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Research Paper

Evaluating the quality of Navigation designed for a WEB site

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Abstract

The whole world is looking for information through web sites. Many search engines have come up to help the users locate the content that they are looking for. User satisfaction is most important to ensure frequent visiting and extensive usage of the web site. The user satisfaction is very much dependent on the kind of navigation designed into the web site. The quality of a WEB site is very much dependent on the kind navigation designed into the system. The ease of use could be affected through simple but effective implementation of the navigational system into the WEB site.
Quality of a WEB site is the key for establishing effective web sites thereby enhance the businesses. Many factors are to be considered for evaluating the quality of the web sits one such factor is "Navigation". Computing the quality of a web site on computational basis is the key to be able to assess the quality of web sites realistically.
In this paper, a computational method for computing the quality of the WEB site considering the Navigation built into the WEB site is presented.

Keywords: Quality of WEB sites, Assessment framework, WEB sites, Computational Methods, Assessing Navigation of web sites

1. Introduction

The information exchange is predominantly taking place due to advent of Internet and WEB technologies. Most of the content these days is hosted on the WEB making it easy for the people have the access to the information in least time and negligible cost. The information hosted on the WEB is of different forms which include text, images, audio and videos. Information is also being available in streamed mode. The Web sites are being used for doing e-commerce including marketing. The way the people live is changing drastically with the content being available on the web changing. How the quality of the content hosted on the WEB needs to be assessed before taking the content hosted on web for granted. The attitude of the people requiring the information is changing heavily. The customers won't be satisfied if the WEB site is not of quality. The WEB site loses its existence and never be surfed if the quality of information hosted on the WEB is erroneous and some time has no relevance or connectedness. The quality of a website can be assessed using some quality factors such as Usability, content Reliability, Flexibility, Functionality, Portability, Maintainability, Privacy, Security, Adequacy of Information, Safety, Content, Navigation and etc. The quality of website can be assessed in many ways. The assessment can also be done using evaluation tools. Many organisations are developing their information in terms of Videos, audios, graphics, text, tables, forms, animations, Logos, dynamic content, mouse over effects, graphics etc. While some web sites are static in nature some other sites are dynamic.
Many methods existing in literature for computing the quality of the WEB site are either subjective or objective. There us prejudice involved in the subjective assessment and there is lack of completeness in the objective assessment of quality of WEB sites. Some methods are biased due to individual preferences or some purely based statistical measurements relating down time, response time etc. The quality of a web site is based on the persons who look at the WEB sites. Programmers look at the WEB site characteristics that include security, functionality and maintainability whereas the users using the WEB site look at the quality of the WEB site in terms of usability, credibility, efficiency and credibility.
Every web site has certain number of quality characteristics. The characteristics must be evaluated to assess the quality of the WEB site and also to find the extent to which the user needs are being met. Assessing the quality of the web site is quite complicated especially when the web sites are complex. The WEB sites that are related to e-commences, museums, sites that deal with animations are actually quite complicated. Even the process that is used for evaluating the quality of a web site is more complex. Most of the quality characteristics of web sites is also are interleaved and inter connected through complex logic that relates the Quality characteristics of the web site. Some of the quality factors can only be computed subjectively and some other parameters are to be evaluated objectively and some other parameters are computed quantitatively. A composite model comprising all aspects of computation of quality is required. Connectivity between subjective, objective and quantitative is requited for the development of proper quality assessment model.
The expectations of a site must first be determined. Quality parameters that are representative of the expectations must be determined and must form into a base or a quality assessment model using which the overall quality of the web site can be assessed. The metrics that measures the quality characteristic must be determined and the quantitative technique that can be used for measuring the quality characteristic must be determined..
The quality assessment methods vary from factor to factor and the number of features that must be considered shall also vary

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from factor to factor. Each feature and the combined effect of all the features must be measured through most suitable computational methods. In this paper the features and computational methods related to the quality factor "Navigation" is presented..

2. Literature Survey

Miss. Kausar Fiaz Khawaja1 et al., [1] have dealt with factors that include Usability, Privacy Security, and Adequacy of information and Appearance which can be used for evaluating the quality of a WEB site. Usability is the ease of use and learnability of a human-made object such as a tool or device. It describes the quality of user experience across websites. Appearance means the visibility of the WEB site which includes appealing, polished and professional presentation. Adequacy of Information means Putting sufficient and useful information in the website. A method has been presented paper that helps computing the quality based on the observations made while the WEB site is in use.

Vijay kumar Mantri et al. [2], have presented that quality of a WEB site can be computed using the factors such as Usability, Safety and Flexibility. Usability of a website must be effective, efficient and satisfactory. Safety of a Website must ensure that no interaction of a user with the WEB site could be ever revealed. Flexibility is the ability to add / modify / remove functionality affecting the WEB pages without damaging the functioning of current ongoing system. The authors have used a tool called Portal Data Quality Assessment Tool (PoDQA) using a quality model called Portal Data Quality Model (SPDQM).

Several quality factors have been considered by Vassilis S. Moustakis et al., [3] that include Structure and Design, Content, Multimedia, Navigation, Appearance, Uniqueness. Information provided to the end user through user interface is called as Content, The extent to which the web site specialized or generalized, reliability and completeness of the information etc., reflects the quality of a web site considering content as a lone parameter. Every user should have a facility to move around the WEB site. Such facility is called navigation. The ability of moving around the WEB site, easy understand the moving around the web site, and the proper functioning and availability of the links reflects the quality of the navigation built into the implementation of the WEB site. The way the content is presented, speed with which the content is browsed is related to the structure of the web site. The Look and feel and the appearance of the web site is very much dependent on use of multimedia objects along with the graphics. Every web site must be differentiate and should look unique different from others. The uniqueness of the site makes more available for the users. User can very easily distinguish the unique sites.

Andrina Graniü et al., [4] have presented the quality of a WEB site from the point of portability. Portability means the ability to move the website from one host platform to another and the platform that runs the site will work on the new host.

Tanya Singh et al. [5], have used quality factors that include Usability, Privacy and Security, Adequacy of information and Appearance. Usability is the ease of use and learnability of a human-made object such as a tool or device. It describes the quality of user experience across websites. Privacy is all about revealing information to those users who are identified by the owner of the user. Only selected users are provided with the information of those data elements intended to be shared by the owner of the data. Security is all about preserving the interaction of the user with the WEB site. Adequacy of information is related to making available complete data without any loose ends that suffice the actual requirements of the end user. Appearance of a WEB site is all about displaying the content in most understandable by using colours. Graphics, sequences etc.

Anusha et. al., [6] have considered Factors such as Portability, Reliability, Functionality, Usability, Maintainability, and Efficiency to asses quality of a WEB site. Portability means the ability to move the website from one host to another and the platform that runs the site will work on the new host. Reliability means that a WEB site shall reflect the same information any number of times it is sought in the same context. It is the probability that the intended page will be available and presented to the user. Website must be Free from errors. Functionality of a website includes accuracy, security, suitability and etc. Usability is the ease of use and learnability of a human-made object such as a tool or device Maintainability includes analyzability, changeability, stability, Testability. Maintainability implies the simplicity with which changes can be made to the WEB site while the WEB site is up and being used for other. Analyzability includes the readability of the content and the ability to intemperate the same including the tracing of navigational paths. Stability is a feature that dictates that the same content is displayed any number of times a user visits a WEB page in the same context. Testability of a WEB site includes all those features using which the proper working of the WEB site is tested while the WEB site is up and running.

Filippo Ricca et al., [7] have considered Content, Design, Organization and user friendliness as the quality factors that must be considered in evaluating the quality of a WEB site. Organization of a Web site includes the identification of WEB pages and the way the WEB pages are linked hierarchically. The linking of the WEB pages is done in such way that is easy to navigate. The WEB pages must be simple and user friendly in the sense, the content shall be presented to the user as per preferences of the user.

Saleh Alwahaishi et. al., [8] have considered playfulness, and Level of representation of the content as the most important factors that should be considered for evaluating the Quality of a WEB site. Most of the presentation on the basement of quality framework has neither provided a framework or appropriate computational methods using which quality of a WEB site can be computed.

Layla Hasan and Emad Abuelrub [9] have proposed a general criterion for evaluating the quality of any website regardless of the type of service that it offers. The have contended that the dimensions of quality criteria that include content, design, organization and user-friendliness. These dimensions together with their comprehensive indicators and checklist can be used by web designers and developers to create quality websites to improve the electronic service and then the image of any organization on the Internet.

Kavindra Kumar Singh et al., [10] have expressed that the rapid growth of web applications increases the need to evaluate web applications quantitatively. WebQEM (Web Quality Evaluation Method) have been used for objectively trying to evaluate the web applications. Weighing a web attribute has been proved to be subjective and mostly dependent on judgements made by the experts. The authors have presented quantitative evaluation strategy to access the quality of WEB sites and Applications. The methodology proposed by them is useful to systematically assess characteristics, sub-characteristics and attributes that influence product quality. They have presented models, methods, procedures, principles and for assessing quality of a WEB site.

Long-Sheng Chen et al., [11] have presented that heavy interaction is taking place among the members especially through social WEB sites. It has become very important to consider the quality of WEB sites. The authors have attempted to define the quality factors of virtual communities and then proceeded to identify key factors by attracting new members by using feature selection technique

Naw Lay Wah et al., [12] have presented that the WEB sites must be evaluated and measured for quality. He has presented several metrics that are quite related to usability associated with good design elements such as word count, total pages, size in bytes, body text percentage, average link text count and others. He has presented the computation of WEB site quality on basis

of 16 factors. He has used support vectors to predict good and bad web pages. A quantitative analysis of WEB page attributes has been presented

3. Assessing the quality of navigation

Navigation is the way user goes about looking for the content of his interest. The complex the content distribution among several pages, the search for the same would become complicated involving too much of navigation. User loses interest when the navigation becomes complicated. The efficiency of the web site also decreases heavily as too much connected among the pages exists. Navigation thus becomes key.
The quality of navigation can be computed into the following factors:

1. Length of Navigational URL
2. Circular referencing the WEB Pages
3. Availability of quick links
4. Availability and quality of image showing the WEB layout
5. Availability of URL links on top of the page which are frequently used by the user

The computational methods for each of the factors / features of the quality factor "Navigation" are presented below.

Length of URL

The Navigation across a web site involves moving around the URLs. The content displayed as a part of web pages are linked with URLs which are used for navigation when the user clicks on the interested contents if such a design is mode. These are generally called as hyperlinks.
The more the length of the URL, the more complex the surfing through the content happens. The quality of the WEB sites suffers with too much length of the URLs. The number of the URLs increases the size of the WEB site increase. The average length of the URL <= 3 web pages gives optimum response. The following table shows the computation of quality in respect of the feature "Length of URL".

URL Length	**Average Length of URL >= 6**	**Average Length of URL = 5**	**Average Length of URL = 4**	**Average length of URL = <=3**
Quality Value	**0.00**	**0.25**	**0.75**	**1.00**

The resource files of the WEB site are scanned through to find out the URLs and the frequency of a particular URL length. The average length of the URL is computed as per the table below:

Serial Number	Length of URL	Frequency of URL	Weighted URL length
1.	1	A	1*A
2.	2	B	2*B
3.	3	C	3*C
4.	4	D	4*D
5.	5	E	5*E
6.	6	F	6*F
	Total	A+B+C+D+E+F (URL_F)	1*A+2*B+3*C+4*D+5*E+6*F (URL_w)

The Average length of URL thus can be computed as $AURL_L = URL_F / URL_w$. Using this value the quality due to the length of the URL can be computed represented as QURLL.

Availability of quick links

The home page is generally populated with references that are frequently referred by the users. The content is assigned with URLs. The URLs must be frequently referred. Too many Quick links will make the entire web site loses its meaning and that too when improper quick links are made available. The quick links can be assessed to find the effectiveness of the same. The following table provides the assessment of the effectiveness of the quick links.

Serial number	Quality of the Quick links	Weight of the quick link	Number of quick links	Weighted quick links
1	Effective	1.00	A	A * 1.0
2	Good	0.75	B	B * 0.75
3	Average	0.25	C	C * 0.25
4	Bad	0.00	D	D * 0.00
Total			A+B+C+D (QL)	A * 1.0+ B * 0.75 + C * 0.25 + D * 0.00 (WQL)

Quality of quick links can be computed as

QQL = WQL / QL

Circular referencing of the WEB pages

The cross referencing and circular referencing of the WEB pages gives poor navigational strength. Navigation if hierarchical fashion reveals easy access to the WEB sites by the users. The resource files of the WEB site can be scanned through to find the number of circular references that have been designed into the WEB sites. The quality of the WEB site considering the feature "Circular references" can be computed using the table below:

Circular Ques	Number of Circular ques >=3	Number of Circular ques = 2	Number of Circular ques = 1	Number of Circular ques = 0
Quality factor	0.00	0.25	0.75	1.00

The quality of the web site considering the number of the circular references = QCQUE

Computing the quality of image showing the WEB layout
The user can get better experience of the WEB site if he has the complete knowledge of the WEB site quite prior to the surfing of the WEB site for content.
A web site launches an image on the WEB site that shows the layout of the web site. Some web site also provides clicking on the layout which maps to the URL where the expected content is available. Availability and non-availability of the layout while being one concern, the quality of the images in another concern and the availability of the Clicking on the layout is yet another concern. The computation of each of the sub-factors is detailed below:

QAVLLAY = Quality due to the availability of the WEB site layout =

$$\{0 = non\ available | 1 = \ Available\}$$

QAVLCLICKS = Quality due to the availability of the clicks on the Layout image

$$= \{0 = non\ available | 1 = \ Available\}$$

QLAYOUTIMG = Quality of the Layout Image can be computed as per the Table below:

Image resolution	600 * 600	800 & 600	1100 * 800	1100 * 1100
Quality factor	4.0	6.0	8.0	1.0

QLAYOUT = Quality of Layout thus can be computed as

= QAVLLAY * QAVLCLICKS * QLAYOUTIMG

Quality due to Availability URL links on top of the page which are frequently used by the user as one of the important features of any web site is the availability of the frequently used URLs by a user who visits the site for surfing. This is complicated but the issue is addressed quite recently. The quality due to this factor can be expressed as

QFREQUENT = Quality due to availability frequently visited URLs by the user =

$$\{0 = non\ available | 1 = \ Available\}$$

Total quality considering the navigation can thus be computed as

$TQ_{Navigation}$ = QURLL * QQL * QCQUE * **QLAYOUT * QFREQUENT**

4. Conclusions

Every web site must be meticulously designed and developed for the use of information hosted on the WEB site. Most of the world is dependent on the quality of information hosted on the WEB site. The dependability on a web site for information can be expressed in terms of the quality of the WEB site. Many factors are to be considered for computing the quality of a WEB site. Ease of carrying navigation is one such factor. Every factor must be expressed using the computational expressions so that the factor is expressed in quantitative terms. Every factor may involve in subsidiary factors existing in hierarchical fashion. The computation of the quality must be expressed considering computations of the entire subsidiary factors. The computation of the quality of a web site considering the factor "Navigation" of the WEB site can be expressed in terms URL length, Availability of Quick links, number of circular queues, quality of layout and the quality of availability of the frequently visited URLs.

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