

Investigating the characteristics used in quantitative analysis of websites evaluation

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ABSTRACT

The quality of e-commerce websites is the most important factor that affects the evaluation of websites. This is because quality represents the sight of organization to keep it competitive, sustainable, and beneficial for customer loyalty. There are many characteristics controlling the quality of websites, each one consists of sub characteristic and attributes. Evaluation of websites is thus an important issue. There are concerns about ways in which web applications are developed and the degree of quality delivered and thus evaluation of websites can benefit companies in providing a sound input in terms of quality. This research paper aims at identifying ways specifically quantitative methods to evaluate E-commerce web sites and look into some critical characteristics that are really beneficial for the purpose of evaluation.

Key words: web site evaluation, quantitative analysis, quality, e-commerce

1. Introduction

The increase in growth of Information technology, web technology, and communications all over the world has made e-commerce to become one of the most famous business models. As a result, many enterprises begin to take e-commerce websites construction into consideration [1].

While the web technology transforms all business into information-based activities, many organizations skipped from the traditional way to electronic way to keep it self competitive and sustainable [2, 3].

In general, e-commerce can be defined as a business process of selling and buying products, goods, and services are performed through online

communications [4]. In other words, E-commerce means exchanging goods and services on the Internet as on-line shopping [5, 6]. E-commerce is considered as one of the factors that changes the way of payment is made. According to Kingston [5] E-commerce allows organization to know about their customers, to tell them more about their services and build strong relationship between the customers and the organization. A large number of e-commerce websites have been established by companies to enhance the reputation of their brand and provide good services to the customers. E-commerce is considered as an ideal way

for organization to reach new customers, reach the global development [7].

The importances of companies' websites have been recognized by many. According to [8] the web is generally playing a main role in diverse application domains such as business, education, industry, entertainment and thus, there are concerns of quality development of web-application.

The quality of e-commerce websites is the most important factor that affects the evaluation of websites. This is because quality represents the sight of organization to keep it competitive, sustainable, and beneficial for customer loyalty. There are many characteristics controlling the quality of websites, each one consists of sub characteristic and attributes.

Evaluation of websites is thus an important issue. The reasons why websites have been found to be unsatisfactory by users are many. A large percentage of websites are in accessible from the user view points and many have short lives. There are concerns about ways in which web applications are developed and the degree of quality delivered and thus evaluation of websites can benefit companies in providing a quality and sustainable sites.

The study aims to compile various quantitative methods of website evaluation. Specifically, characteristics and sub-characteristics used in the measures are explored and analyzed.

2. Review of Related Literatures

There are many approaches to evaluate websites. In general, two approaches are widely recognized: quantitative and

qualitative. In this paper, the quantitative approach is studied and discussed.

2.1 Quantitative methods

Quantitative methods can be defined as methods that use mathematical and statistical techniques to analyze data [9]. Specifically, the methods are applied to test empirical theories and hypotheses, including primary quantitative data such as those derived from sample surveys or aggregate statistics such as election results, census materials, or cross-national statistical series.

Through past literatures, it has been found that several quantitative methods have been used in evaluating e-commerce websites. [10] Used Quality Evaluation Method (QEM) to measure the functionality (global search, navigability and content relevancy), usability (site map, addresses directory), efficiency and site reliability. These methods have been used to evaluate the product quality successfully [2].

Another method known as Analytic Hierarchy Process (AHP), developed by Satty in 1971 has been used to solve the scarce resources allocation and planning needs for the military. Later it had become one of the most widely used tools for making decisions based on multi criteria.

Gray analysis (GA) method had been used by [11] to measure the distance between the set of every evaluation objects scores and the set of the best score of each criterion. The object whose distance is the shortest is chosen to be the best website.

Another important method found was Data Envelopment Analysis (DEA). This method has been used to evaluate multi criterion problems and found that it could improve efficiencies. It is a

powerful quantitative, analytical method for measuring and evaluating performance [6]. [2] developed Web Assessment Index (WAI) to evaluate websites effectiveness. This method has also been used by [12] for their analysis. Websites have also been evaluated based on customer satisfaction. Among the methods are Fuzzy Technique for Order Preference by Similarity (FTOPSIS) developed by [13] and Depth, an approach that performed scenario-based heuristic usability evaluation for e-commerce sites [14]. The Microsoft Usability Guidelines (MUG) was another method used to evaluate the website usability. MUG comprised of five categories: content, ease of use, promotion, made-for-the-medium and emotion [15]. Other methods of websites evaluation were Eye Tracking (ET), original Web Assessment Method (WAM). ET used user's eye movement as the basis for analysis [16]. OWA used a set of criteria to evaluate the quality and success of existing e-commerce applications. It focused on the customer perspective and found that the success in implementing the offer of products and services are contributed to specific features of the electronic medium [1]. WAM, on the other hand, examined three classic transaction phases of electronic markets: information, agreement and settlement [17].

3. Analysis

The various methods identified from past literatures are compiled and grouped into quantitative categories. The past researches gathered are not comprehensive because of time limitation and difficulty in getting the resources due to some restrictions.

The past researches that are accessible are compiled and presented in Table 1. Due to space limitation Table 1 and other tables are placed in the Appendix.

Table 1 shows several groups researchers that used quantitative methods to evaluate websites. The researches are not listed in any order. The characteristics used in their evaluation methods are shown and the results are summarized and presented in the last column (Result).

4. Discussion and Conclusion

The characteristics of the evaluation methods are compiled and listed. Some of the characteristics can be grouped together. Examples are customer satisfaction and usability.

From the list of characteristics, six categories are identified; usability, functionality, reliability, efficiency, maintainability, and portability. These categories are known as measurements of quality. Fig. 1 below shows the representation of characteristics and their relation with quality

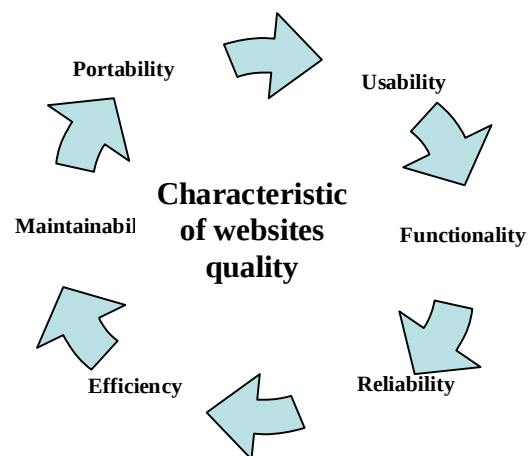


Fig.1 Characteristics of websites quality

Usability is the set of attributes that are used to measure the ease of system with which system can be learnt and understood from the user perspective. It also described effectiveness. Usability can be measured through these criteria: ease of learning, task efficiency, ease of remembering, understandability, and satisfaction [18, 19].

Functionality is the set of attributes that are used to measure the capability of the software product and can be seen as functions which meet stated and implied requirements for the software. Functionality can be measured through these criteria: accuracy, suitability, interoperability, flexibility, information on product delivery, and client support [19].

Reliability is the set of attributes that bear on the capability of software to maintain its performance level under stated condition for a stated period of time [20, 21]. Reliability is measured through measurements such as maturity, fault tolerance, and recoverability.

Efficiency is a characteristic that takes into account the relationship between the software's performance and the amount of resources used under stated conditions. This characteristic can be measured through time behavior resource behavior, and page generation speed [19, 20].

Maintainability is the capability of the software product to be modified. It includes corrections, and improvements of the software to changes in the environment. Examples of measurements of maintainability are extensibility, stability, testability, analyzability, and changeability. [19]

Portability is the capability of the software product to be transferred from one environment to another. The environment may include organizational, hardware or software environment [19].

Based on the characteristics presented in Table 1, the popularity of characteristics are obtained. This was done by calculating the occurrences of the characteristics. The occurrences were calculated in terms of percentage. The formula used was the total number of occurrences divide by 20 (number of researchers) multiply by 100.

Fig.2 presents the percentages of measurements obtained. The result (Fig. 2) obtained showed that usability occurred 95% while functionality occurred 45%. Reliability, efficiency, maintainability, and portability occurred 40%, 45%, 10%, and 15% respectively. For more details see Table 2 (Appendix1)

Based on the figure, it can be seen that usability is the most popular or common measurement used. Next most common measurement is functionality and efficiency. Reliability is the third most popular measurement. Portability and maintainability are the fifth and sixth most popular characteristics used in evaluating websites.

The reasons for the popularity of the measurement have not been discussed in this paper. This is due to time constraints and is still in the process of collecting supporting materials. In terms of best evaluation method, it is difficult to pin point what is the best characteristics to be used in evaluating websites in terms of quantitative measures? This is because each has its advantage and

disadvantages and researchers are experts in their own way and chose to evaluate based on their own expertise in analysis. In terms of measurements, which of the six categories is the best measurement? It is definitely an ideal if a comprehensive measurement is incorporated in an evaluation. However, using all measurement is a complex process and maybe unachievable due to limitations in terms of resources. Thus, the use of several measurements is recommended

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Appendix

Table 1: Past researches on Quantitative methods

Research number	Author (year)	Method	Characteristics studied	Result
1	Francisco Javier Miranda, Rosa Cortés and Cristina Barriuso (2006)	Web Assessment Index (WAI)	accessibility, speed, navigability, site content.	Poor results if characteristics of WAI are absent.
2	Miranda, Cortés and Barriuso (2006)		functionality, usability, efficiency, reliability.	High flexibility of the WAI and WAI could have detect the weaknesses of web Pages assessed.
3	Francisco Javier Miranda, Rosa Cortés and Cristina Barriuso (2006)	Quality Evaluation Method (QEM)	functionality, usability, efficiency, reliability	Excessive number of attributes employed raises some subtle problems of computational nature
4	Luis Olsina, Gustavo Rossi (2001)		user perspectives navigation, interface, reliability, usability functionality, efficiency	Found that many e-book store suffer if characteristics studied are absent
5	Luis Olsina , Gustavo Rossi (2000)		Usability, Functionality, Reliability, and Efficiency	The method used are more efficient and powerful
6	A. K. Abd El-Aleem, W. F. Abd El-wahed, N. A. Ismail, F. A. Torkey (2005)	Data envelopment analysis (DEA)	design, usability and performance	Found that are four sites efficient and five inefficient
7	Vaclav Petricek, Tobias Escher, Ingemar J. Cox, Helen Margetts (2006)	Manually analysis	internationally, nodality link structure of e-government sites, Internal Structure, External Connectivity	The US and Canada emerge as the most internally connected and navigable sites in relation to their size.
8	Mehdi Fasanghari, Navid Gholamy , S. Kamal Chaharsooghi, Shohre Qadami , Mohamad Soltani Delgosha(2008)	customer satisfaction evaluation method	customer satisfaction.	The evaluation method shows good results and can be used as a good tool for evaluation.
9	Peide Liu, Ruishan Hu (2008)	Synthesis evaluation method, OWA and LOWA operator	service, information, technology, credit and security.	Identified the best e-commerce website in terms of product and services. Facilitate identifying the strength and potential websites so that sensible

				decisions can be made.
10	Chu Fang-fang, LI Yi-jun(2005)	Grey Analysis (GA)	The usability of the Websites, The reliability of the websites, The cost of using the websites	The order from the best websites to the worst websites are presented.
11	Chu Fang-fang, LI Yi-jun (2005)	Concordance Analysis (CA)	The usability of the Websites, The reliability of the websites, The cost of using the websites.	The priority index and the non-priority index of websites are presented.
12	Chang Jinling, Xia Guoping (2005)		Satisfaction, dissatisfaction.	A simple evaluation model which is each practical and programmable.
13	M. Sartzetaki, Y. Psaromiligkos, S. Retalis, P. Avgeriou (2003)	Depth (evaluation approach based on DDesign PaTterns & Heuristic criteria)	The usability of the Websites.	Identifies that easy-to- measure are important.
14	Alistair Sutcliffe (2002)	Heuristic evaluation Methods	Attractiveness and usability, design.	Heuristics should not be used for subjective rating style judgment.
15	Chang Jinling, Guan Huan, (2007)	Microsoft Usability Guidelines,	Content, Ease of use, Promotion, Made-for- the-medium and Emotion.	All websites showed great importance to “Content”. Other attribute differ from site to another.
16	Ekaterini Tzanidou, Shailey Minocha, Marian Petre, (2005)	Eye Tracking method	Design of the website.	Users rarely looked at the menu bar Their scan paths focused mainly on the middle left side of the screen.
17	Yi-wen Liu*, Young-jik Kwon, Byeong-do Kang (2007)	Fuzzy logic	Website basic technique, Web page design., Website information/content, Website function/service.	Presented the applicability of the proposed approach.
18	Adriano Bessa Albuquerque, Arnaldo Dias Belchior (2001)		Conceptual Reliability, satisfactorily, Reliability of the Representation.	All factors are found to be important. However, Security and Integrity obtained the best score.
19	Chu Fang-fang, LI Yi-jun, (2005)		The usability of the Websites, The reliability of the websites, The cost of using the websites.	Presented the ranking of websites from best to worst. However could not know the absolute value of each website.
20	Petra Schubert, Uwe Leimstoll, (2001)	original Web Assessment (WA) method	Ease of Use, Usefulness, Trust category	Most web sites were far from fully meeting user expectations

Table 2: Occurrences of measurements used in quantitative methods

Categories of measurement	Research number																				occur
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Usability	*	*	*	*	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*	19
Functionality	*	*	*	*	*	*			*					*			*				9
Reliability		*	*	*	*					*	*							*	*		8
Efficiency	*	*	*	*	*	*	*										*		*		9
Maintainability										*	*										2
Portability	*			*			*														3

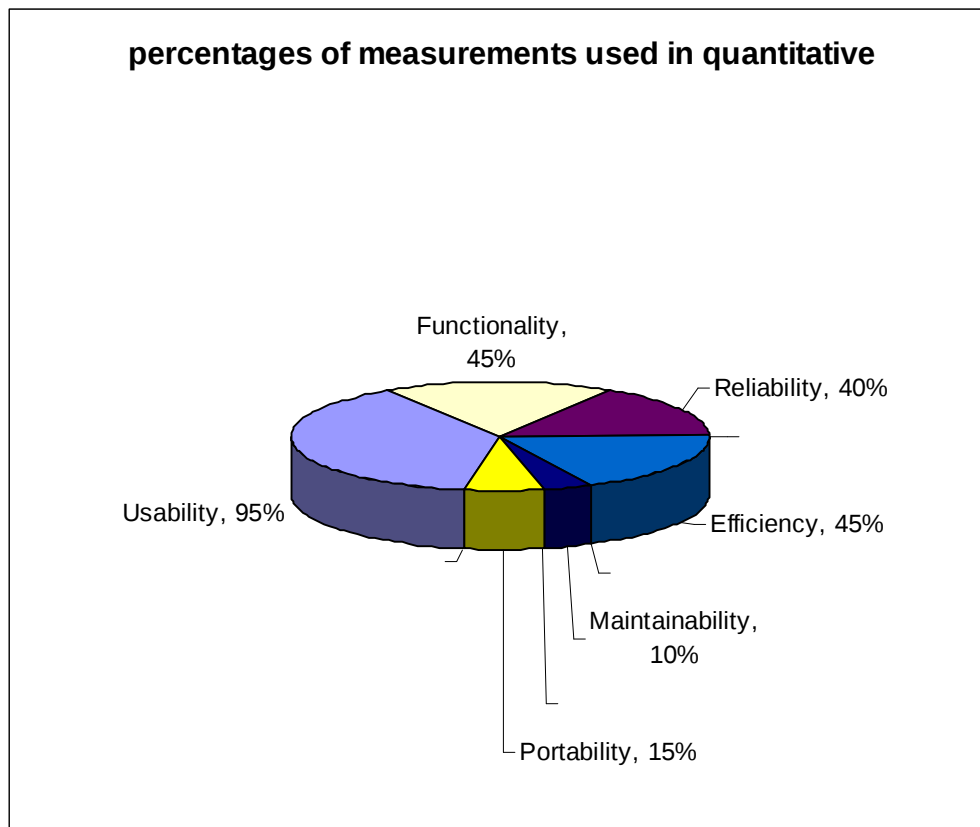


Fig.2 Percentage of measurement used in quantitative