

Fitzpatrick *et al*.[4] studied quality models with human computer Interface. He characterized a general arrangement of 12 exterior and 5 interior quality variables. Exterior elements involved suitability, installability, usefulness, flexibility, usability, learnability, interoperability, unwavering quality, wellbeing, security, rightness and proficiency. Interior properties included practicality, testability, adaptability, reuse and convenience. He later recognized an extra 5 web site-particular qualities: perceive ability, clarity, validity, engagibility and separation. For each of the qualities they characterized an arrangement of "empowering agents" that mirror the presence and significance of the trademark being referred to.

Offut [5] examined the quality properties of web applications and distinguishes eight characteristics: unwavering quality, ease of use, security, accessibility, adaptability, viability, execution and time-to-business sector. Olsina *et al*. [6] depicted a quality evaluation which has been used to delineate a quality prerequisite tree containing more than 100 qualities that allude to various site spaces, e-commerce, and scholarly destinations and

give an unmistakable system to determine these quality qualities.

Layla Hasan and Emad Abuelrub [7] identified and proposed a four dimension criteria where he stated the important quality factors, namely, content quality, design quality, organizational quality and user-friendly quality. Younghwa Lee a and Kenneth A. Kozar [8] investigated quality of a WEB site on e- business triumph and proposed an analytic hierarchy process (AHP) approach by identifying the factors like system quality, data quality, vendor-specific quality, amenity quality. They also compared various evaluation factors depending on the type of website. While there are many other quality models and approaches to a site's inner and exterior evaluation, they do not have any model that quantitatively assesses and covers all quality aspects and assesses the performance of every page of a website individually.

Web quality metrics are characterized by an estimation technique and the estimation scale. Keeping in mind the end goal to assess the quantity of quantifiable physical or conceptual qualities for comprehension and advancing sites use. Web metrics are similar to a user's experiences once on the site [9]. For instance, the style qualities will keep individuals on the site; reputation attributes expand individuals' trust, and urge individuals to make a buy. Web metrics survey a site in various areas which incorporate e-business, academics etc. Each representative is associated to key pointers, and used to enhance the site quality and increase user satisfaction.

Lilburne *et al*. [10]projected a method that help to compute quality, quality characteristic and quality indicators as shown in Figure-1. A quality measurement is recognized as the measurement of a set of quality characteristics, each measured as a set of sub-characteristics referred to as a set of Quality Indicators.

Figure1. A typical quality assessment model.

Quality measurement indicates total overall quality of a system. It is measured in terms of percentage (%). Quality attributes are the components that express abnormal state of the website; quality sub-attributes are the second level variables which separate the quality attributes. Quality indicator is the quantifiable criteria for computing either quality attributes or sub-attributes. The computation of quality, quality characteristic score and quality indicators are shown in Table-1.

Table-1. Quality related computational measures.

Serial number	Type of measurement	Empirical formula
1.	Quality	Σ CQCF/ Number of Characteristics
2.	Characteristics QCF score	CQCF = Σ SQCF/ Number of Sub-Characteristics
3.	sub-characteristics QCF score	SQCF = Σ QCF/ Number of quality Indicators
4.	Quality Indicator (QCF)	QCF = (Earned Score/ Possible Score)x100%

Today electronic application is mind boggling[11]. A number of existing site assessment strategies assesses a site's quality taking into account its areas (e.g. e-business, instruction, amusement, and so forth). It is important to make a far reaching site assessment strategy that is pertinent to every one of the sites. As indicated by a standard ISO quality model, a far reaching site assessment strategy is compulsory to talk basic quality components of the web request, since the components shift for various types ofsites.

A sum of current site assessment strategies by and large involve the assessor who has IT foundation to survey the potentials in a site. It is hard to apply if the general population doesn't have any IT aptitudes [12]. An effectively utilized interface and auto-assessment are vital in new site assessmenttechniques.The quality criteria for a site's notoriety are illuminated in numerous current site assessment strategies, however most respectable criteria are endless. The quantifiable noteworthy criteria should be characterized in a far reaching web assessment technique (e.g. client input, activity, and so on)[13]. To conclude, the qualities and shortcomings of the web assessment results ought to be connected to the client's desires, and simplicity of comprehension. There is no method that can evaluate a website quantitatively.

3. PROPOSED APPROACH

To assess the quality of a website effectively and efficiently, we must first create a website evaluation method which will provide a base for quality framework and quality evaluation, thereby obtaining a group of scores which relate to "user needs" and appropriate to assess the quality of live websites.

3.1 Quality assessment framework

In order to assess the quality, one needs a quality framework. Finding a quality framework involves recognizing different objects and the characteristics of the objects and the way a characteristic can be evaluated. The quality framework that can be used and extended as when required could be recognized as shown in the Table-2. The framework involves identification of all possible quality factors and the way the factors are evaluated considering different web characteristics and the related sub-characteristic. The main level or the main quality characteristics is broken down to a second level or sub-characteristic and third and final level also known as measurable criteria breaks down the second level. One can identify many quality factors and the characteristics that represent the quality factors. The Characteristics are further broken down to look into a quality issue in more precise manner.

It is important to successfully characterize the quality attributes in web that ought to be suitable in the distinctive sorts of sites. This is vital in light of the fact that one of the primary points in this study is to assess the quality of a website naturally, paying little respect to diverse spaces, sorts and dialect of outline. There are 28 quantifiable measures and five quality attributes, which may be comprehensively secured by all the site's parts concerning the customer's viewpoint. The main approach is to determine the nature of the site and find the quality of the same through assessment of the quality properties, sub-qualities and pointers. One has to go to most possible elementary level of feature identification based on the extent to which a feature can be expressed to most possible elementary level. It is quite complex and difficult to define that quality of a WEB site considering the diverse characteristics of a WEB site. Some distinct characteristics, such as ease of use, multimedia, rich content, reputation etc., individually could signify quality but there should be some way the characteristics are connected up to signify overall quality of the WEB site. It could be seen that while some parameters could be quantitatively computed, some needs relative comparison to be assessed.

Table-2. Quality assessment framework.

Quality factor serial	Quality factor	Characteristic	Sub-characteristic
	Aesthetics	Image	**Image size**
			One larger Image in one page
			Image ALT
			Image Link
		Page resolution and re-sizable Table	Sizable Table
			Optimizing page resolution
		Colour	Multiple colours
			Sage Colour
			Limited Colours
		Emphasis	Text Underlining
	Ease of use	Consistency	CSS Attributes
		Navigation	Frame validity
			Link to home
			Navigation Menu Bar
		Comment	Label of Link Table and form
			Description of Meta Data
	Multimedia	Plug-in-support	
		Attributes of Multi-media Components	
		One media in one Page	
		Using thumbnails	
	Rich Content	Bulletin Boards	
		Information Guide	
		Search Engine	
		Avoiding Auto Refresh	
	Reputation	Customer feedback	
		WEB Traffic	
		Domain name	
		Information Publicity	

3.2 Quality evaluation procedure

The overall quality of the website is computed using bottom up approach. Most elementary level characteristic is computed and the same is used to compute the quality of the higher-up characteristic. The Quality of aesthetics of a website can be computed using many factors based on quality of images, Page resolution. Table size, colour composition and the way the WEB content has been emphasized. Table-3 shows the way quality of different factors that represent aesthetics. The quality as such can be defined as cardinal values such as "high quality", "medium quality", and "low quality". Each quality factor related to aesthetics shall have a kind of weight based on the effect that it can create on the quality of the website, For Example Images and colours used for the development of a website contributes most of the quality of the website each given with a weight. It is easier to assign a weight to a quality attribute manually as the attributes of each of the factor are minimal and is easy to assign weight to a particular attribute. There is no need as such to bringing statistical methods for assigning weights to the attributes.

Each of the quality characteristics can be graded as high quality, medium quality and poor quality each represented by a value. The quality of aesthetics can be computed as below:

0.3: Image * (Quality Value of Image Size + Quality Value of Number of Images in a Page + Quality value of Image ALT + Quality Value of Image Link). The quality value could be related to high quality, medium quality and

poor quality each represented by the value 0.25, 0.15. 0.05 Respectively
+
0.1: Table characteristics * (quality value which could be related to high quality, medium quality and poor quality each represented by a value of 1.0, 0.6, and 0.2 respectively
+
0.1: Page resolution characteristics * (quality value which could be related to high quality, medium quality and poor quality each represented by a value of 1.0, 0.6, and 0.2 respectively
+
0.3: Colours * (quality value of multiple colours + quality value of safe colours + quality value of image ALT + quality value of blind colours) which could be related to high quality, medium quality and poor quality each represented by a value of 0.33, 0.20, and 0.1 respectively+
0.2: Emphasis * (quality value which could be related to high quality, medium quality and poor quality each represented by a value of 1.0, 0.6, and 0.2 respectively)

The weightage assigned to each of characteristic value is dependent on the number of characteristics attributes that can be considered for each of the quality factor. Table-4 shows the mapping quality level of characteristic value. Considering the weightage of the characteristic attribute and the quality assessment of the characteristic attribute, the quality factor could be computed as 0.89. Much lower quality value signifies the need for improvement of the quality in respected of the associate feature. In the similar manner the quality of other factors that include easiness of usage, multimedia, rich content can be computed and summed up to reflect the overall quality of the website.

Table-3. Quality assessment of aesthetic factors.

Quality factor	Quality element	Weight	Quality characteristics	High quality	Medium quality	Poor quality
Aesthetics	Image	0.3	Image size	High quality when height and width is defined (BMP format)	When height and width is defined (JIF format)	When height and width of the paper has not been defined
			Number of Images in a page	One (360 X 360)	Many with different windows (360 X 360)	Many in the same window
			Image ALT	Text representation of an image	Dummy ICON representation	Non representation
			Image link	Image associated with a href	Static reference to an image	No link established
	Table size	0.1	Entire table	Entire table fitted into a single page	Table fitted with horizontal scrolling	Table fitted with horizontal and vertical scrolling
	Page resolution	0.1	Entire page	Page size > Table size	Page size = Table size	Page size < Table size
	Colors	0.3	Multiple colours	Many	Average	Less
			Safe Colours	Used as many	Few colours are used	Safe colours not used
			Blind colours	Nil Use	Few usages	Many in use
	Emphasis	0.2	Style characteristics	Style characteristics Fully used	Style characteristics moderately used	Style characteristics not used

Table-4. Mapping quality values to characteristic attributes.

Quality Factor	Quality Element	Weight	Quality Characteristics	High Quality	Medium Quality	Poor Quality
Aesthetics	Image	0.3	Image Size	0.25	0.15	0.05
			Number of Images in a Page	0.25	0.15	0.05
			Image ALT	0.25	0.15	0.05
			Image Link	0.25	0.15	0.05
	Table size	0.1	Entire Table	1.00	0.60	0.20
	Page resolution	0.1	Entire Page	1.00	0.60	0.20
	Colors	0.3	Multiple Colours	0.33	0.20	0.10
			Safe Colours	0.33	0.20	0.10
			Blind Colours	0.33	0.20	0.10
	Emphasis	0.2	Style characteristics	1.00	0.60	0.20
Total				4.49	0.90	0.00

Total Score = 0.30 * (0.25 + 0.25 + 0.15 + 0.15) + 0.1 * (1.0) + 0.1 * 0.60 + 0.3 * (0.33 + 0.33 + 0.33) + 0.2 * (1.0)
= 0.30 * (0.8) + 0.1 * 1.0 + 0.1 * 0.60 + 0.3 * 0.99 + 0.2 *1.00
= 0.24 +0.1+0.06+ 0.29 + 0.2 = 0.89

4. COMPUTATION QUALITY OF A GIVEN WEBSITE - PILOT PROJECT

The quality framework has been applied to an existing website. The results have been obtained after evaluating a website for aesthetics, easiness of usage, multimedia, richness of text. Reputations are shown in Figures 2-5 and the overall assessment is shown in the Figure-6 and pictorially in Figure-7.

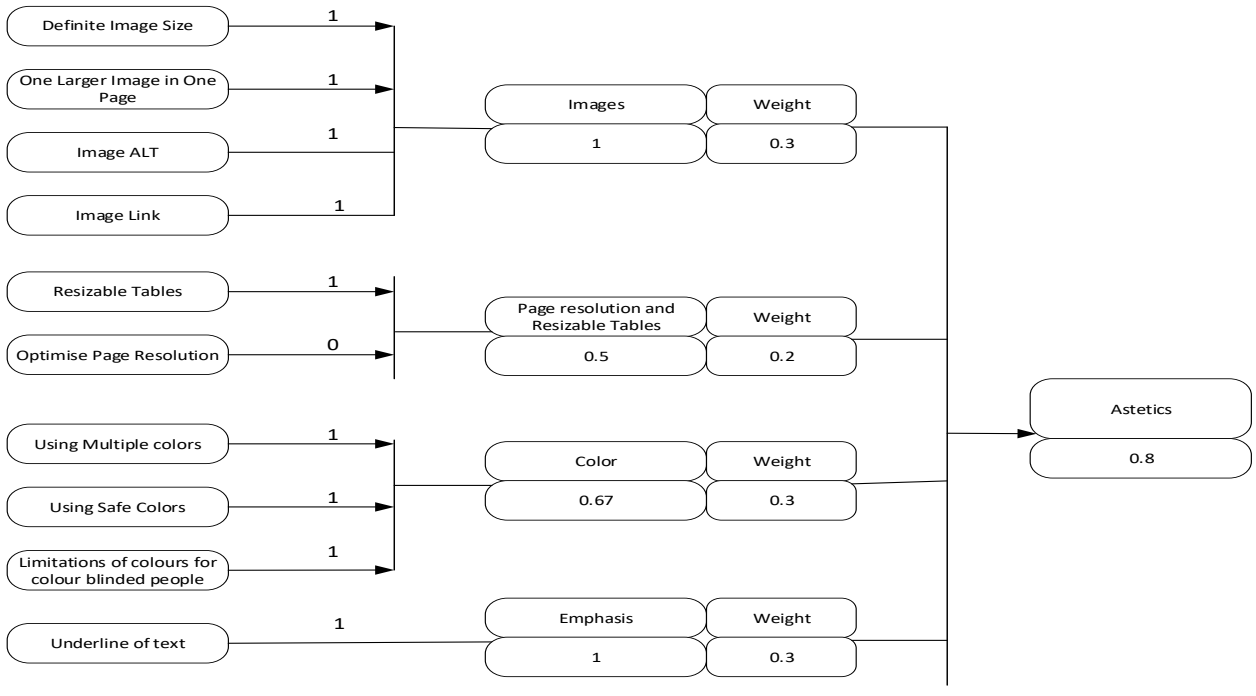

Figure-2. Quality assessments of aesthetics.

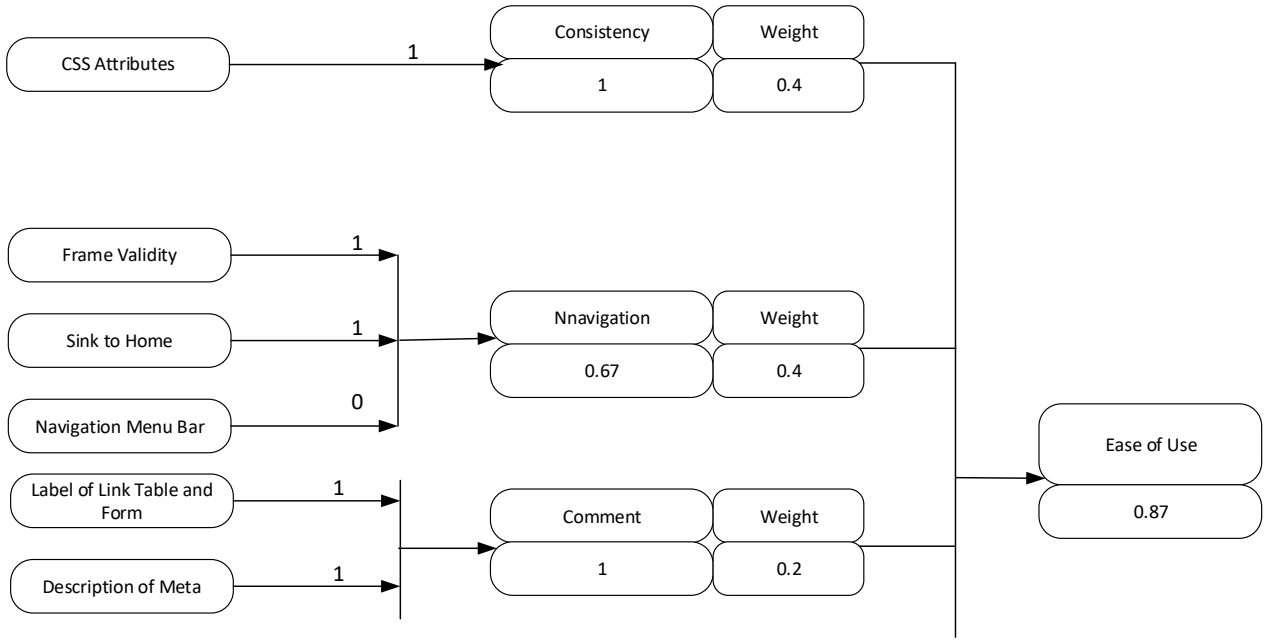

Figure-3. Quality assessment of easiness of usage.

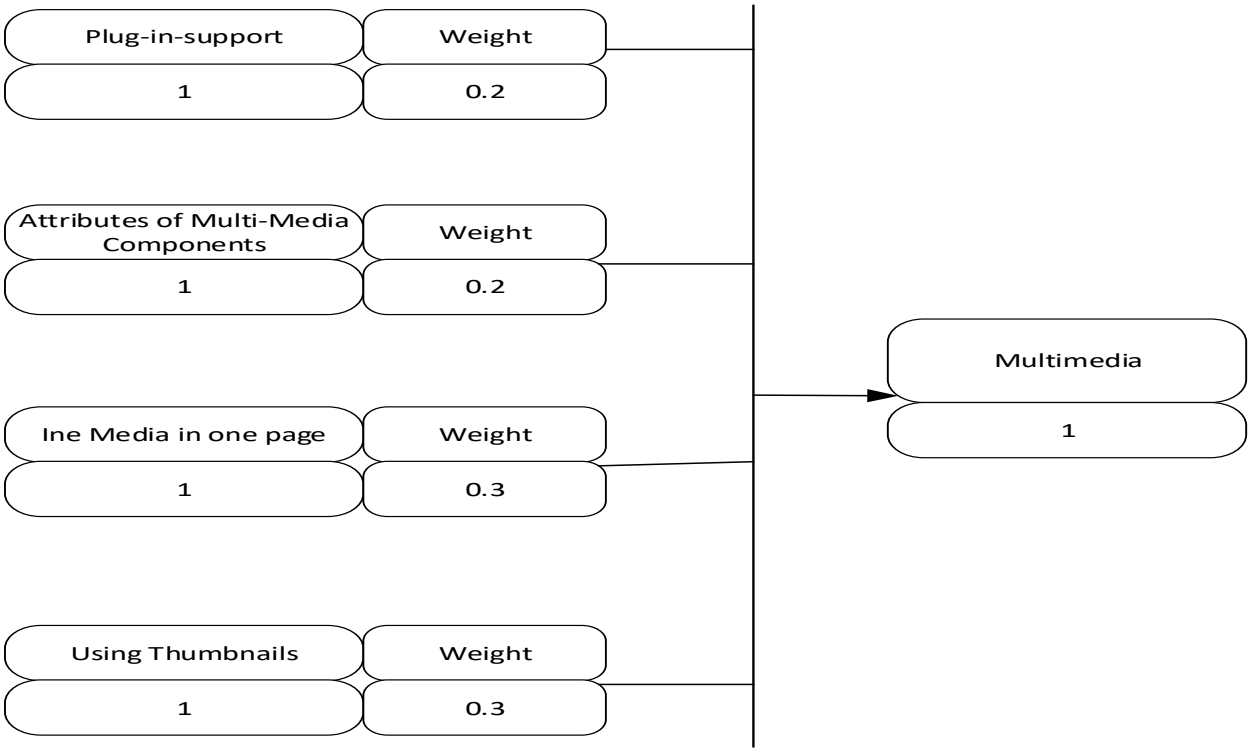

Figure-4. Quality assessment of multimedia.

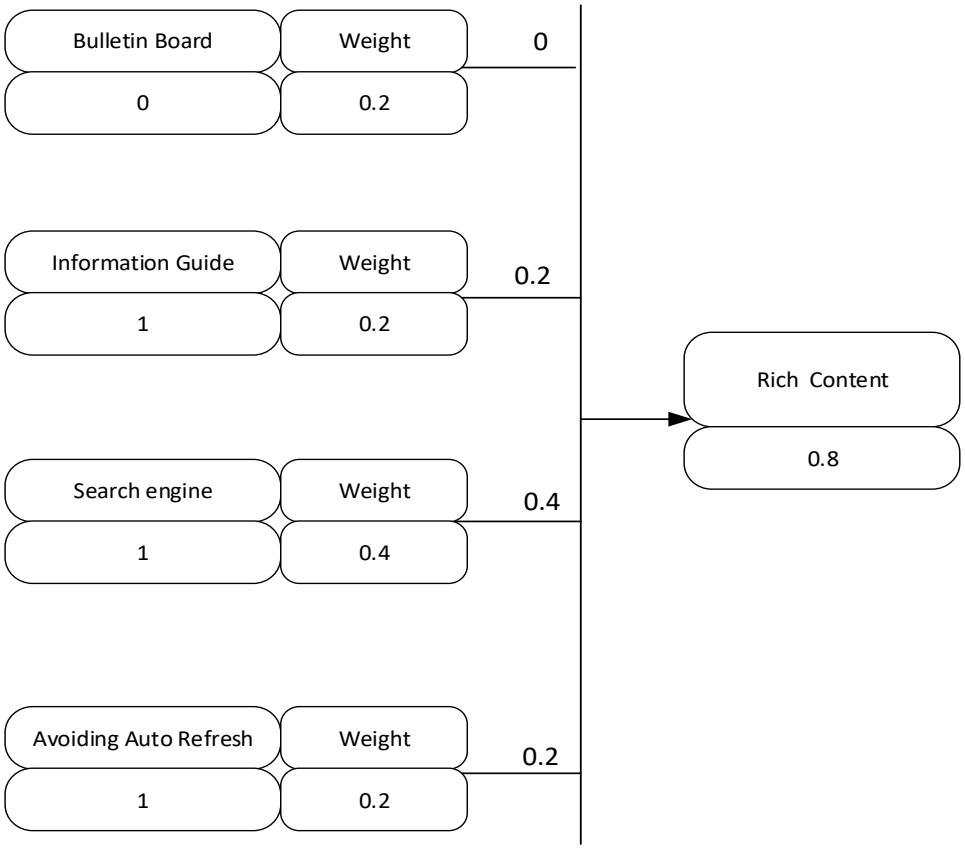

Figure-5. Quality assessment of richness of text.

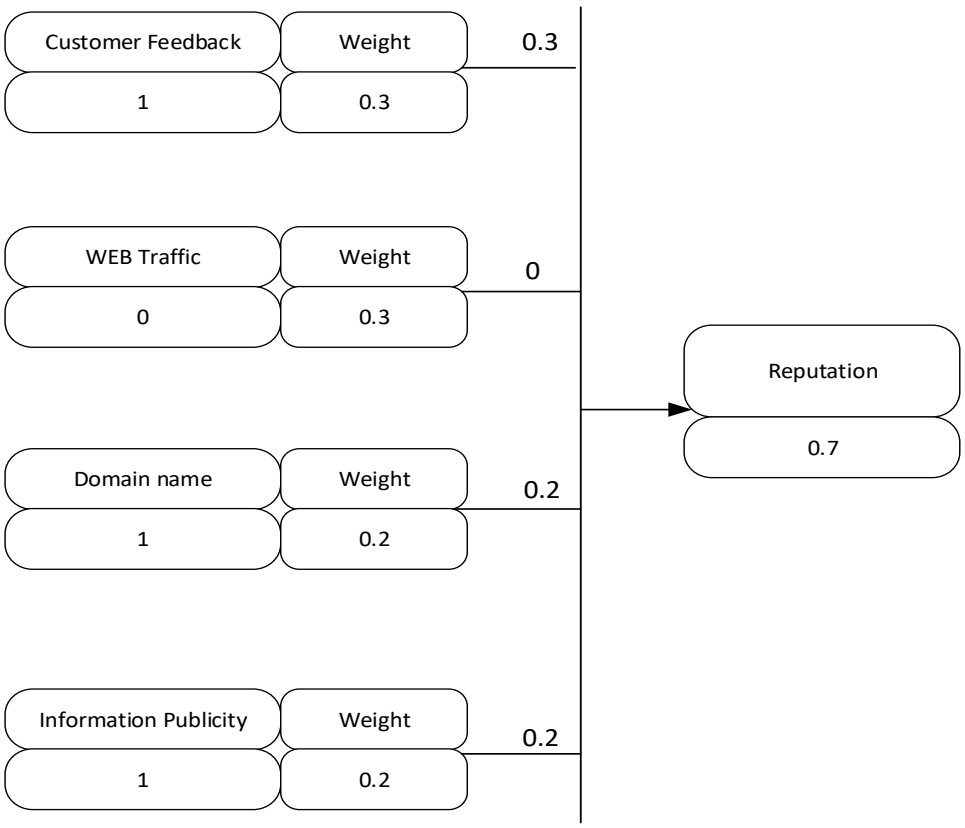

Figure-6. Quality assessment of reputation.

Quality	Asthetic Weight=0.3	Ease of Use Weight = 0.2	Multimedia Weight =0.1	Rich Content Weight = 0.1	Reputation Weight = 0.3	Final Score
KL University	0.8	0.87	1	0.8	0.7	0.80

Figure-7. Overall assessment of the website.

Final Score = 0.3x Aesthetics + 0.2x Ease of Use + 0.1x Multimedia +0.1 x Rich content+0.3x Reputation

= 0.3x0.8+0.2x0.87+0.1x1+0.1x0.8+0.3x0.7

=0.80 (ie: 80%)

Figure -8. Overall assessment of the website.

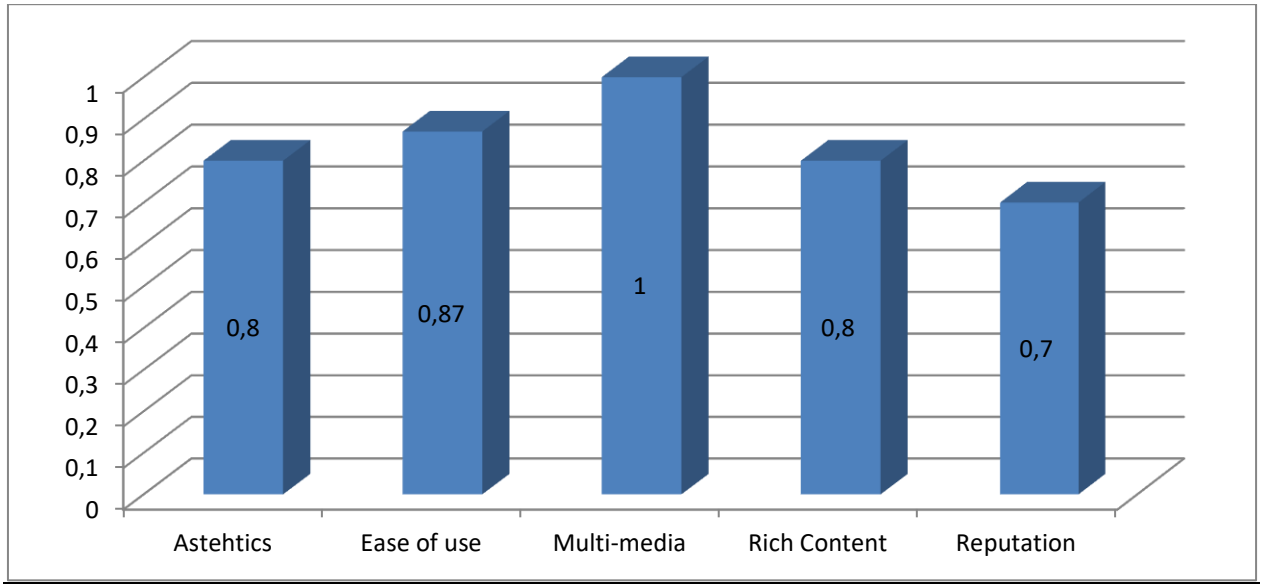

Figure 9. Quality representations of different factors for chosen website.

5. CONCLUSIONS

A framework has been presented in this paper for computing quality of a website. The levels of quality computation which include characteristic, sub-characteristic and quality indicators have been presented. The framework can be used for calculating quality of any live WEB site. Weights have been assigned to the characteristics and sub-characteristics to show the relative importance of one over the other. Poor quality has been designated as "0" and high quality has been designated as "1" and intermittent quality factors are given a value that best represents the characteristic. Tabulating the quality characteristics along with their quality values will reveal the weak, good and excellent characteristics of a web site. It becomes evident to find where a web should be improved.

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