

DEVELOPMENT OF E-COMMERCE QUALITY AND EVALUATION FRAMEWORK BASED ON TECHNICAL AND USER PERSPECTIVES

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ABSTRACT

This research aims to construct a quality framework for effective website applications specifically for B-to-C e-commerce application that hopefully can guarantee the development of quality software in the organisations in this industry. Finding from previous studies indicate that this problem occurs because of ignorance of consumer needs in their websites development. The proposed framework consists of two main attributes of quality: the behavioural and the user aspect. The behavioural attributes deals with assessing e-commerce in technical aspects to ensure the quality of the software. While the user aspect deal with user expectation and satisfaction toward quality e-commerce application. These two components of quality produce a balance model between technical requirement and human factor. The objectives of this research are to investigate and identify e-commerce evaluation attributes based on user's perspective, to identify evaluation attributes based on e-commerce application behaviour (technical) perspective, to design an architecture of attribute's measures and metrics and to construct a new integrated e-commerce evaluation framework based on users and technical perspectives. The research will be conducted in four main phases which include: 1) the theoretical and empirical study; 2) design the architecture of attributes, measures and metrics; 3) construction of an integrated e-commerce quality evaluation framework, and 4) confirmation study. The framework will provide a complete mechanism for assessing e-commerce B-2-C application. This research will offer missing factors for e-commerce assessment from consumer perspectives (consumer aspect) that can be used to improve organization websites to meet the consumers need and to keep the organization competitive and sustainable.

Keywords: E-Commerce quality framework, evaluation framework, technical and User perspectives

INTRODUCTION

The growth of information technology, web technology, communications, and internet users all over the world, has created a new paradigm that is changing the way of shopping. Consumers are no longer bound to specific times or specific locations if they want to shop; consumers can purchase whatever products or services virtually at anytime and from any place. In other words, this is known as e-commerce. E-commerce is considered as one of the most important contributions of the information technology revolution (Smith & Rupp, 2003).

E-commerce can be defined as a business process of selling and buying products, goods, and services through online communications or via the internet medium (Li et

al. 2005). In other words, e-commerce means exchanging goods and services on the Internet as on-line shopping (El-Aleem et al., 2005). According to Focazio (2001), company interactive communication channel is classified into four main types of e-commerce which are Business to Business (B2B), Business to Consumer (B2C), Consumer to Business (C2B), and Consumer to Consumer (C2C). B2B refers to online transaction conducted between business companies. B2C refers to the transactions conducted between business and consumers via electronic way. C2B refers to consumers selling their goods or services to business via online. Finally, C2C involves online interactions conducted between consumers.

For successful e-commerce transactions, the consumers' needs must be considered by the companies when developing websites. However, most e-commerce websites neglected the consumers' needs (consumers' perspective) (Nielsen, 2000; Gamon et al., 2005). Therefore, the bridge between the consumers and the websites must be built by identifying the characteristics that can improve the interaction between the consumers and the sites.

Research Questions

The problem in this research is that most e-commerce websites fail to help companies to reach their objective because they did not take the consumers' needs and quality into consideration when developing their websites. Therefore, these companies need to support their websites with the characteristics from both aspects (technical aspect) to support the quality of the websites and user aspect (non-technical aspect) to support the needs of consumers for ensuring all quality aspects are catered to in their websites. Therefore, as emphasized earlier, there is an urgent need for quality evaluation framework for B2C e-commerce applications that covers all quality aspects and measures the quality objectively rather than subjectively, as well as a standard guideline for e-commerce websites evaluation.

Research Objectives

This objective of this research are: 1) to investigate and identify the quality characteristics for e-commerce website evaluation based on consumer's perspective, 2) to identify quality evaluation characteristics based on e-commerce website behavior (technical perspectives), 3) to investigate and identify the mechanisms and procedures for websites quality evaluation, 4) to construct a new integrated quality evaluation framework for B2C e-commerce applications based on technical and consumers perspectives, and 5) to evaluate and validate the integrated quality evaluation framework for B2C e-commerce websites.

METHODOLOGY

The research methodology consists of four sequential phases to achieve the research objectives and solve the research problem as shown in Figure 1.

Theoretical Study

The first essential phase of the research begins with the literature review on the existing research related to software, website evaluation, online consumer characteristics, and quality categories. It includes references from journals, books, proceedings and other academic research. The aim of this phase is to investigate

the existing mechanism and problems related to web and e-commerce applications, the limitation on the software and website quality models, and the characteristics that affect the quality of evaluation. The literature review is explored in greater depth in the Theoretical Framework section.

Based on the literature findings, the research will proceed with designing and testing questionnaires via a pilot survey. The data from the pilot test will be analyzed to produce pilot reports and any modification on the items in questionnaires will be implemented in this stage before the real survey is conducted.

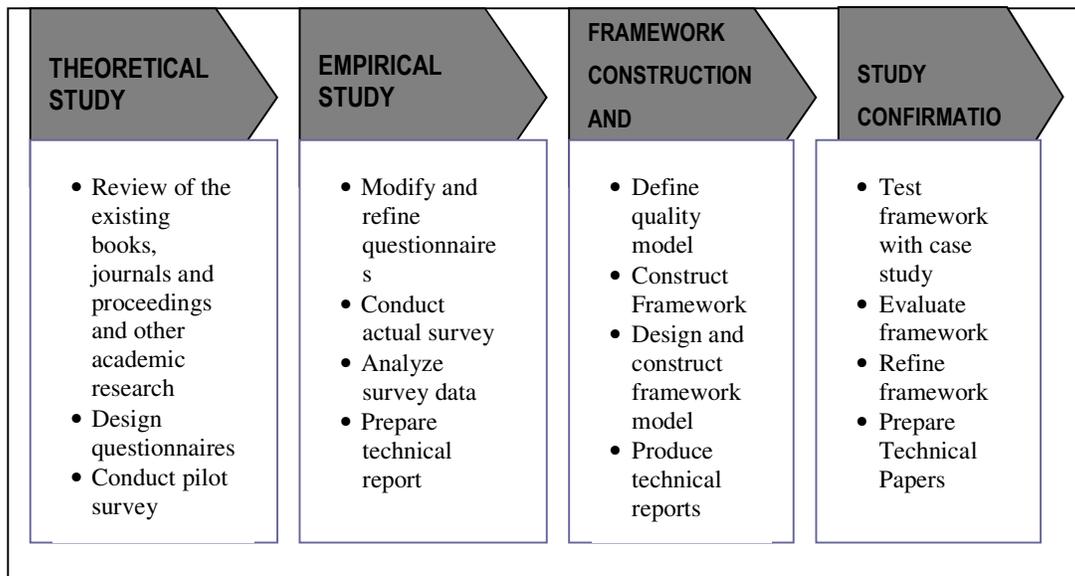


Figure 1 Research Methodology

Empirical Study

The second essential phase of the research is the Empirical study. A survey will be administered in order to obtain inputs from various sectors. This is also known as requirements-design-implementation strategy to ensure that it meets the needs of a number of different interest groups in the industry. Analysis from this phase will give an input to the following phase of this research.

Framework Construction and Development

The third phase of the research is to construct the framework. Based on the empirical and literature findings, appropriate methods or techniques for quality evaluation will be embedded in the framework together with the characteristics. New framework will be introduced.

Confirmation Study

The fourth phase of the research is the confirmation study. Once the new framework is completed in the Framework Construction and Development phase, the evaluation of the framework will take place. The proposed framework will be applied and validated at the selected organizations. Feedback from the case study will be used to refine the framework. This is to prove that the framework of quality evaluation for B2C applications is tested and is a practical framework in real environment.

The next section discusses in detail the underpinning literature that built up the foundation for this study.

THEORETICAL FRAMEWORK

Quality is seen as a very important factor that determines the success or failure of any software products. As such, companies have realized that in order to stay competitive and sustainable in the digital world of business they have to ensure the quality of their websites (Husain et al., 2009). Therefore, there is a need to develop a sound e-commerce quality and evaluation framework to determine if e-commerce applications conform to requirements. This section will seek to establish an initial theoretical framework of the current quality and evaluation models, by providing an explicit conceptual framework and understanding of focus for current studies. A comprehensive systematic review of the existing literature is analysed and summarised into the following four areas: (1) software quality models; (2) websites quality models; (3) websites assessment approach and (4) e-commerce evaluation.

Software Quality Models

There are several software quality models that have been used in various industries to improve the quality of software products. However this paper only discussed two most popular models which are McCall and Pragmatic Quality Factor.

The McCall's Model

McCall's model is a model used in the military in the United States. It was developed in 1977 by the US Air force Electronic System Division (ESD) for improving the quality of software products and makes it measurable. McCall quality characteristics are: efficiency, integrity, reliability, usability, accuracy, maintainability, testability, flexibility, interface facility, re-usability, and transferability. One of the contributions of McCall's model is the relationship created between quality characteristics and metrics. He decomposed these quality characteristics into attributes that can be measured by quality metrics. However, Tawfik et al. (2007) and Behkamal et al. (2009) argued that not all of McCall's metrics can be measured objectively. In addition, it did not take the functionality aspect into consideration (Ortega et al., 2003).

Pragmatic Quality Factor (PQF)

Based on limitations and constraints in previous models of software quality, Yahaya, Deraman and Hamdan (2008) has developed a new quality model named as Pragmatic Quality Factor or PQF. The PQF consists of four main components: behavioural attributes, impact attributes, responsibility, and weight.

a) The Behavioural Attributes

The behavioural attribute is defined as the external quality characteristic of specific software and how it behaves in the actual operating environment. The behavioural attributes include efficiency, functionality, maintainability, portability, reliability, integrity and usability. The behavioural attributes are derived from ISO 9126 attributes with the integrity aspect included. It covers threat and security aspects.

b) The Impact Attribute

The impact attribute refers to the human aspect of quality toward the product. It illustrates the impact of the software in term of quality to the users and also

measures the conformity of software to the user requirement. This attribute is important to balance the quality model between technical measurement of software and human factor (Dekkers & McQuaid, 2002). The metrics include measures of popularity, performance, trustworthiness, law and regulation, recommendation, environmental adaptability, satisfaction and user acceptance.

c) **Responsibility and Measurement of Metrics**

The third component in PQF is the responsibility. It is defined as the responsibility person to answer the questions related to metrics. It is also named as the interviewee in this model. The PQF identified specific interviewee to responsible in giving the assessment score of each metrics. The measurements used are Likert scale of 1 to 5 based on collaborative perspective among assessment team members.

d) **Classification of Attributes and Weight Factors**

In this model attributes are classified into three levels of classification namely low, moderate and high. Each of these classifications is assigned with weighting factors. Therefore, different requirements may have assigned different values of weight factors according to individual business requirements. This model allows flexibility in determining the weight factors of the software.

Based on the discussion above, PQF will be chosen as the baseline model to develop quality evaluation framework based on technical and consumer's perspectives for e-commerce websites or (B2C applications) because it closely related to this study.

Website Quality Models

Evaluation of e-commerce websites requires a quality model. The following section is a short review of websites quality models that were proposed over the last few years that cover various points of view and several characteristics.

Websites Assessment Index Model

This model was proposed by Miranda et al. (2006) to evaluate the potential of Spanish e-banking websites. His model was based on four characteristics – accessibility, speed, navigability and site content. He evaluated accessibility by accounting the number of hits on the website, linking popularity and presence of search engines. Speed was assessed by a chronometer in ideal environment (Miranda et al., 2006). Navigability was assessed by permanent site menu and keyword search function. Finally, content was assessed using a binary yes or no scale which are Informational factors, Transactional factors, and Communicational factors. The main contribution of this model is allowing the managers and researchers to compare between the attribute and component of the internet websites in order to determine the problems and opportunities and avoid the subjective factors mentioned in the previous models. However, this model neglected the users' perspective (Miranda et al. 2006).

The ISO 9126 Standard Quality Model

The purpose of ISO 9126 standard quality model proposed in 1992 by an international standard was to define software quality models and to measure its characteristics. It defined the product quality as a set of product characteristics.

ISO/IEC 9126 classifies software quality into four parts (Ortega et al. 2003; Tawfik et al. 2007).

The first part is ISO/IEC 9126-1 (ISO/IEC, 2001a) which defines a quality model as a framework that explains the relationship between the other approaches to quality; it is an updated quality model. This model includes six main quality characteristics which are functionality, reliability, usability, effectiveness, maintainability and portability. Each one of these characteristics is decomposed to a set of sub-characteristics supported by relevant aspects of the software to explain the main characteristics which in turn make it more concrete and measurable.

The second part is ISO/IEC 9126-2 (ISO/IEC, 2003a) which defines a set of external measures. It explains how the product works on its environment. Part three is ISO/IEC 9126-3 (ISO/IEC, 2003b) which defines a set of internal measures, that explains how the product was developed. Part four is ISO/IEC 9126-4 (ISO/IEC, 2001b) which defines a set of quality-in-use measures. This is a user's view of quality (Bevan 1999).

The main contribution of this model is the breakdown of the concept of quality. This model decomposed the quality characteristics into sub-characteristics to be more concrete and measurable. However, this model does not provide a clear way to measure these quality aspects and reflects the developer's point of view rather than the user's point of view (Tawfik et al. 2007; Pfleeger & Atlee 2009).

Despite some of the limitations, ISO9126 quality model is a well known model and has been used widely in researches and industries all over the world. Therefore, ISO model will be chosen as the baseline model to develop quality evaluation framework for B2C e-commerce applications based on technical and consumers' perspectives.

Websites Assessment Approach

There are two common approaches to evaluate websites: quantitative and qualitative.

Quantitative Research Methods

Quantitative methods can be defined as methods that use mathematical and statistical techniques to analyze data. It is based on measurable data gathered from a broad range of sources, often followed by objective analysis (Punch 2005). Several quantitative methods has been used in evaluating e-commerce websites. For example, Olsina and Rossi (2000, 2002) used Quality Evaluation Method (QEM) to measure the functionality (global search, navigability and content relevancy), usability (site map, addresses directory), efficiency and site reliability of websites. This method was also used by Miranda et al. (2006) to evaluate product quality.

Strengths of quantitative research methods include:

- can generalise research findings when the data is based on random samples of sufficient size;
- data collection and analysis are relatively quick;
- the research results are relatively independent of the researcher; and

- it is useful for studying a large number of people (Blaxter et al. 1996; Morse 2003).

Weaknesses include:

- the researchers' categories that are used might not reflect local constituencies' understandings;
- the researcher might miss out on phenomena occurring because of the focus on theory or hypothesis testing rather than on theory or hypothesis generation, and
- knowledge produced might be too abstract and general for direct application to specific local situations, contexts, and individuals (Blaxter et al. 1996; Morse 2003).

Qualitative Research Methods

Qualitative methods can be defined as methods that use general description of properties that cannot be written in numbers, and cannot be reduced to something that can be enumerated. It is based on individual, often subjective analysis (Punch 2005). In the case of qualitative methods, Liu et al. (2007) proposed Fuzzy Analytic Hierarchy Process (FAHP) approach. This approach was used to evaluate e-commerce websites based on vagueness and uncertainty of judgment. However, most researchers used common qualitative method such as interviews (Miranda et al., 2006) and case study (Li et al., 2005; El-Aleem et al., 2005; Jinling, 2005).

Among the strengths of qualitative research methods are:

- data based on the participants' own categories of meaning;
- useful in describing complex phenomena and studying a limited number of cases in depth; and
- provide understanding and description of peoples' personal experiences of phenomena, (Blaxter et al. 1996; Yin 2003).

Among the weaknesses of qualitative research method includes:

- knowledge produced might not be generalizable to other people or other setting;
- it is difficult to make quantitative prediction; and
- the results are more easily influenced by the researchers' personal biases and idiosyncrasies (Patton 2002; Bryman 2001; Yin 2003).

E-Commerce Evaluation

In terms of evaluation, the literature pinpoints to scarce studies on websites quality evaluation from consumer perspective (Gamon et al. 2005; Lee et al. 2006). According to Fasanghari and Roudsari (2008), e-commerce websites evaluation with regards to consumers' perspective is still in the initial stages. Therefore, there is need to improve the evaluation of e-commerce websites with characteristics that cover the consumers' perspective. In line with this, e-commerce websites quality and consumers online shopping characteristics are discussed below.

E-commerce Websites Quality

Ethier et al. (2006) classified research on websites quality concept into four major research categories: (1) the information quality, system quality, and services quality (Chuan-Chuan et al. 200; Liu & Arnett 2000); (2) websites functionalities such as

design, response time, content (Evans & King 1999; Bauer & Scharl 2000); (3) services quality which includes factors such as reliability, responsiveness, assurance, and tangibility (Cox & Dale 2002; Cai & Jun 2003); and (4) user perception of quality; websites quality based on information, responsiveness, reliability, and friendliness (Wan 2000).

Consumer Online Shopping Characteristics

The consumer characteristics that have impacted on the adoption of information technology and needed to be consider in e-commerce evaluation include individual characteristics (personality, lifestyle, attitude); environmental (culture, image, attention); product/service (tangibility, intangibility, type, price); medium (usability, efficiency, navigability); and online merchant and intermediary (service quality, privacy).

Figure 2 illustrates the theoretical framework diagrammatically.

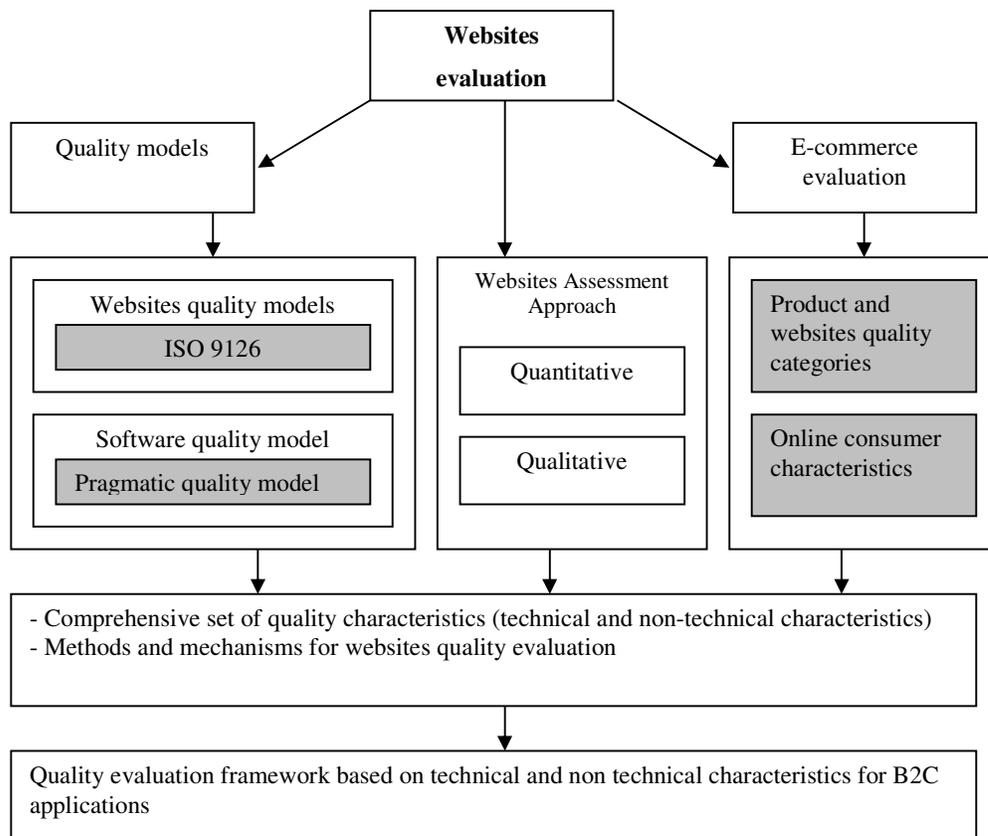


Figure 2 Theoretical Framework

CONCLUSION

This paper presented the theoretical framework which underpins this study. The discussion revolves around common models for quality evaluation, specifically, software quality models and websites quality models. Discussion between quantitative research methods and qualitative research methods were also presented. Furthermore the strengths and weaknesses of each have been

highlighted. This is followed by a discussion of e-commerce websites quality. Finally, the categories of quality and the consumer behavior are presented.

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