

Website Evaluation Models: Key Challenges Explored

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Abstract— In today's digital age, the internet is essential for both government and non-government functions, with web browsers providing access to various services. Every organization, whether governmental or private, has its own website. However, designing and evaluating a perfect site remains a challenge due to the lack of universal standards. To create a successful website, two key factors must be considered: the purpose of the website for the organization and the diverse needs of its users. However, fully defining these factors is difficult due to gaps between company leaders, website users, and IT professionals, as well as the constantly evolving technology landscape. While various website evaluation models exist in literature, each has its limitations. This paper aims to briefly explore the most widely used models, highlighting their drawbacks, and proposes features for a new evaluation model based on this discussion.

Index Terms- Website Quality, Cloud computing, Internet of Things

I. INTRODUCTION

Web engineering goal is to design perfect website. But story does not end at here as one need flexible and adaptable methods as well as tools to evaluate the website in a systematic and efficacious way for full success. The main technical problems arises due to poor navigation, missing information or contents, problems in operating transaction forms and unsatisfied graphical design [1]. Other problems are due to dynamicity e.g. evolving area of web domains in government, health and education sectors, new business models and inclusion of users of different ages [2]. Cloud computing and Internet Of Things have also given new dimensions to web engineering.

To implement any method of evaluation, a strategic methodology of whole process is needed which takes the shape of model. It is the model which specifies the activities and their order for evaluation of a website. A variety of models exist in literature for web evaluation

but some are obsolete where as some are very tedious to implement. Some are multi dimensional [3-5] where as some are domain specific [6-8]. A complete specification of domain models is prescribed in [5]. Some models are defined according to ISO guidelines but they are very general too [9-10]. Some models explain step by step procedure for evaluation of website [11].

The main fact is none of these models is recognized as standard process model. The main models deal with user satisfaction so their main impact is for external user's view. But some intention should also be given to evaluate the needs of website from organization point of view during its development. For this, a strategic evaluation first be conducted and then final website should be evaluated from user point of view. This paper aims to:

1. Classify and discuss main models exist in literature.
2. Describe the limitations of existing frameworks
3. Propose a new strategic methodology for website evaluation.

II. METHODOLOGY ADOPTED

First of all, the major databases e.g. Science Direct, IEEE, Springer, ACM and Taylor & Francis Publications have been accessed to find the research papers on website evaluation. About 150 papers have been accessed from previous fifteen years. Then, their abstracts have been read to find out there relevance with topic. In the next step, 95 relevant papers have been selected for detailed study. Then, full text of articles has been studied and through iterative group discussions, articles have been finalized for in depth literature review. At the end, it has been concluded that the models can be categorized as generic models and domain oriented models as shown in Figure 1.

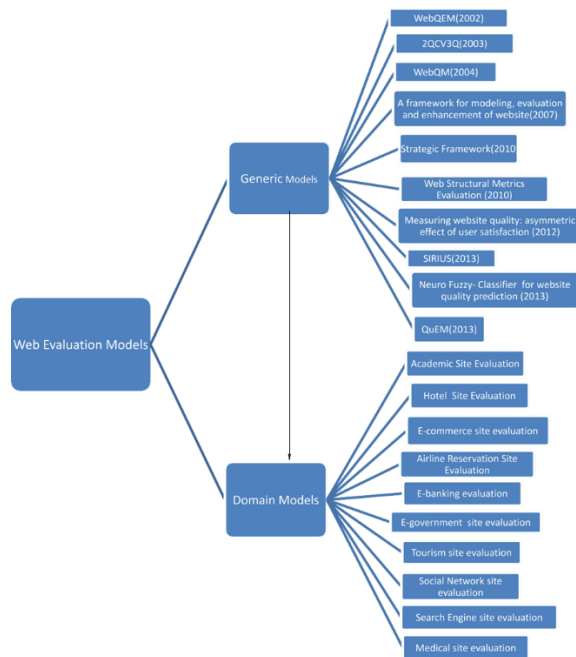


Figure 1: Classification of Web Evaluation Models [13]

III. EXISTING MODELS

Among the two types of models, first are those which describe general steps for website evaluation according to software engineering principles and they can be applied to any website. Others are domain specific which are refined form of first category and these are dynamic in nature. Generic models are mostly designed according to the software engineering principles and prescribed a limited number of steps which seems to be easy but in reality they impose a lot of decision making problems to an analyst [12] e.g. to evaluate the website one needs requirements gathering from various types of unknown user which is very cumbersome task. There are also lack of proper tools, activities and techniques to fully implement them.

The second class of models deals with process models which are very easy to implement but the way they prescribed assumptions, instructions, metrics, and tools and techniques [13-14] make them domain or task specific and hence they lose generality. In the changing technical world, they become obsolete in a few time in their own domain. Due to the evolving web, new domains are created very frequently, and one needs new models for them. But all these models are

developed upon generic models guidelines as base with minor modifications. So, there is a trade off between generic models and domain models. The main fact is none of these models is recognized as standard process model.

A. Generic models

These models are mainly milestones of web evaluation as without them domain specific models can't be designed. These models are also competing for standardization. They are also not too much dynamic and become obsolete rarely. The main models under this category are:

- WebQEM(2002) [18]: This methodology is useful to systematically assess characteristics, sub characteristics and attributes that influence product quality. The main aim is to classify the web metrics for web evaluation. This model can be applied to different domains as its prerequisite is to define quality attributes, sub attributes, measuring indicators. Again, it can be used from developer point of view as well as user & managerial point of view. It focussed on user-perceptible product features such as navigation, interface, and reliability rather than product attributes such as code quality or design. It can discover absent features or poorly implemented requirements such as interface-related design and implementation drawbacks or problems with navigation, accessibility, search mechanisms, content, reliability, and performance. This has become complex as too many metrics are involved with weight discrepancies and furthermore metrics have to be decided by web designer at the time of implementation.
- 2QCV3Q(2003) [19]: The 2QCV3Q model helps developers to evaluate website quality from both owner and user viewpoints. It highlights elements that, when suitably combined, permit thorough site assessment and guide development. Site owners and developers can therefore use this model in every project phase, involving both the site owner and the user or customer more closely to ensure that the site matches their requirements and can be constantly improved to achieve total quality. From the model's nature, its application can't be completely automated; however numerous tools can effectively support it. Developers can also use

2QCV3Q to design an integrated support environment. But for its implementation, quantitative metrics and micro discussion is not shown.

- WebQM(2004) [34]: It evaluates the web resource quality by using some critical features such as autonomy and dynamics, openness and heterogeneity of contents. It also considers the feasibility of model, its effectiveness and fitness for the web quality issues. This model is further formally specified and validated [35].
- A framework for modeling, evaluation and enhancement of website(2007)[30]: A three layered framework which consists of application analysis layer, generic website design layer, and graph modeling layer, with the necessary mappings in between them is presented. It can be applied across different domains or sectors. While the current practice is mostly qualitative and ad hoc, formal modeling methods and analytical techniques to evaluate and improve website performance are adopted. The framework is not designed according to usability point of view and the main emphasis is on content and design. Several areas deserve immediate attention, e.g. the analysis of categorization of website design objectives and constraints need to be further investigated and validated both conceptually as well as empirically. Mainly two distinctions are given i.e. content & design.
- A Strategic framework (2010) [20]: It has been based on a review of the literature from 1995-2006 for web evaluation. In this study, 12 unified factors with percentage of their supported studies are shown. Evaluation criteria with five factors and various sub-factors are presented and finally a five step web evaluation process is identified for e-commerce studies. There was very limited research performed to explore the web strategic issue in website evaluation. No case study is shown in this study, only conceptual method is presented, so web analyst need high expertise to implement it.
- Web Structural Metrics Evaluation (2010) [32]: The study describes navigability features in order to evaluate the popularity of website. No. of inlinks i.e. the links which are received by the site from other sites and outlinks which are hyperlinks originating within a website has been measured to evaluate popularity. An HTML parser has been developed to measure some features which evaluate structural complexity.
- Measuring website quality: asymmetric effect of user satisfaction (2012) [21]: This study has given more impact from user point of view; hence, identify content and navigation as the key ingredients for a quality website. So, it has been suggested that web designers and website evaluators should take into consideration these attributes more closely. This study aims to identify easy to administer practical measurement tools. According to usability guidelines, various attributes are compared and contrasted which results content and navigation as the key ingredients. Websites of various business schools are evaluated via assignment of a random yet typical task and their responses are calibrated before and after completion of the task graphically.
- SIRIUS (2013) [13]: It is the recent general method whose aim is to evaluate usability of a website according to type of website. So, the very first step in this method is to find the category of website according to some aspects and criteria. Then it decides the evaluation values at lower level. After that weighing criteria for these values are determined that is different for each type of website. In the final step, usability metrics are shown which help the analyzers to analyse the site well. This is the method which is general but become domain specific during implementation. The main limitation is the need of an in-depth requirement gathering and decision making for its implementation and it also evaluates only usability. It measures accessibility first and then usability as most researchers [15] [16] [17] think that usability can only be increased if site is more accessible to its users.
- A Neuro-Fuzzy Classifier for Website Quality Prediction [31]: The main aim of this model is to predict the website quality whether it is good or bad by using Fuzzy Inference System which is based on two techniques, ANFIS-Subtractive clustering and ANFIS-FCM. It validates these techniques from pixel-awards data. Only 9-parameters are used for web evaluation and all parameters are webpage structure based. This model is difficult to use.

QuEM (2013) [29]: This model has given main impact on weighing criteria of low level parameters by using Decision Making Trial and Evaluation Laboratory (DEMATEL). By applying Fuzzy set theory, it evaluates the relative degree of interactions among parameters which are helpful in applying weighing constants with more accuracy [28]. It has also used the Choquet integral to evaluate the design quality of website. This model is represented in application form and finally evaluates a shopping site. The model has not given any idea how to measure lower level metrics and highly depends upon experts decision in linguistic form. All these models are summarized in Table 1

B D o m a i n Oriented Models:

These models are basically refined form of generic models. When generic models are applied in specific domain their features are reorganized according to the needs. Some evaluation metrics are not needed or preferred for some specific domain site whereas for second type of site same metric can be most significant e.g. high quality images for shopping site can be most prioritized requirement as the final product should have high class visibility than some other banking or educational site. Classification of websites domains is well shown in [13]. However, the domain of websites is an emerging field, yet we have studied some specific domains which are shown below:-

- Academic site evaluation: A Usability Evaluation Model for Academic Library Websites [22] has been developed for academic library websites based on literature review and expert consultation. The model measures three parameters with sub-parameters from user survey and then applied various statistical techniques for validation. Another model [33] measures the web log data i.e. number of unique visitors, total visitors, hits, bytes accessed to predict the usability of higher school of education. Some studies have mission for evaluating e-learning [52-53] while others evaluate just one or two parameters i.e. service quality[54] and usability[55].

CONCLUSION

This paper highlights the problems in web evaluation. A lot of models have been discussed. It has been seen literature is rich in general models which are according

to software engineering principles but another class of models which are domain-oriented deals with some specific sites and can't be standardized. So, there is a need to define the new evaluation methodology which can take the benefits of both models as well as new methods of weighing criteria which is shown in this paper. In future, researchers can do case studies by adopting this methodology and can refine existing models. One can also include the design evaluation criteria for a website as poorly design sites are not easy to operate and can also lose operational quality.

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