

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

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ABSTRACT

The study produces an e-commerce quality and evaluation (ECQE) framework based on consumer perspectives. It was conducted in four main phases that include: 1) theoretical study; 2) empirical study; 3) e-commerce quality and evaluation framework construction and development, and 4) confirmation study. The ECQE framework includes four components: quality factors that deal with user expectation and satisfaction; assessment entity, assessment specification, and quality level. The framework was tested on six e-commerce websites. Results show that the ECQE framework is applicable and realistic. The ECQE framework offers a guidance and standard procedure for e-commerce website quality evaluation that can be used to improve organization websites to meet the consumers need and to keep the organization competitive and sustainable.

ABSTRAK

Kajian ini menghasilkan sebuah kerangka kerja kualiti dan penilaian e-dagang yang berasaskan perspektif pelanggan. Ia dijalankan dalam empat fasa termasuk: 1) kajian teori; 2) kajian empirik; 3) pembinaan rangka kerja penilaian kualiti e-dagang, dan (4) kajian pengesahan. Rangka kerja ECQE mempunyai empat komponen: faktor kualiti yang berasaskan kepuasan pengguna; entiti penilaian, spesifikasi penilaian dan aras kualiti. Kerangka kerja ini telah diuji ke atas enam laman web e-dagang. Keputusan menunjukkan bahawa kerangka kerja ECQE ini adalah bersesuaian dan realistik. Kerangka kerja ECQE menawarkan bimbingan dan prosedur standard penilaian kualiti untuk laman web e-dagang yang boleh digunakan untuk meningkatkan laman web organisasi dalam memenuhi keperluan pengguna dan memastikan organisasi yang berdaya saing dan mapan.

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1 INTRODUCTION

1.1 Background

Nowadays, the technological advances of the twenty first century have led to significant increase in Internet using for commercial purposes (Kraemer, 2006) and Web technology is transforming all business into information-based activities. Many organizations are moving from the traditional way of doing business to the electronic way to be more competitive and sustainable (Miranda et al., 2006; Liu et al., 2007).

Since, the development of the first commercial website in 1994, e-commerce has grown rapidly. E-commerce is considered one of the most important contributions of the information technology revolution (Smith & Rupp, 2003). It is predicted that e-commerce usage shall increase rapidly during the next years. Laudon and Traver (2008) supported this theory and they also predicted in the near future all commerce business shall be e-commerce business by the 2050. Many companies have begun to focus on e-commerce website construction in improving their strategic planning activities (Liu & Hu, 2008). This is also in line with the fact that through online purchasing the number of Internet users is possible to be constantly increased (Bai et al., 2008; Wang and Zhou, 2009). In addition, the consumers are no longer bound or loyal to specific times or specific locations if they want to shop but they can purchase whatever products or services virtually at anytime and from any place. In other words, online shopping is the process used by the consumer when he/she decides to shop via the Internet from anywhere and at anytime.

Every Internet user is considered a potential consumer for companies providing online sales. Therefore, Tang and Tung (2009) emphasized that organizations and

companies are really eager to succeed in their promotions and sales over the Internet and provide the best picture of the high quality of their products, with the aim of reaching more consumers and meet expectations. This in turn affects the gain and profitability of the companies.

In general, 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 (Sun & Wang, 2003). In other words, e-commerce means exchanging goods and services on the Internet as on-line shopping (El-Aleem, El-Wahed, Ismail, & Torkey, 2005). Indeed, e-commerce is considered one of the best methods for buying and selling products, services, and information electronically. Besides, e-commerce is also considered one of the factors affecting the way payment is made. As stated by Focazio (2001) and Madu and Madu (2002), company interactive communication channel classified for four main types of e-commerce which are:

- i. Business to Business (B2B) refers to online transaction conducted among business organizations.
- ii. Business to Consumer (B2C) refers to the transactions that conduct between business and consumers via electronic way.
- iii. Consumer to Business (C2B) refers to consumers selling their goods or services to business on online ways.
- iv. Consumer to Consumer (C2C) involves the online interaction conducted among consumers.

According to Kingston (2001), e-commerce is considered an excellent choice for companies to reach new customers, to help the companies to globalize, to allow

companies to know about their customers, and to build strong relationship between the customers and the companies. In general, 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; El-Aleem et al., 2005). Indeed, e-commerce is considered one of the best methods for buying and selling products, services, and information electronically. Therefore, many e-commerce websites have been established by companies to enhance the reputation and provide good services to the customers through the companies' websites.

Oppenheim and Ward (2006) claim that the increasing number of Internet users and the growth of technology surrounding the Internet are due to the change in consumer behaviour. Therefore, the consumers' factors must be known so that the companies are able to reach maximum numbers of consumers and raise the loyalty percentage for the companies. Also, the consumers' needs must be considered by the companies when strategizing their objectives. This motivated the companies to sell their products and services through their websites (Wang & Zhou, 2009). Understanding the consumer factors has become an important issue to evaluate the e-commerce websites from the consumer perspectives (Cheung et al., 2003). However, the literature indicates that measuring user satisfaction is a complex task. Furthermore, determining the factors that enhance users' attitude toward companies' websites is critical (Ahn et al., 2007) due to many factors that affect consumer satisfaction from e-commerce websites, as well as consumers' point of view, must be considered (Zviran et al., 2006; Bai et al., 2008).

As highlighted by Albuquerque and Belchior (2002) and Tian (2004), failure of the dot.com companies occurs when the behavior of the websites deviates from user expectations or if the websites neglect consumers' needs. Besides, it was reported that more than seventy five percent of dot.com companies do not last longer than two years (Kearny, 2001, Paynter et al., 2002; Albuquerque &Belchior, 2002; Irani and Love, 2002; Nataraj and Lee, 2002; Thornton & Marche, 2003). So, e-commerce websites evaluation becomes an important issue in the last few years because of some reasons which are:

- Many e-commerce websites have a short life because they don't meet the minimal software quality requirement (Irani and Love, 2002).
- To discover the absent feature or requirements poorly implemented in e-commerce websites (Tan & Tung, 2009).
- A large percent of websites are in accessible from the user view points (Ahn, Ryu, & Han, 2007).
- Increasing concerns about the ways in which e-commerce websites are developed and the degree of quality delivered (Tan & Tung, 2009).

Apart from these reasons, the consumers' perspective is often ignored in website evaluation (Zhang et al., 2011; Loiacono et al., 2002; Cheung et al., 2003;Gamon et al., 2005; Lee et al., 2006; Yahaya et al., 2008; Wang & Zhou, 2009). In addition, many researchers linked this failure to the neglecting of consumers' needs (Rosen and Purinton, 2004; Gamon et al., 2005; Joia and Olivera, 2005; Olivera and Joia, 2008; Lee and Kozar, 2006) or ignoring the consumers' element in their website development (Hausman&Siekpe, 2009). According to the above scenario, many e-commerce websites fail to help the companies to reach their objective (Kearney,

2001; Thornton et al., 2003; El-Aleem et al., 2005; Hausman, 2009; Tan et al., 2009). Therefore, the consumer factors must be taken into account in e-commerce website development to ensure the success and quality of e-commerce websites to meet the consumers' expectations.

1.2 Research Objective

This study aims to construct an e-commerce quality and evaluation framework based on user perspectives. In order to achieve this aim, the following specific objectives have been identified:

- i. To investigate and identify quality attributes for e-commerce evaluation.
- ii. To enhance the Pragmatic Quality Factor (PQF) model based on e-commerce evaluation attributes.
- iii. To design the architecture of e-commerce quality and evaluation attributes measures and metrics.
- iv. To validate the enhanced framework using selected e-commerce websites.

1.3 Research Scope

The study focused on e-commerce websites and was conducted through survey to investigate the current practice towards quality development on Jordanian e-commerce websites in terms of degree of satisfaction, online buying habits of e-commerce consumers, obstacles and constraints surrounded e-commerce websites, and factors that consumers consider when evaluating e-commerce websites. Since consumers are considered the key success factor for sustaining e-commerce implementation, the study was conducted to obtain e-commerce quality attributes based on consumers' perspectives.

1.4 Significance of the Study

There are several benefits in accomplishing this study that can be summarized as the following:

- i. The proposed framework will contribute a notion to body of knowledge in e-commerce quality and evaluation.
- ii. The study had identified e commerce quality attribute that can be used by the software practitioners as guidelines in developing an effective and efficient e-commerce websites which able to meet consumers' expectations. Furthermore, since e-commerce website evaluation is complex and still immature, findings from this study may be used as reference to conduct effective evaluation. Apart from that the findings also useful for other researchers to improvise the e-commerce website evaluation.

1.5 Research Methodology

In order to solve the identified problems and achieved the research objectives, the methodology used in this study was divided into four phases as shown in Figure 1:

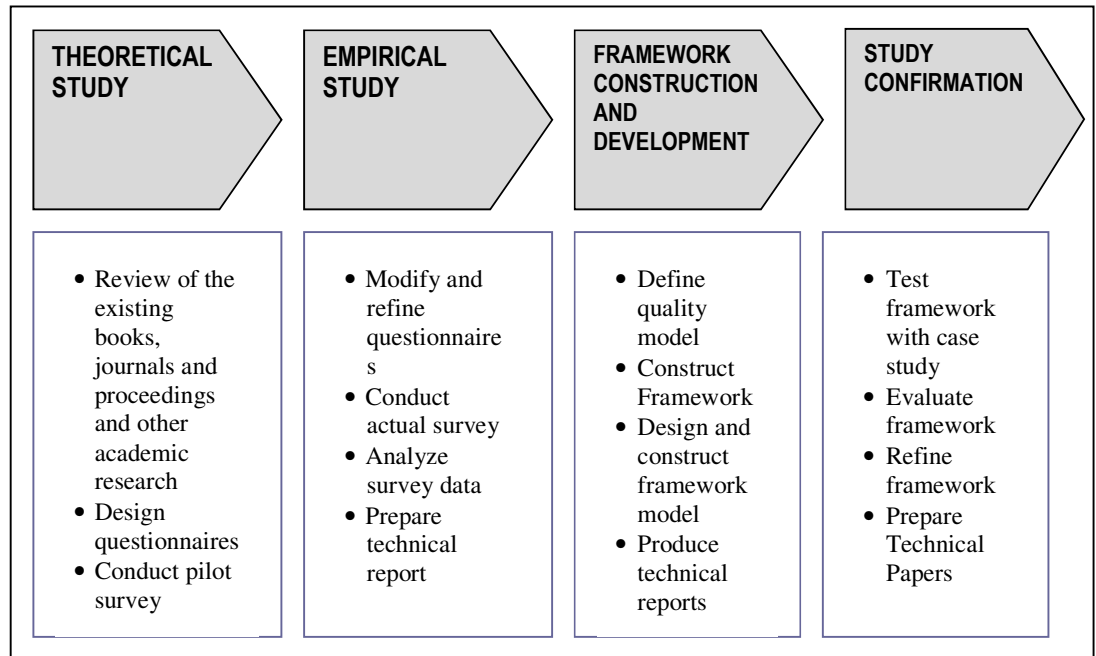


Figure 1 – Research Methodology

i. Theoretical Study

The first essential phase of the research begins with the literature review on the existing research in the area of software and 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. 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.

ii. Empirical study

The aim of this phase is to investigate the existing mechanism and problems related to implementation of e-commerce applications. The research project will conduct a survey to obtain inputs from various sectors. This is also known as requirements-design-implementation strategies to ensure that it meet the needs of several different interest groups in the industry. The survey technique was chosen as it has been known to be suitable for a descriptive study. The survey was conducted in Jordanian firms that aim to describe the current practices of website's development and describe the online buying habits of Jordanian consumers. In addition, this technique is suitable for a study that seeks to answer questions related to "what" or "how many/much" (Yin, 1994). Analysis from this phase will give an input to the following phase of this research.

iii. E-Commerce Quality and Evaluation Framework Construction and Development

Finding from previous studies indicate that this problem occurs because of ignorance of consumer needs in their websites development. Based on findings from the literature and empirical study, the framework for e-commerce quality and evaluation is constructed. The proposed framework consists of the attributes of quality based on users' perspective that includes user expectation and satisfaction toward quality e-commerce application. The framework can be used for improving organization websites to meet the consumers need and to keep the organization competitive and sustainable.

iv. 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 e-commerce 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.

2 LITERATURE REVIEW

There are several quality evaluation models that were previously developed. This chapter presents and discusses some significant models related to software quality and websites quality. The aim of the discussion is to show the strengths and weaknesses of the models and identify factors that were used as guidelines to ensure the quality of software or an application (Tian, J. 2004).

2.1 Software Quality Models

There are several software quality models and these models can be classified into two categories, hierarchical models and non-hierarchical models (Behkamal et al. 2009). The following section discusses seven popular hierarchy models (General Electric Model, Boehm, FURPS, ISO 9126, Dromey, Systemic, and Pragmatic Quality Model) and two non-hierarchical models (Bayesian Belief Networks, and Star Model).

2.1.1 *The General Electric's Model*

The General Electric Models, also known as the McCall's model was developed in 1977 by the US Air force Electronic System Division (ESD) to improve the quality of software products and include measurable factors. Out of fifty-five quality factors investigated, eleven factors and 23 quality criteria were selected. The quality factors were efficiency, integrity, reliability, usability, accuracy, maintainability, testability, flexibility, interface facility, re-usability, and transferability and can be measured using software metrics. See

Figure 2 below. The model was meant for measuring final products, and the quality factors were identified from users' point of view. McCall's model identifies three areas of software work, which are: 1) Product Operation which refers to

understandability of the product, product efficiency, and capability to provide the result required by the user (Correctness, Integrity, Reliability, Usability, Efficiency); 2) Production Revision which is related to an ability to handle change and error correction (Maintainability, Flexibility, Testability); 3) Product Transition which is related to the ability to work in different environments, and the effort needed to change the environment (Portability, Reusability, Interoperability). According to Milicic (2005), this model considers the relationship between the users and developers who focuses on the external quality measured by the users and the internal quality that is measured by developers who also assess this relationship. The weakness of the model is that not all the metrics used in the model can be measured objectively (Tawfik et al., 2007; Behkamal et al., 2009). Some of the metrics such as tractability is not meaningful or definable at an early stage for users. This model did not apply the criteria outlined in the IEEE standard and focuses on the quality of the end product (Cote et al., 2006 and did not take the functionality aspect into consideration (Ortega et al., 2002).

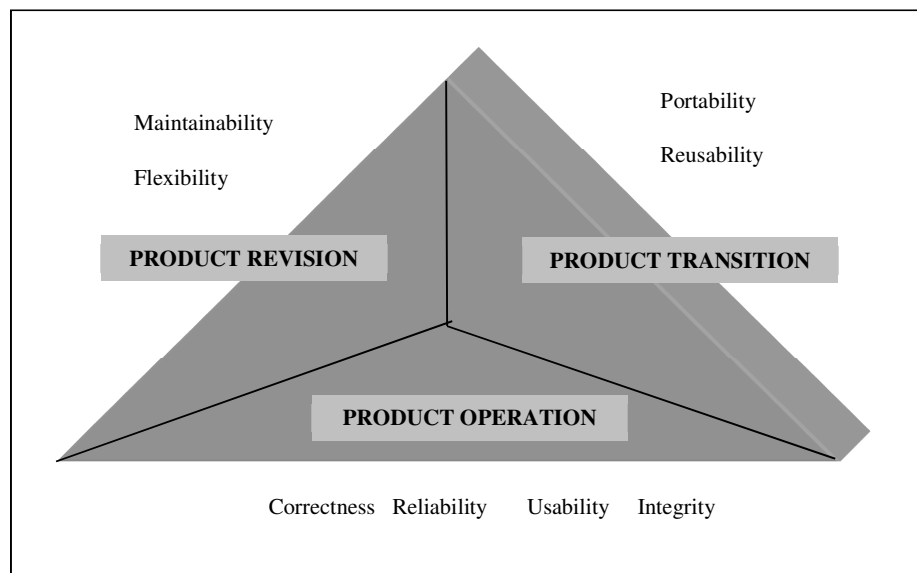


Figure 2 - McCall's Software Quality Factors (adopted Pressman (2001))

2.1.2 The Boehm Model

The Boehm model was developed in 1978 to satisfy the needs of users, testers, designers and maintainers (Figure 3). The model comprised of seven factors that were placed under three levels: portability, reliability, efficiency, human engineering, testability, understandability, and modifiability. In total 15, measures were used to score the factors.

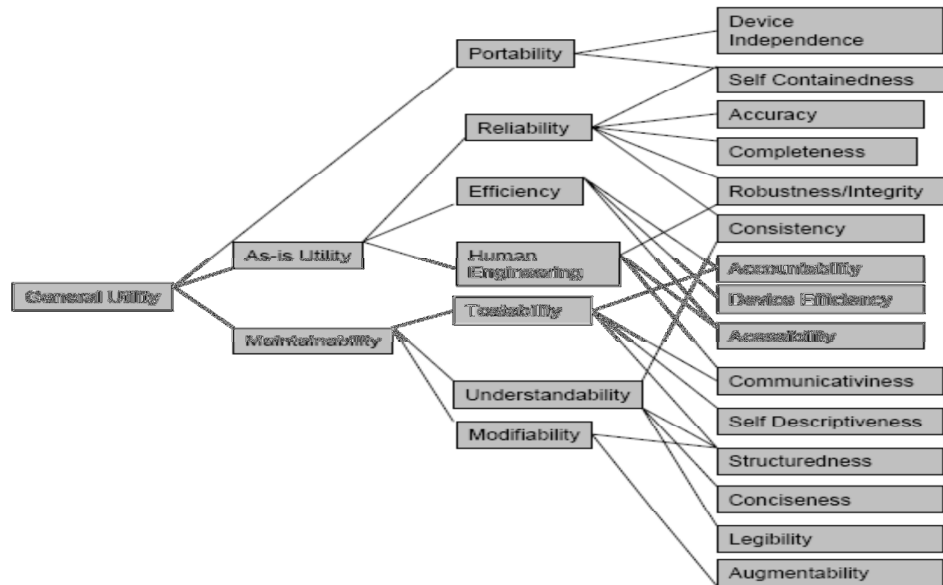


Figure 3 - Boehm's Software Quality Characteristics (adopted from Milicic (2005)).

The major contribution of this model is the inclusion of characteristics related to hardware performance, which are not available in the previous models. However, Boehm did not suggest measuring the quality characteristics (Milicic, 2005; Tawfik et al., 2007) and emphasized on the product perspectives of quality (Cote et al., 2006).

2.1.3 The FURPS Model

The FURPS Model, proposed by Robert Grady and Hewlett-Packard consisted of two groups of requirements, functional and non-functional. Functional requirements are requirements based on input and expected output, while non-functional requirements are based on usability, reliability, performance, and supportability characteristics. The model is used to assess product requirement and product quality. Functionality includes security, capabilities and feature sets. Usability consists of user documentation, consistency in the user interface, human factors, wizards and agents, and aesthetics. Reliability covers aspects such as recoverability, predictability, accuracy, and frequency and severity of failure, while, performance includes conditions on functional requirements such as speed, efficiency, availability, accuracy, recovery time, resource usage throughput, and response time. Supportability includes testability, extensibility, maintainability, compatibility, configurability, adaptability, serviceability, installability, and localizability (or internationalization). This model did not include portability, which is considered one of the important characteristics of a software product (Ortega et al., 2002).

2.1.4 The ISO 9126 Standard Quality Model

The ISO 9126 standard quality model was developed based on McCall and Boehm models to define the software quality based on a set of product characteristics. ISO/IEC 9126 classifies software quality into four parts (Ortega et al., 2002; 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 among the other approaches to quality. The second part is ISO/IEC 9126-2 (ISO/IEC, 2003a) which defines a set of external measures and 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, explains on how the product was developed. The internal quality determines the external quality. Part four is ISO/IEC 9126-4 (ISO/IEC, 2001b) is a user's view of quality and states a set of quality-in-use measures (Bevan, 1999).

The model measures quality in terms of six characteristics: functionality, reliability, usability, effectiveness, maintainability and portability (see Figure 4). Each characteristic is decomposed into a set of sub-characteristics supported by relevant aspects of the software. Functionality covers essential functions that the software product provides and the related sub-characteristics are suitability, accuracy, interoperability, compliance, and security. Reliability consists of a set of attributes related to the ability of the system to maintain its services in a defined time under known conditions. The sub-characteristics are maturity, recoverability, compliance and fault tolerance. Usability is the set of attributes related to the ability to understand and use the system. The related sub-characteristics are learnability, understandability, compliance and operability. Efficiency is a set of attributes that provide the

relationship between the software performance and its resources, under stated conditions. The sub-characteristics related to these are time behavior, resource behavior and compliance. Maintainability is a set of attributes that recover the error and fix a fault. The characteristics related to this factor are stability, analyzability, changeability, compliance and testability. Portability consists of a set of attributes that can adapt to environment change, and can work in different environments. The sub-characteristics are installability, replaceability, conformance and adaptability.

The main contribution of this model is the breakdown of the concept of quality. This model decomposed the quality characteristics into sub-characteristics that are more concrete and measurable. It also supports all perspectives of quality and defines both external and internal characteristics obtained by end users (Tawfik et al., 2007).

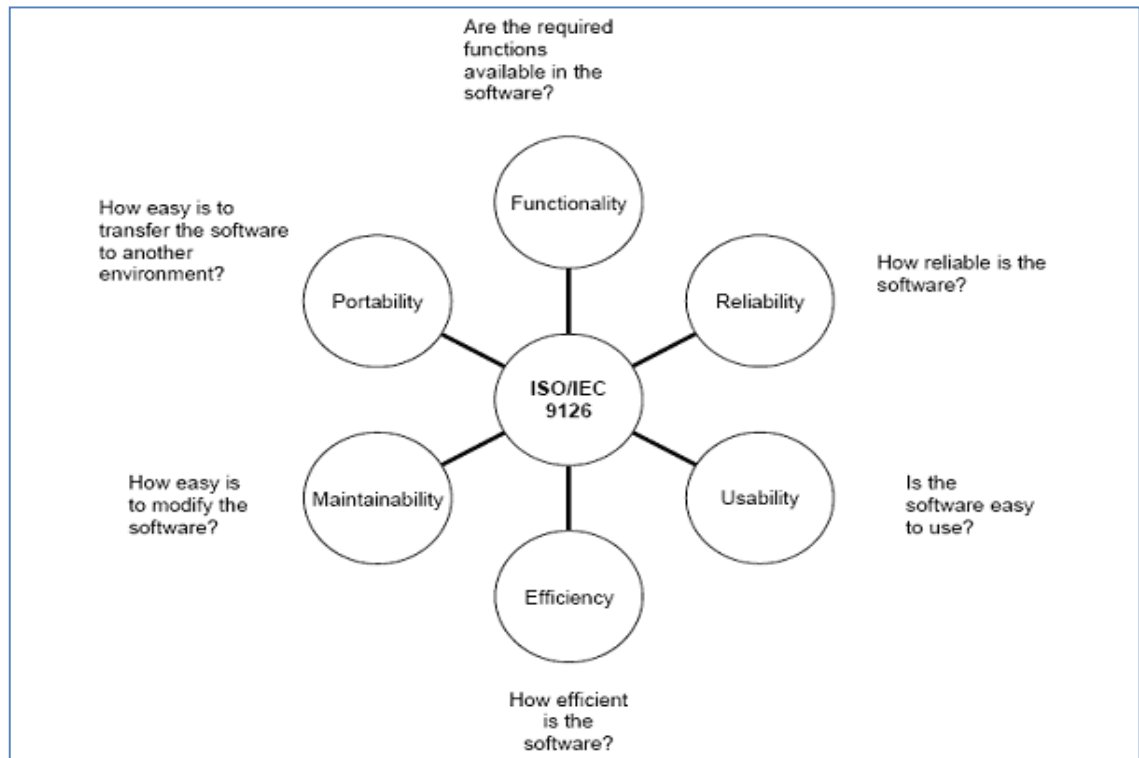


Figure 4 - ISO 9126 Model (adopted from Pressman (2001))

2.1.5 The Dromey Model

The Dromey model was proposed to clarify the relationship between characteristics and sub-characteristics of the quality, and the model attempted to identify characteristics that affect the quality characteristics (Dromey, 1998; Ortega et al., 2002). Characteristics such as functionality and maintainability cannot be measured in a direct way and cannot be built into the system. Therefore, identifying a set of properties that represent the complete set of product properties and providing high-quality characteristics can solve this problem. In other words, the high level quality characteristics cannot be measured in direct way or be built into the system. Alternatively, these characteristics can be built into the system by recovering them with a complete set of properties that represent those characteristics and providing high quality level characteristics. Dromey's model attempted to connect tangible product properties and intangible quality characteristics by focusing on the relationship between quality characteristics and sub-characteristics (see Figure 5). The link between tangible product properties and intangible quality characteristics must be established. According to the above, Dromey's model consisted of three principle elements of constructs with causal linkages among them, which are: - 1- a set of components; 2- a set of high level quality characteristics; 3- a set of tangible, quality-carrying properties of components. This construction gave his model the ability to be more powerful and dynamic from any hierarchical decomposition of other quality models such as ISO/IEC 9126 (Ortega et al. 2002), also, making it applicable to different systems. This model added two quality characteristics on the ISO 9126 model which are process maturity, which was not considered in previous models and reusability. It consisted of eight level quality characteristics, i.e. Functionality,

Maintainability, Reliability, Portability, Usability, Reusability, Efficiency, and Process Maturity. However, Dromey's model does not take the efficiency character of the software into consideration to determine the quality of software. Furthermore, it just emphasizes product perspectives of quality to determine other perspectives (Cote et al. 2006).

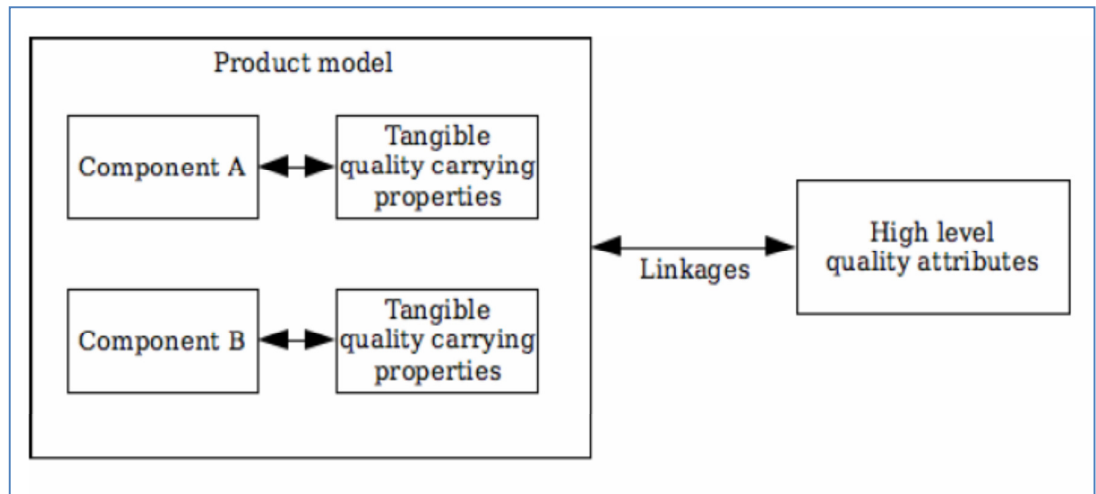


Figure 5 - Dormeys Model (adopted from Cote et al. (2006))

2.1.6 Systemic Quality Model

In 2003, the Systemic Quality Model was proposed, focusing on quality of product, and based on Callaos and Callaos (1996) concepts regarding product efficiency and effectiveness. There is a similarity in concept between the products' characteristics in this model and definition of efficiency and effectiveness in the Callaos' model. Moreover, Systemic Quality Model considers the relationship between three aspects, which are product-process, efficiency, effectiveness and user-customer to achieve the global systemic quality (Ortega et al. 2002; Rincon et al. 2005); whereas, the hierarchical structure is not used here and is the same as the previous model. ISO 9126 characteristics are presented by systemic quality model and divided into two

dimensions, which are Product Effectiveness and Efficiency to represent the software product quality (see Figure 6). Basically, the balance between the efficiency and effectiveness is important to conclude the special care for products. In addition, the process dimension must be incorporated and take the various characteristics needed into consideration to achieve the systematic quality evaluation (Ortega et al. 2002). However, this model does not cover the user requirements and conformant aspects.

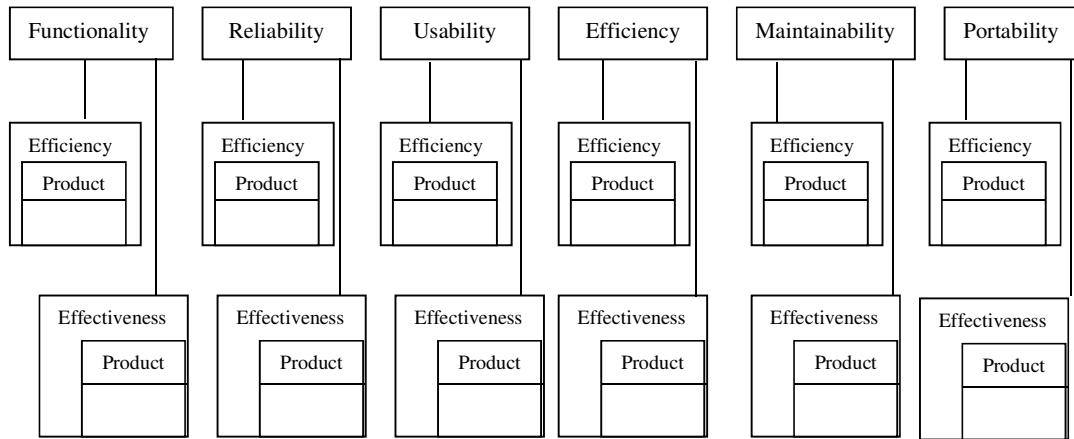


Figure 6 - Elements of the Systemic Quality Model for Software Products (adopted from Ortega et al. (2003))

2.1.7 Pragmatic Quality Model (PQM)

In 2007, PQM was proposed to assess the software product for certification process, which describes the relationships between attribute (un-measurable) and measurable metrics. It consists of four components: behavioral characteristics, impact characteristics, responsibility, and weight. The characteristics were decomposed into sub-characteristics (attribute) and metrics, which make the measurement suitable and understandable. Behavioral characteristics are derived from ISO 9126 with an integrity aspects added, which make the model include efficiency, functionality, maintainability, portability, reliability, integrity, and usability. In the age of hackers

and firewalls, the importance of the integrity aspects has increased. This attribute measures the ability to with-stand attack on its security that comprises of program, data and document. It covers threat and security aspects. Previous studies have indicated the importance of integrity in software quality attributes (Yahaya et al. 2006). These characteristics are defined as external quality in used or the behavioural characteristics of software quality.

The second component refers to human aspects, which are user perception and user requirements. It explains the impact of the product on the users. The impact characteristics help the model to keep the balance between the technical and the non-technical characteristics. It includes popularity, performance, trustworthiness, law and regulation, recommendation, environmental adaptability, satisfaction and user acceptance. Each of these characteristics is broken down into sub-characteristics, and then decomposed into metrics that made the measurement easy.

The third component in this model is the responsibility or interviewee. It is the person who has the responsibility to conduct the certification exercise. It is also named as the interviewee in this model. The PQM has identified specific interviewee to be responsible in giving the assessment score of each metrics. The scale of metrics was from 1 that means unacceptable to 5 excellent.

The fourth component in this model is the weight where each metrics has its own weight. The weighting factors defined in PQM is based on findings from the previous survey (Yahaya et al. 2008). Attributes are classified into three distinct classifications

namely low, moderate and high. The attributes are sorted into these classifications according to the calculated weight score. The classifications are shown in Table 1.

Table 1 - Classifications of attributes and its weight factor (adopted from Yahaya and Deraman (2010))

Levels	Attributes	Weight Factor
Low	Flexibility Intraoperability Interoperability Portability Survivability	1-4
Moderate	Safety Efficiency Maintainability Usability	5-7
High	Functionality Reliability Integrity	8-10

The main contribution of this model is it provides opportunity and gives priority or contribution of quality attributes to reflect the business requirement, which makes it practical for different types of applications. It includes behavioral characteristics and impact characteristics. Behavioral characteristics deal with technical aspects, higher level of quality characteristics and how the software behaves in the environment. Impact characteristic covers human aspects (non-technical aspect) of software (user's perspectives), which it not covered in the previous models. In addition, this model decomposes the characteristics into sub-characteristics which in turn decomposed to metrics.

The earliest models of quality such as McCall, Boehm, FRUPS, Dromey, and ISO are limited in measuring the external software characteristics such as reliability,

maintainability, portability, and functionality, which do not consider others necessities needs such as user expectation and user requirements and needs (Yahaya and Deraman 2010). Software quality that focusses more on customer satisfaction and software correctness is not sufficient to be declared as good quality without user satisfaction (Denning 1992). PQM model includes these requirements with impact characteristics that cover the human aspects. Therefore, according to above discussion PQM model will be chosen as the baseline model to develop quality evaluation framework based on consumer's perspectives for e-commerce websites.

2.2 Other Software Quality Models

As mentioned before, software quality models can be classified to into two categories; hierarchical models and non-hierarchical models. The following section discusses the non-hierarchical software quality models Bayesian Belief Networks, and Star quality Model.

2.2.1 Bayesian Belief Networks

The Bayesian Belief Networks (BBN) quality model was proposed in 1985. It is represented by direct acyclic graph consisting of nodes and arrows in which the node and arrows represent discrete random variables and the cause-effect relationship between the nodes respectively to define software development (see Figure 7 below). Each node in Bayesian Belief Networks contains the probabilities of each potential output; this is presented by a conditional probability table, in terms of combination between the possibility of input and output state. This combination gives this model

the ability to learn their prior probabilities for the different possible input and output sets.

Moreover, Bayesian Belief Networks also provide a mathematical way to measure the weight for each probability in both directions, which makes it an attractive way to represent the software quality. This universal structure gives the companies and organization the ability to choose the best state that meets the company's objectives and consumers' needs since it interacts directly with human users (Neil et al. 2000). It cannot be used for software product evaluation because the lack of criteria (Behkamal et al. 2009).

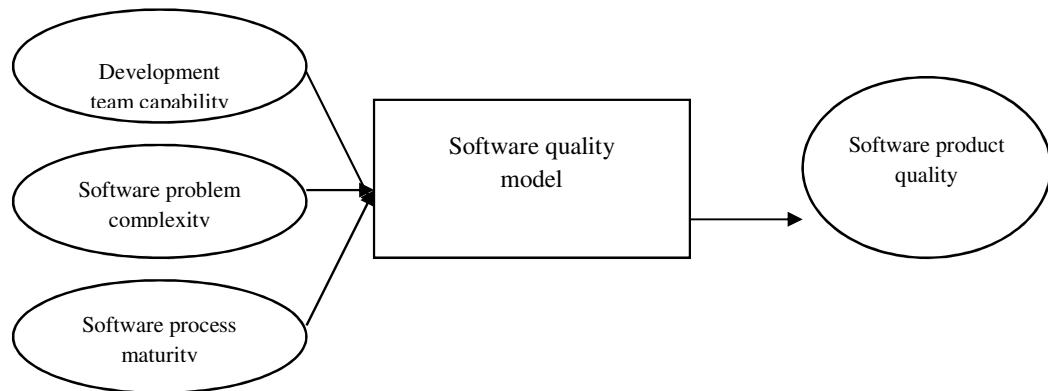


Figure 7 – BBN Software Quality Model (adopted from Fitzpatrick (1996))

2.2.2 Star Model

Star model presents different perspectives for software quality based on Acquirer and Supplier that is defined by ISO/IEC 12207 in 1995. This model discussed three important elements which are: Procurer or Acquirer, Producer or Supplier, and Product (Figure 8 presents the star model).

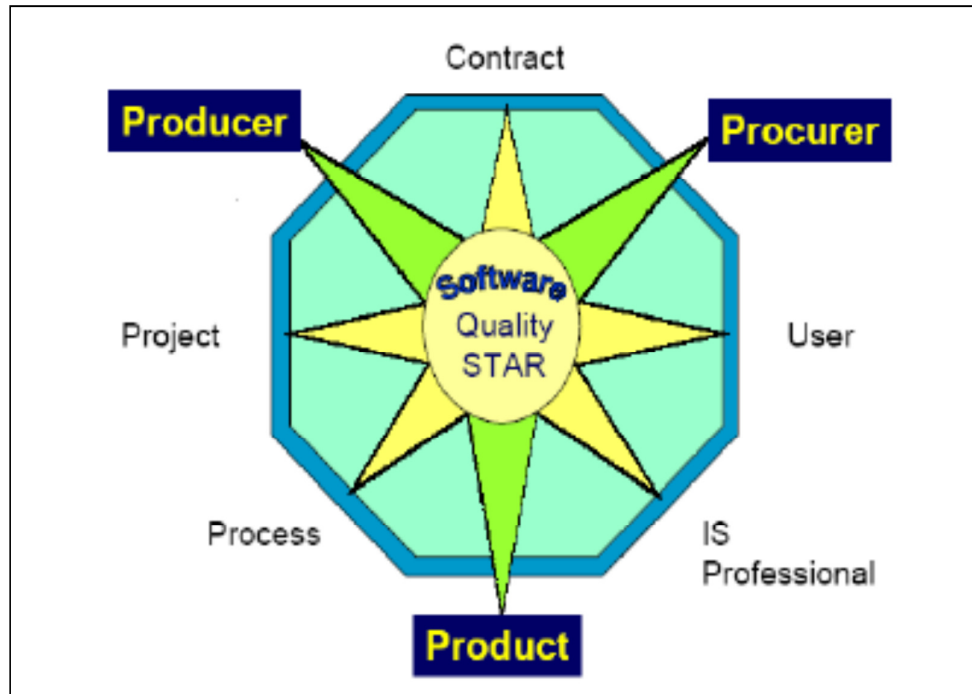


Figure 8 - Software Quality Star (adopted from Fitzpatrick (1996))

The contract in this model specifies the quality characteristics of the product clearly; where the procurer perspective on the producer organization is ensuring that the organization will use the optimal or best project management technique to show the quality for the product; and about the perspective of procurer of the product to ensure that the product is satisfactory and acceptable by the users and can be maintained and serviced by the professional users in their environment (Fitzpatrick 1996).

However, it did not present standard characteristics to measure the quality. Therefore, it is unsuitable to be used for software product evaluation because of the lack of criteria (Behkamal et al. 2009).

2.3 Discussion on Software Quality Models

Table 2 shows the characteristics of the previous software quality models. Each of these models measures the quality of the software products from various dimensions with distinct characteristics. Analysis from these quality models has demonstrated that there is different quality characteristics associated with different models. The main quality characteristics found in the majority of the models are: efficiency, reliability, usability, portability, functionality, and maintainability that appear in more recent models and are considered essential and vital.

Table 2 - Quality characteristics in previous software quality models (adopted from Yahaya and Deraman (2008))

Quality characteristics/ software quality models	McCall (1976)	Boehm (1978)	FURPS (1987)	ISO 9126 (1991)	Dromey (2003)	Systemic (2003)	PQM (2007)
Testability	*	*					
Correctness	*						
Efficiency	*	*	*	*	*	*	*
Understandability		*			*		
Reliability	*	*	*	*	*	*	*
Flexibility	*						
Functionality			*	*	*	*	*
Human engineering		*					
Integrity	*					*	*
interoperability	*						
Process maturity					*		
Maintainability	*	*	*	*	*	*	*
Changeability		*					
Portability	*	*		*	*	*	*
Reusability	*			*			
Usability			*	*		*	*
Performance	*		*				
User conformity							*

In conclusion, there is no comprehensive set of evaluation characteristics to measure the quality of the software products. In addition, lack of user perspectives characteristics in the previous model should also be mentioned. In terms of websites quality models, there is scarcity of comprehensive set of evaluation index system (Chen et al. 2005). Furthermore, there is a lack of a comprehensive set of criteria for

developing effective e-commerce websites (Tan et al. 2009). Moreover, most of these models are based on subjective view rather than objective view to measure the quality of the websites, which makes the measurement biased.

2.4 Websites Quality Models

Rapid growth and use of the web during the last decade have made the web a rich ground for research activities. Since the web is a new medium for business interaction, and other areas such as infrastructure, services, and products, organizations and suppliers are searching for the most effective way to communicate with potential customers, motivate consumers to browse their sites or purchase their products and services, and establish relations with customers to get their loyalty and trust in order to keep them self-sustainable and competitive. The websites are considered the best way or entry point to achieve these goals in a modern environment. Websites play a tangible role in our daily lives. It is obvious that websites represent an issue of considerable importance to firms. Therefore, significant attention should be focused on the quality and evaluation of e-commerce websites. Any attempt to assess the quality of a website requires a quality model. Positive quality perceived by consumers is difficult to achieve. As a result, a quality model should not neglect external, internal, or quality-in-use characteristics (Biscoglio 2006). In response, companies have to assess the quality of their websites regularly to know the potential problems, and the quality needed by the consumers (Tan and Tung 2009). The following part 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 used to evaluate the websites.

2.4.1 The Sectorial Indices Model, RUR

This model which was proposed in 2000 to evaluate the civic nets and the local telematic services focuses on features, elements, websites possession, interactivity of sites, content, services distribution, websites accessibility, and technological competence. Six sectorial indices were used to evaluate the websites. These indices were chosen according to their presence and the articulation of various services, which are: - 1) Administrative Transparency, clear understandability in the management of the offices. 2) Quality of the services, concern with the affirmation of an interactive dimension of the public services. 3) Access and interactivity, which mean the accessibility of the websites or the facility that provides access to information with an interactive procedure. 4) Interactions and relationality, concerned with the popularity of the sites and the effort taken by the administration to build connections between these sites. 5) Territorial marketing: the region is considered the primary factor for development; regional economies are in competition to attract resources and investments. 6) Technological quality: to cope with the evolution (RUR 2001). However, this model neglected the user perspective in the evaluation of the websites. These six sectorial indices have been chosen according to their presence in articulation and dynamic web, as these features may change with time.

2.4.2 Website Quality Features Model

The Expanded Website Quality Model was proposed by Ping Zhang and Gisela von Dran in 2001 to evaluate the websites from users' satisfaction perspective based on

Kano's Model. Kano's model took three levels to define consumer expectations for product and service quality, which are: Basic level, Performance level, and Exciting level. Moreover, this model indicates two important variables playing a significant role in changing the perception of quality: time variable and imitation by others, with these two factors moving into normal expectation for the user. In this model, websites can be defined into three types of quality simultaneously with consumers' expectations: 1- Basic features, support expected users' needs; 2- Performance Features supply the performance quality of the Website; 3- Exciting Features, which enchant the user to get his/her or her or her loyalty and satisfaction. This model is defined into seventy four features in the web environment; for each feature, the average score is calculated, and the weight is considered. These features are divided into three groups to examine the feature from a three-quality perspective (Zhang & von 2001). The Expanded Website Quality Model allows designers to identify the features such as performance and basic features that provide the companies sustainability and preconditions for consumer satisfaction. However, this model is not effective to attract new consumers (Zhang & von 2001; Biscoglio 2006). It seemed that consumer characteristic is lacking in this model. Thus, this model looks less attractive. In another word, it does not have the characteristics that contribute to reach new consumers.

2.4.3 Pentagon Quality Model, Censis

This model is defined in research on the Public Administration Websites Evaluation in 2001. Based on ARPA method (Analysis of the Public Administrations Nets), thirty two Ministries and other Public Corporations websites have been analyzed,

measuring sixty three indicators relating to diverse aspects such as technical characteristics, functionalities, contents and available services. Since these indicators refer to different dimensions, they used parametric analysis to group the homogeneous value and come up with five thematic indices that can cover analytically all the characteristics for the various websites and measure the value of these websites in terms of qualitative correspondence. The value given to these websites according to the five thematic indices are: 1. Accessibility - the ability of the websites to make its services and contents achievable to all; 2. Usability - the understandability and ease of use and navigation; 3. Institutional Characterization - the recognizability of the organization's website and recognition of the nature of the site by users; 4. Administrative Transparency - the rule and constraints on the information, for the organization and the public; 5. Availability of the Services - interaction among public corporations is possible. Additionally, the total websites quality can be determined through the average of the five thematic indices (Biscoglio 2007). These five thematic indices are insufficient to cover all technical and non-technical characteristics used to measure the quality of the websites in several dimensions. Furthermore, this model focuses on Public Administration Websites.

2.4.4 Model 2QCV3Q or 7-loci

The 2QCV3Q model was developed by Mich et al. (2003), as part of a research project called “Applications of IT to analyze the tourism sector” financed by the DISA, University of Trento. This model gets its name from the initials of the Ciceronian loci of classical rhetoric for searching for the possibility of applying a requirements analysis of the quality model in the development of the websites.

Moreover, it is based on classical rhetoric, which is used to determine the completeness of a given description combined with “5W+H” formula or five Wh-questions, which are “who, what, why, when, where” and one “H” which represent “HOW”. This model allows identifying the main websites dimension, since it is a general structure of the quality model and has been built independently from website under analysis.

The 7-loci dimensions are: Identity, Content, Individuation, Maintenance, Usability, and Feasibility. The theorists of the 7-loci model emphasize the need to establish the level which is needed to analyze the characteristics of the website by adopting a quality model for websites evaluation. The characteristics of the 7-loci model are:

- Scalability: the evaluation must be taken from various degrees, based on the evaluation’s purpose, the user’s needs, and the supporter’s requirements.
- Domain independence: meta-model has to be applicable in different segments.
- General purpose - depends on the purpose or type of corporation or individual, or for electronic commerce or education.
- User-friendly - applicable for people with different skills.

Moreover, it can be used in the prototyping, specifically in the initial phase of an evaluation process, to support "quality requirements" identification (Mich et al., 2003). However, this model focused on the image of the organization and was introduced for marketing purposes, mainly in the tourist environment.

2.4.5 *Minerva Model*

This model proposed in 2003 by Minerva group gets its name from Ministerial NETwoRk for Valorising Activities in Digitisation; and is concerned with cultural websites such as museums, cultural institutions, and libraries. This model has two objectives: the first is to represent the quality characteristics from the dimension of cultural sites on the web, and to support the mechanism for designing and developing cultural websites. Therefore, Minerva's model observed the following criteria which are another important initiative for websites quality:

- Transparency (decrease user confusion and uncertainty)
- Effectiveness (the content must be relevant, homogeneous, related, and correct and the user must be able to navigate the site easily)
- Maintenance and update (the content must be up to date)
- Accessibility (the website has to be accessible to all users. Regardless of the technology that they use, including navigation, content, and interactive elements)
- User-centered (take the needs of users and the feedback into consideration in responding to evaluation)
- Responsive (contacting the site and receiving an appropriate reply by the users must be allowed within the site, and the interaction and information sharing between the site and the user effectively must be allowed too).
- Multi-lingual (to provide sites with access in more than one language)
- Interoperable (website must be committed and flexible to be interoperable within cultural networks to help users to allocate the content and services that meet their needs)

- Managed (website must be managed to obey and follow the law, and respect legal issues such as privacy and clearly state the conditions on which the Website and its contents may be used)
- Preserved (the website and content must be preserved for long time, this can be done by adopting strategies and standards for preserved insurance) (Minerva, 2003).

However, this model is aimed at cultural websites such as museums, libraries without giving the attention to e-commerce websites whereas research on commercial websites or e-commerce websites should cover the cultural websites.

2.4.6 The Heptagon Quality Websites Model

The Heptagon quality model was purposed to evaluate the Municipalities of the Province of Milan website in 2003. This model takes the general quality of a Public Administration Website into consideration through explaining three main dimensions and seven factors of quality which are 1) technical dimension which includes accessibility and usability. 2) Communicative dimension which includes Communicative Style and Graphical System 3) Institutional dimension which includes Wealth of the Contents, Service Valences, and Bi – directionality. From measuring the value of the seven factors and taking the weight of these factors into consideration, this model can be displayed as a graph having zero centers and the factor taking value from zero to ten around the center to express the distance between the reached quality and the ideal quality (Mich et al. 2003).

2.4.7 The Analytic Website Quality Model

This model is based on ENTOTEAM model and is considered an evolution of it. It was proposed for educational purposes by Polillo in 2004, to help students in college courses to be trained by the person responsible to develop global ability of critical analysis. It can be used to achieve an in-depth evaluation of the websites. Furthermore, it can be helpful for performing a quick check-up of a website in order to find the most important areas which need improvement. The main advantage of the Polillo's model is that it is based on a vision of the website development and website management process. Therefore, defining the websites objective is very important and necessary in this model. Seven factors called Macro-characteristics have been taken to estimate the quality of the websites which are: Informative architecture of the site, Communication, Functionality, Contents, Management, Accessibility, and Usability.

For suitable websites quality evaluation, all characteristics are decomposed to sub-characteristics; each of these characteristics represent value (from 0 = very bad to 4 = very good) to display the quality site profile through a star diagram. According to the objective of the site, the characteristics and sub-characteristics will take different value because it represents different importance for websites evaluation. However, this model focuses on the external quality and quality-in-use and did not take the internal quality into consideration (Polillo, 2004).

2.4.8 Berkeley Model

In 2004, University of California, Berkeley, recommends two ways for web pages evaluation: Techniques to apply and Questions to Ask. These techniques help to find what we need to know about web pages, by asking a series of questions, which help to decide whether the web pages can be trusted or not, such as: 1) Last update for the web page; 2) Look for related links, and find what type they are; 3) The publisher of the page; 4) Look for information on the webpage on “About Us” link; 5) look at page that evaluates its content and has good reputation; 6) lookup for author’s name in search engine. 7) Be careful to be a victim. 8) Be sure about the sources of your information.

2.4.9 A Comprehensive Model for Websites Quality

This model was proposed by O. Signore in 2005 and called the comprehensive model for websites quality to identify user perceived characteristics, and relate these characteristics to the internal code features for identifying weak points and proceeding with focused user tests. This model considered the limitation of current quality evaluation approach. Different approaches defined general criteria, and did not consider a specific type of sites. It is widely known that difference must be taken into account between sites when measuring the characteristics; the criteria are mainly qualitative. Moreover, some characteristics are often considered more than once, and many evaluation criteria are biased to usability and accessibility, or overlap between them; the perception of quality now focuses on defining metrics instead of different user perspectives.

This model provides five dimensions or measurement criteria connected to internal and external qualities, which are:

- Correctness - considers the internal and external aspects that can be measured by several tools,
- Presentation - such as page layout, link presentation, text presentation, and multimedia presentation,
- Content - considers the readability; related to information architecture and structure (last update to content).
- Navigation - considers the navigation bar, the site structure and the kind of navigation (horizontal, vertical, mixed navigation).
- Interaction - considers the transparency, recovery and help criteria (Signore 2005).

However, they concentrated on the technical aspect that can be measured, neglecting other features, treating them as less important.

2.4.10 Websites Assessment Index Model

Miranda proposed a model for websites evaluation in 2006 and called it “website assessment index model” (see Figure 9). He took four characteristics - accessibility, speed, navigability and site content to evaluate the potential private websites of Spanish e-banking. He evaluated the accessibility by counting the number of hits on the website and linking popularity to indicate the success of the websites, and presence of search engines. The second character, speed, was assessed by a chronometer in ideal environment (the tests were carried at the same hour with the

same computer (AMD-K6 processor, with 64MB of RAM, 4 MB graphics card) equipped with a 56kbps modem connected by an ordinary phone land line, because there are many factors affecting the evaluation such as hardware and connection hour. Furthermore, he assessed navigability - the third character by two factors. Permanent site menu provided the users fast access to different web pages from every page, and keyword search function, for more suitable search for the items within the company home pages. Additionally, he considered three sets of factors to assess the content of the websites using a binary yes or no scales which are informational factors, transactional factors, and communicational factors. The main contribution of this model is allowing the managers and researchers to compare 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 focused on the managers' and researchers' perspective and did not take the users' perspective into consideration (Miranda et al., 2006).

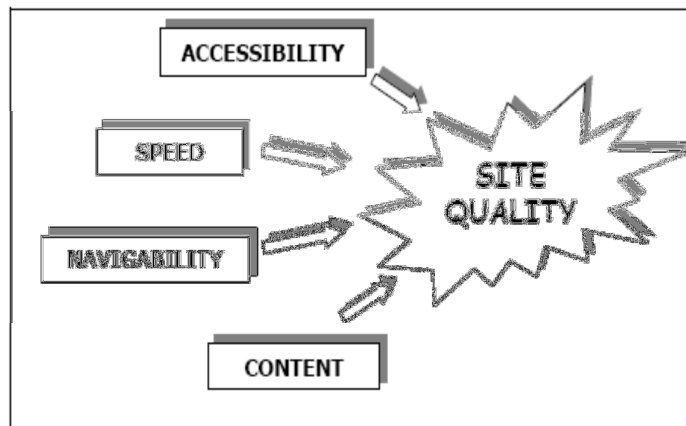


Figure 9 - Websites Assessment Index Model (adopted from Miranda et al. 2006)

2.4.11 The Standard ISO / IEC 9126 model

ISO/IEC 9126-1 model defines the characteristics of software quality and the metrics for quality evaluation. Derived from the McCall and Boehm models, this model was developed in 1992, and the second version was released in 2001. This model composed of four parts:

1. The model of the characteristics and sub-characteristics of software quality (ISO / IEC 9126- 1 Computer Software Engineering Product Quality – Part 1: Quality model, 2001)
2. The metrics for the measure of the external quality (ISO / IEC TR 9126-2, 2003)
3. The metrics for the measure of the internal quality (ISO / IEC TR 9126-3, 2003)
4. The metrics for the measure of the quality in use (ISO / IEC TR 9126-4, 2004).

This model defines six characteristics and twenty one sub-characteristics to evaluate the External and Internal quality of the software. The six characteristics are: Functionality, Usability, Reliability, Efficiency, Maintainability, and Portability. The description of each of these characteristics is explained in the following:-

1. **Functionality** - The capability the software to provide functions which meet stated and implied needs when the software is used under specified condition. The capability of the system to offer services in different environments on specific conditions. The following sub-attributes are suitability, accuracy, interoperability, compliance, and security.

2. **Reliability** – The extent to which software can be expected to perform its intended function with required precision. The ability of a software to perform its required functions under stated conditions for a specified time. The associated sub-attributes are maturity, fault tolerance, and recoverability.
3. **Usability** - the ability of the software to be understood and easy to use. The sub-attributes associated with usability are understandability, learnability and operability.
4. **Efficiency** – The extent to which the software is able to do more with less system (hardware, operating system, communication, etc.) resources. The ability to accomplish a job with minimum time and effort. The associated sub-attributes are time behavior and resource behavior.
5. **Maintainability** - the ability to modify the software. Ease of effort for locating and fixing a software failure within a specified time period. This factor is made up of four sub-attributes, analyzability, changeability, stability and testability.
6. **Portability** - the ability of the system to work in different environments. Ease of effort to transfer software from one hardware configuration and/or software system environment to another. Portability has four sub attributes which are adaptability, installability, conformance and replaceability.

Whereas, the quality-in-use is evaluated by four characteristics that represent the user point of view of the software: Effectiveness, Productivity, Safety and Satisfaction. Effectiveness is the ability of the system to help the users to reach their objectives with accuracy and completeness; productivity is the ability of the system to support the users with resources to achieve their objective efficiently; safety is the ability of the system to support the users to achieve their objective with minimum risk;

satisfaction is the ability to provide and support the users' activities in a fixed context of use. ISO 9126 model can be used as a practical approach for defining quality and the questionnaire based method (Hendriks et al. 2000). It has been invented since 1992 and today, it is still being accepted and used in researches that deal with software quality (Adnan & Bassem 2006; Cote et al. 2004). There are many researches done that investigated software assessment and quality using the ISO/IEC 9126 model as their guidelines in the assessment (Torchiano et al. 2002; Cote et al. 2005; Adnan and Bassem 2000; Behkamal et al. 2009).

The characteristics of the ISO 9126 model defined are suitable to every kind of software, including computer programs. Moreover, it is providing consistent expressions for software product quality. ISO/IEC 9126-1 provides a framework for making trade-offs between software product capabilities. As discussed before, the ISO 9126 model looks more complete than other quality models. The characteristics of the ISO 9126 model are: hierarchical structure, comprehensive expressions and terms, simple and accurate definitions, having criteria for evaluation, and has one-to-many relationships between various layers of the model (characteristics, sub-characteristics, and metrics) which makes it more comprehensive than other quality models (Behkamal et al. 2009). 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, the ISO 9126 quality model is a well-known model and has been used widely in researches and industries all over the world. The ISO 9126 model is a general quality model for any software product, but it needs some customization and enhancement for a particular case (Boegh 2006; Bertoa, Troya & Vallecillo 2006;

Behkamal et al. 2009). Therefore, the ISO model will be chosen as the baseline model to develop a quality evaluation framework for e-commerce applications based on consumers' perspectives.

2.5 Discussion on Websites Quality Models

A good mechanism for controlling the quality of a website is the use of metrics. It is easy to find many web metrics in current literature but, until now, there is no guideline for web metrics use. This situation makes the using of the defined metrics difficult and dangerous (Calero et al. 2005). In literature, there are many models that discuss the websites quality in different dimensions through various characteristics. However, several evaluation models fail to take user characteristics in their websites development, and this has led to failure of their websites to achieve companies' objectives (Olivera & Joia 2005; Joia & Olivera 2008). Moreover, these models are unscientific due to the evaluation and the weights for the characteristics being mostly considered from one view, which is a subjective view (Wang 2009). Websites evaluation must discuss important elements such as: categories, factors, weights, assessment model, and how to rank these factors in a standard way. However, the literature indicates scarce researches that discuss complete set of evaluation index system aiming at the quality of the business-to- consumers' websites (Chen et al. 2005).

According to Bai et al. (2008), there is an urgent need to understand the use of the websites from online consumer behavior. Nevertheless, many research on the websites evaluation area signifies a lack of consumers' point of view or consumer

perspective (Schubert & Dettling 2001; Loiacono et al. 2002; Gamon et al. 2005; Yahaya et al. 2008). Since the web is a dynamic medium which means the characteristics related to this medium are altering with time (Zhang & von Dran 2001; Hausman & Siekpe 2009), finding the characteristics on online consumer behavior is very difficult and a critical issue (Biscoglio et al. 2007). In conclusion, continuous refinement of these characteristics is extremely needed (Joia & Olivera 2008). Moreover, most e-commerce websites measure the quality of the websites from one view, which is subjective, thus, making the measurement of the quality very difficult and not understandable.

According to the above scenario and the discussion for each websites quality model, there is a lack of standard models for e-commerce websites evaluation. In addition, no guidance and standard mechanism was used to evaluate the quality of the e-commerce websites previously.

2.6 Websites Assessment Approach

There are many approaches to evaluate websites. In general, two approaches are widely known: quantitative and qualitative. In this proposal, the quantitative and qualitative approaches are studied and discussed.

2.6.1 Quantitative Research Methods

Quantitative methods can be defined as methods that use mathematical and statistical techniques to analyze data. It's based on measurable data gathered from a broad range of sources, often followed by objective analysis (Punch 2005). It has been found that several quantitative methods have been used in evaluating e-commerce websites. For example, Olsina and Rossi (2002) and Olsina and Rossi (2000) 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. Such a method was also used by Miranda, Cortés and Barriuso (2006) to evaluate product quality.

Another method known as Analytic Hierarchy Process (AHP), developed first by Satty in 1971 was used to solve the scarce resources allocation and planning needs for the military. AHP later became one of the most widely used tools for making decisions based on multi-criteria. In addition, Grey Analysis method (GA) was used to measure the distance between the set of every evaluation object's scores and the set of the best score of each criterion, and to choose the object whose distance is the shortest to be the best website. It found that this method gave near value of evaluation as indicated by Deng (1982), Fang-fang and Yi-jun (2006). Another important method was Data Envelopment Analysis (DEA) which was used to evaluate multi-criterion problems and improve the efficiencies. According to El-Aleem, El-Wahed, Ismail, and Torkey (2005), DEA is a powerful quantitative and analytical method for measuring and evaluating performance.

At the level of measuring websites effectiveness, Miranda, Cortés, and Barriuso (2006) developed a method known as Web Assessment Index (WAI) and used in turn by Marincas (2007) for evaluation. Fuzzy Technique for Order Preference by Similarity (FTOPSIS) which was developed by Fasanghari and Roudsari (2008) is another example of methods to evaluate websites based on user preference. Furthermore, Depth, as suggested by Sartzetaki, Psaromiligkos, Retalis and Avgeriou and Sutcliffe (2002) is an approach that performed a scenario-based heuristic usability evaluation for e-commerce sites. The Microsoft Usability Guidelines (MUG) was another method used to evaluate the website usability.

In Jinling and Huan's point of view (2007), MUG contains five categories: content, ease of use, promotion, made-for-the-medium and emotion. Other methods of websites evaluation were Eye Tracking (ET), Original Web Assessment (OWA) and Web Assessment method (WAM). ET used user's eye movements as the basis for analysis as stated by Tzanidou, Minocha, and Petre, (2005). OWA used a set of criteria to evaluate the quality and success of existing e-commerce applications. The method focused on three areas namely customer satisfaction, success in implementing the offer of products, and how services are considered with reference to the specific features of the electronic medium. WAM, on the other hand, examined three classic transaction phases of electronic markets. Schubert (2002) named them as: information, agreement and settlement. Where other researchers like Liu and Hu (2008), Liu, Kwon, and Kang (2007) used questionnaire to collect data Table 3 summarized the past methods used in quantitative evaluation.

Table 3 - Past researches on quantitative methods.

Research number	Author (year)	Method	Characteristics studied	Remark
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 detected 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, modality 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)	usability, reliability, and cost	The order from the best websites to the worst websites is presented.
11	Chu Fang-fang, LI Yi-jun (2005)	Concordance Analysis (CA)	usability, reliability, and cost	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	usability of websites.	Identifies that easy-to-measure are important.

		criteria)		
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 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)		usability, reliability, and cost	Presented the ranking of websites from best to worst. However could not know the absolute value of each website.
20	Petra Schubert,	original Web	ease of use,	Most web sites

	Uwe Leimstoll, (2001)	Assessment (WA) method	usefulness, trust category	were far from fully meeting user expectations
21	Adriano Bessa Albuquerque, Arnaldo Dias Belchior (2001)	Questionnaire	usability, conceptual reliability, presentation reliability.	All factors obtained a good final evaluation, however, security and integrity obtained the best score.
22	Yi-wen Liu*, Young-jik Kwon, Byeong-do Kang (2007)		technique, design, information, services.	The approach is applicable as an evaluation technique for e-commerce websites.
23	Mehdi Fasanghari and Farzad Habibipour Roudsari (2008)		customer satisfaction and expectation.	Evaluation method creates suitable results and the evaluation could be done as well as possible.
24	Mehdi Fasanghari, Navid Gholamy ,S.Kamal Chaharsooghi, Shohre Qadami ,Mohammad Soltani delgosha (2008)		satisfaction degree.	The evaluation method creates suitable results, and the degree of satisfaction and expectation are closely related.
25	Chu Fang-fang, Li Yi-jun (2005)		usability, reliability of the websites, the cost of using the websites.	The order of websites from best to worst is presented.
26	M. Sartzetaki, Y. Psaromiligkos, S. Retalis, P. Avgeriou (2003)		existence, user satisfaction, easy of use, and/or usefulness,	Provide information on quantitative and qualitative

			functionality, usability.	evaluations.
27	Adriano Bessa Albuquerque, Amaldo Dias Belchior (2002)		usability, conceptual reliability, representation reliability.	Evaluate each sub factors of quality. The sub factors are then rated according to its importance. The domain used was e-commerce website application.
28	Alistair Sutcliffe (2002)		attractiveness and usability, design.	Capture users' ratings for the variables used. Found that designers have little guidance for creating attractive user interfaces.
29	Chang Jinling, Guan Huan (2007)		content, ease of use, promotion, made-for-the-medium and emotion.	Investigate the importance of variables used from user point of view. Found the rating was different from one user to another.
30	Petra Schubert, Walter Dettling, (2002)		performance.	Comparison of the performances of two companies (SwissAir and Amazon.com) based on offers given by each company.

2.6.2 Strengths of Quantitative Research Methods

Strengths of quantitative research methods include: testing and validating already constructed theories about how and why phenomena occur, testing hypotheses, which are constructed before the data is collected, can generalise research findings when the data is based on random samples of sufficient size, can generalise research findings when it has been replicated on many different populations and subpopulations, useful for obtaining data that allows quantitative predictions to be made, the researcher may construct a situation that eliminates the confounding influence of many variables, can allow one to more credibly establish a cause-and-effect relationships, data collection using some quantitative methods is relatively quick, provides precise, quantitative, and numeric data; data analysis is relatively less time consuming (using statistical software); the research results are relatively independent of the researcher; it may have higher credibility with many people in power, and it is useful for studying a large number of people (Blaxter et al. 1996; Neuman 2003; Morse 2003; Creswell 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; Neuman 2003; Morse 2003; Creswell 2003).

2.6.3 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's based on individual, often subjective analysis (Punch 2005). In the case of qualitative methods, Marincas (2007) stated that Zadeh initiated the fuzzy set theory, and Bellman presented some applications of fuzzy theories to the various decision-making processes in a fuzzy environment. In fact, Fuzzy theory is widely applicable in information gathering, modeling, analysis, optimization, control, decision making and supervision. It is used in support of linguistic variables and there is uncertainty in the problem. Moreover, the Extended Web Assessment Method (EWAM) was built based on WAM, Technology and Acceptance Model and several alternative approaches. Fuzzy Analytic Hierarchy Process (FAHP) approach, as proposed by Liu, Kwon and Kang (2007), was used to evaluate e-commerce websites based on vagueness and uncertainty of judgment. However, most researchers used common qualitative method such as interviews. Researchers like Miranda, Cortés, and Barriuso (2006), Albuquerque and Belchior, (2002) did so. Case study was used by Li, Sun, and Wang (2005), Kingston (2001), El-Aleem, El-Wahed, Ismail and Torkey (2005), Ventura (2007), Jinling (2005), and Albuquerque and Belchior (2002). Table 4 summarizes the past methods used in qualitative evaluation.

Table 4 - Past researches on qualitative methods.

Research number	Author (year)	Method	Characteristics studied	Remark
1	Yi-wen Liu, Young-jik Kwon, Byeong-do Kang (2007)	Interview	Website basic technique, web page design, website information/content, website function/service.	Case study which shows that judgments on the website characteristics of all decision makers are consistent and can be accepted.
2	Ekaterini Tzanidou,		expectations and preferences from e-commerce sites.	Investigate how the users' previous experiences with Internet / e-commerce

	Shailey Minocha, Marian Petre, (2005)			websites and their preferences and expectations of e-commerce-interaction influence their eye movement.
3	Petra Schubert, Walter Dettling (2002)	Extended Web Assessment Method (EWAM)	electronic markets and transaction phases, information technology / media-inherent characteristics, performance marketing.	Used EWAM together with TAM to evaluate websites quantitatively and qualitatively.
4	Alistair Sutcliffe (2002)	Observation	users' errors when navigating websites; expert style.	Found that most of users' make errors when navigating websites
5	Mehdi Fasanghari, Navid Gholamy, S. Kamal Chaharsooghi, Shohre Qadami, Mohamad Soltani Delgosha (2008)		customer satisfaction. attractiveness	Most of observed user problems could be identified by expert inspection using heuristics. From the case study it was found that only two heuristics attracted adverse comments: judgment of symmetry and depth of field.
6	Adriano Bessa Albuquerque, Amaldo Dias Belchior (2002)		usability, conceptual reliability, representation reliability.	Investigate the appropriateness of factors used for measuring websites.
7	Mehdi Fasanghari, Navid Gholamy, S. Kamal Chaharsooghi, Shohre Qadami, Mohamad Soltani Delgosha(2008)		product, service, network system, payment	Found product, service, network system, and payment could be used for evaluation of websites.

2.6.4 Strengths and Weaknesses of Qualitative Research Methods

Strengths and weaknesses of qualitative research methods include: data based on the participants' own categories of meaning, useful for studying a limited number of cases in depth, useful for describing complex phenomena, provide individual case information, can conduct cross-case comparison and analysis, provide understanding and description of peoples' personal experiences of phenomena, can describe phenomena as they are situated and embedded in local contexts, the researcher almost always identifies contextual and setting factors as they relate to the phenomena of interest, the researcher can study dynamic processes, the researcher can use primarily qualitative method of grounded theory to inductively generate tentative but explanatory theory about a phenomena, can determine how participants' interpret constructs, data is usually collected under naturalistic settings in qualitative research, qualitative approaches are especially responsive to local situation, conditions, and stakeholders' need, qualitative researchers are especially responsive to changes that occur during the conduct of a study and may shift the focus themselves to exploring how and why a phenomena occurs, researchers can use an important case to vividly demonstrate a phenomena to the readers of a report, and determine idiographic causation (i.e., determination of causes of a particular event) (Blaxter et al. 1996; Yin 2003).

Weaknesses of qualitative research methods include: knowledge produced might not be generalizable to other people or other setting (i.e. finding might be unique to the relatively few people included in the research study); it is difficult to make quantitative prediction; it is more difficult to test hypotheses and theories with large participant pools; it might have lower credibility with some administrators and

commissioners of programs; it generally takes more time to collect data when compared to quantitative research methods, data analysis is often time consuming, and the results are more easily influenced by the researchers' personal biases and idiosyncrasies (Patton 2002; Seidman 1991; Creswell 2003; Bryman 2001; Yin 2003; Neuman 2003).

2.6.5 Discussion on Websites Assessment Approach

It has been found that several quantitative and qualitative methods have been used in evaluating e-commerce websites. They studied the e-commerce websites from various dimensions and several characteristics. Each researcher used different characteristics from the other. Sometimes, an overlap occurs between the characteristics. However, according to qualitative and quantitative research methods used to evaluate, e-commerce websites in Table 3 and Table 4, there is no standard mechanism to evaluate the e-commerce websites. In other words, there is no guidance to evaluate e-commerce websites. However, standard attributes are needed to measure e-commerce websites. Moreover, e-commerce websites companies really need guidance to evaluate their websites.

2.7 E-commerce Evaluation

Web technology has transformed all business into information-based activities. Many organizations have moved from the traditional way to an electronic way to keep themselves competitive and sustainable (Miranda et al. 2006; Liu et al. 2007). This has created a paradigm shift in the traditional way people shop. A customer is no

longer bound to opening times or specific locations; he can purchase products or services virtually at any time and from anywhere they want. The Internet is a relatively new medium for communication and for information exchange that has become present in our everyday life. The number of Internet users is constantly increasing, which also signifies that online purchasing is increasing (Joines et al. 2003). Oppenheim & Ward (2006) explained the rapid increase in the growth of the use of broadband technology combined with a change in customer behavior.

Online shopping is the process consumers go through when they decide to shop on the Internet. The Internet has developed into a "new" distribution channel (Hollensen 2004), and the evolution of this channel has been identified by Smith and Rupp (2003) to be the most significant contribution of the information revolution. E-commerce means exchanging the services or products or information via the Internet. So, E-commerce is considered the best way for the companies to reach new consumers.

Using the Internet to shop online has become one of the primary reasons to use the Internet, combined with searching for products and finding information about them (Joiness et al. 2003). No doubt, the Internet has developed into a highly competitive market, where the competition between the companies over the consumers is fierce. In order to have an impact on consumers, in a competitive market, the first step is to identify convincing and influencing aspects when purchasing online, which are regarded as factors. An assessment of these factors could expose that an e-commerce direction is the way to establish better business opportunities for the companies and to take a considered competitive advantage in the market space (St-Pierre 2001).

However, many websites fail to help companies to reach their objectives because they do not take the quality of their websites into account in websites development (Kearney 2001; Thornton et al. 2003; El-Aleem et al. 2005; Lee et al. 2006; Hausman 2009; Tan et al. 2009; Husain et al., 2009). To help the development of quality of these sites, the characteristics of the quality of this domain must be determined and identified. In addition, since the web is a dynamic medium, the characteristics related to this medium are altering with time (Zhang & von Dran 2001; Hausman & Siekpe 2009), thus, making finding the characteristics on online consumer behavior very difficult and critical (Biscoglio et al. 2007). In conclusion, the continuous refining of these characteristics is extremely needed (Joia & Olivera 2008).

Companies realized that the quality of their websites is a very important issue in order to keep them self competitive and sustainable as web technology has transformed the business from a traditional way to an electronic way (Husain et al. 2009). Therefore, there are urgent needs for quality evaluation models to determine if the application conforms to requirement. An evaluation Results from these models can help to identify the problem area, in accurate quality prediction, which in turn helps to improve quality products, control and manage the project, improve the development process (Tian 2004). However, several evaluation models fail to take user characteristics into account in their websites development (Olivera & Joia 2005; Joia & Olivera 2008). In terms of evaluation, the literature pinpoints to scarce studies on websites quality evaluation from consumer perspective, which means the consumers perspective in the websites evaluation is ignored (Loiacono et al. 2002; Cheung et al. 2003; Gamon et al. 2005; Lee et al. 2006; Wang & Zhou 2009). According to Fasanghari & Roudsari (2008), e-commerce websites evaluation with regards to

consumers' perspective is still in the initial stages. Therefore, there is a need to improve the evaluation of e-commerce websites with characteristics that cover the consumers' perspective.

In line with the above scenario, two sections must be discussed: firstly, the quality of the websites, and secondly, the consumers who interact with these sites and consider the key success factors for those sites in order to cover the needed area for this research.

2.7.1 E-Commerce Websites Quality

Milicic (2005) and Cote et al. (2006) defined the quality as the ability of the product and services to provide consumer satisfaction and meet the consumers' expectations. According to Ethier et al. (2006), the research on websites quality concept can be classified into four major research categories. The first considered that the information quality, system quality, and service quality were the main and critical components of the websites quality (Chuan-Chuan et al. 200; Liu & Arnett 2000; Moon & Kim 2001; Cao et al. 2005; Ahn et al. 2007). The second is concerned with websites functionalities such as design, response time, content (Evans & King 1999; Bauer & Scharl 2000; Huizingh 2000). The third included researches that present services quality as a fundamental aspect for websites quality and included factors such as reliability, responsiveness, assurance, and tangibility (Cox & Dale 2002; Cai & Jun 2003; Webb & Webb 2004). The fourth category focused on the user perception of quality; websites quality based on information, responsiveness, reliability, and friendliness (Wan 2000). Websites have to meet the consumer's expectations in terms

of information, enjoyment, and transactions (Katerattanakul 2002; Huang 2005). However, huge numbers of websites were developed without taking the quality of the websites into consideration (McGovern et al. 2002; Thornton and Marche 2003; Lau 2006; Allahawiah and Altarawne 2009). The following section will present the first category of websites quality.

2.7.1.1 System Quality

System quality is defined for the period of the system analysis and development, depending on the consumers' needs. System quality is considered one of the important factors that affects consumers' satisfaction of the web. Thus, factors such as technical adequacy, delay, security, appearance, and navigability, are considered important characteristics that affect the quality of the system (Ahn et al. 2007). A system with high level of quality will grant the convenience, privacy, and faster responses for the consumers. Liao and Cheung (2001) present the impact of the system capability on the usefulness and perceived ease of use of websites. Koufaris (2003) showed that using mechanisms for search may provide the consumers the feeling of enjoyment and fulfillment. On the other hand, other researchers have developed various measures of system quality like Swanson (1974), Emery (1971), and Hamilton (1981) whereby they included characteristics to measure the quality of the system. Swanson (1974) included reliability of the computer system, online response time, ease of terminal use and Emery (1971) included database content, aggregation of details, human factors, response time, and accuracy of the system. Whilst, Hamilton (1981) included response time, turnaround time, data accuracy and

currency, reliability, completeness, flexibility of the system, and ease of use as a part of formative evaluation.

2.7.1.2 Information Quality

At the phase of design and development of the system, various types of information are usually determined and some characteristics such as timeliness, reliability, and accuracy will be projected as a result of the system operation (Ahn et al. 2007). Raganathan & Ganapathy (2002), considered the content as one of the important characteristics to measure the quality of the information, and the character used the most to measure the quality of the information. Srinivasan (1985) measured the user-perceived effectiveness of the system by the content which in turn included accuracy of the information; relevancy of information, adequacy, and understandability of the contents. In addition, he argued the form of the content which included quality of format, timeliness of reports, sequencing of information, and mode of presentation.

Lederer et al. (2000) show that information quality and perceived usefulness had strong relationship. Also, Jarvenpaa and Todd (1996) showed that information with high level of clarity and visual appeal of the products or services may generate positive comment from the consumers. Also, high levels of information quality (variety, completeness, detailed, accurate, timely, relevant, and reliable) could provide the consumers with convenience, enjoyment, and better purchase decisions (Ahn et al. 2007). Koufaris (2003) decomposed the information into two groups, which are non-value-added and value-added for more enrichment and satisfying shopping information and showed this decomposition could be helpful and interesting.

2.7.1.3 Services Quality

For the service quality, numerous communication mechanisms are needed for accepting user complaints and their timely resolution within web-based projects. Furthermore, web-based project involves the perception of users for helping them to be more effective, and know the feedback, consider their suggestion for the product and services, and participants to solve the problems (Ahn et al. 2007).

Several researches considered measuring services quality are tangibles: responsiveness and reliability (Pitt et al. 1995; Myers et al. 1997). Myers (1997) argued the service quality importance between the end-user computing and the non-centered environments; and point to the danger if the information system researchers measure the quality without taking the service quality into consideration. In addition, Barnes and Vidgen (2001) built WEBQUAL model to measure service quality based on ten dimensions, which are aesthetics, navigationally, reliability, competence, responsiveness, accessibility, credibility, security, communication and understandability. They also presented the measurement concepts to the service quality for websites. However, a few studies have discussed service quality as success factors of websites, and there is an urgent need to consider other values of services from the consumer's perspective. This is because service quality plays an important role in online retailing (Ahn et al. 2007). Sun & Lin (2009) concluded that there are urgent needs to discover the characteristics of products that affect consumer e-shopping.

2.8 Consumers Online Shopping Characteristics

Online consumer shopping is the process of when, how, where, why and what the customers do or do not buy (products or services) (Jackson et al. 2006). It combined factors from psychology, sociology, social, anthropology and economics to try to understand the customer decision making process and needs.

The number of Internet users is constantly increasing, which also signifies that online purchasing is increasing (Joines et al. 2003; Bai et al. 2008; Wang & Zhou 2009), due to growth in the use of broadband technology combined with a change in consumer behavior (Oppenheim & Ward 2006). Each one of these users is considered a potential consumer for companies providing online sales. Because of rapidly increasing Internet usage and growth of technology surrounding the Internet, most companies are interested to sell their products and services through their websites for competition (Wang & Zhou 2009). This is because a consumer is the vital and the most responsible factor for the success of such organizations and companies. In other words, if these organizations and companies are really interested to succeed in their promotion and sale over the Internet, they must meet the consumers' needs. Therefore, understanding online consumer behavior on the websites is extremely needed (Bai et al. 2008). But, most websites were not developed to cater for the interaction between consumer and the websites (Joia & Olivera 2008), and without having clear knowledge of what factors contribute to achieve a high quality (Liu & Arnett 2000; Thornton & Marche 2003; Gebauer & Ginsburg 2003; Sun & Lin 2009).

According to Palmer (2003) and Wu et al. (2003), there is an urgent need to understand the online consumer's perception of more desirable websites to help the decision makers to develop high quality websites. Thornton & Marche (2003) and Gebauer & Ginsburg (2003) pointed out that the companies' decision makers have made huge investment in websites development without knowing the factors that contribute to developing websites with high quality. However, most websites were not developed to cater for the interaction between consumer and the websites, and there is scarce knowledge about consumer behavior on virtual environment (Joia and Oliveira 2008).

Oppenheim and Ward (2006) explained that the current primary reason people shop over the Internet is the convenience. Such a convenience is evident in the number of Internet users who is constantly increasing. This actually signifies that online purchasing is increasing (Joines et al. 2003), due to growth in the use of broadband technology combined with a change in customer behavior (Oppenheim & Ward 2006). Moreover, providing the consumer with purchasing characteristics as no other medium does, and the ability to use it any time and purchase products, visualize consumers' needs with products, discuss products with other consumers and creating competitive prices among companies (Joines et al. 2003), support the fact that the Internet and its consumer-related websites are considered massive software. According to Hoffman and Novak (1996), the time plays an important role in changing the relationship between the consumer and the company, due to the new possibilities that the Internet can offer to the consumers through the market space. Companies seek to increase the weight of their power without losing the quality or their control.

In order to get the consumer attention, promotion implementations that are aligned with the market plan of the organization are very important to develop the relationship between consumer and organization (Brondmo 2001). It is very important to facilitate the dialog between the consumers and organization to get the consumer attention regarding a consumer decision on which web to visit from various competition sites (Godin 2001). Goldsmith (2000) and Limayem et al. (2000) concluded that the personal innovativeness is the personality trait explaining the intention of the consumer's online purchasing. Moreover, the content must be attractive and highlighted to consumers (Lee & Turban 2001)). Jarvenpaa et al. (2000) found that the trust in an Internet store is the key attribute of online shopping.

As mentioned before, online consumer shopping behavior is a process of when, how, where, why and what the consumers do or do not buy (product or services) (Jackson et al. 2006). Many researchers suggested five main factors influencing consumers' Online shopping they are: Individual/consumer characteristics, Environmental influences, Product/service characteristics, Medium characteristics, and online merchant and intermediary characteristics (Iliu 2001; cheung et al. 2003; Cheung et al. 2005; Lin 2006), for trying to understand the consumer decision making process and needs, since, satisfactory understanding of consumer behavior will give returns of gain and profit for organizations. These factors will be discussed in the following sections.

Characteristics from users' aspect must be taken into consideration to meet the quality that the consumers expect and must be considered in the websites development (Joia

and Olivera 2008). Unfortunately, most of the e-commerce websites have been developed without considering the importance of the user's aspect (characteristics of the users) during the websites development (Joia and Olivera 2008). Also, these sites were developed without having clear knowledge of what factors contribute to achieve a high quality (Liu & Arnett 2000; Thornton & Marche 2003; Gebauer & Ginsburg 2003; Joia & Olivera 2008; Sun & Lin 2009). Generally, the literature pinpointed to scarcity of studies on websites quality evaluation from consumers' perspective, i.e. the consumers' perspective in the websites evaluation was ignored (Loiacono et al. 2002; Cheung et al. 2003; Gamon et al. 2005; Lee et al. 2006; Wang & Zhou 2009). In addition, several e-commerce evaluation models fail to take the users' characteristics into consideration in e-commerce websites development (Joia and Oliveira 2008). Therefore, the consumers' point of view must be considered in the websites development (Zviran et al. 2006; Bai et al. 2008).

2.8.1 Individual/Consumer Characteristics

Individual/consumer characteristics are considered one of the main important characteristics that had an impact on the adoption of information technology. These characteristics relate to other specific characteristics that cover the consumer characteristics' area such as:

Demographics characteristics which include personality, lifestyle, attitude, consumer resources, and the value, and consumer's psychological characteristics, which include trust, flow, and satisfaction, and behavioral characteristics, which include the characteristics that talk about the product information, frequency of usage, access

location, and duration; as well as motivation and experience characteristics (Cheung et al. 2003; Lin 2006).

2.8.2 Environmental Influences

According to Blackwell et al. (2001), environmental characteristics such as culture, image, attention, social influence, and peer influence play a significant role in affecting the decision purchasing process. Also, there is strong relationship between these characteristics and the characteristics of online consumer behavior (Cheung et al. 2003).

2.8.3 Product/Service Characteristics

Cho and Park (2003) discussed the product characteristics from the tangibility and intangibility concept, and the other characteristics referred to as service characteristics, i.e. processes such as need for on-line customization, need for on-line interaction, and proportion of on-line substitution for services. Jarvenpaa and Todd (1996) considered that the product type, quality, and the prices are the key attributes in shaping the perception of the consumers. Also, they suggested decomposing the characteristics of the product/services to characteristics referring to knowledge about the product, the type of product, tangibility, frequency of purchase, differentiation and price.

2.8.4 Medium Characteristics

Medium characteristics related to a system have been widely studied in the information system literature (Cheung et al. 2003; Cheung et al. 2005). Many software quality models include these characteristics to evaluate the quality of the products and the systems such as McCall's model, Boehm's model, FURPS Model, ISO 9126 standard quality model, and Dromey's Model. These models argue various characteristics from several dimensions such as usability, reliability, efficiency, and navigability. Additionally, they used these characteristics to evaluate the websites, with some characteristics related to web such as ease of navigation speed. Some of these models include characteristics related to the user perception because the fact that the consumers are considered the key success factors to these sites. But they still had weaknesses in this topic, especially about what are the characteristics needed to evaluate the websites from the consumer point of view and how to help the decision makers to develop their websites to meet the consumers' needs.

2.8.5 Online Merchant and Intermediary Characteristics

Online merchant and intermediary characteristics are considered the key characteristics of online stores, such as service quality, privacy and security control, brand/reputation, delivery/logistics, after sales services (Iliu 2001; Cheung et al. 2003; Cheung et al. 2005).

2.9 Summary

This chapter previews the common models for quality evaluation, specifically, software quality models and websites quality models. The software quality models are McCall's model, Boehm's model, FURPS Model, ISO 9126 standard quality model, Dromey's Model, Systemic Quality Model, Pragmatic Quality Model, Bayesian Belief Networks, and Star model. The websites quality models are the Sectorial indices' model, the standard ISO / IEC 9126-1 model, Website Quality Features model, Pentagon quality model, 2QCV3Q or 7-loci Model, Minerva model, the Heptagon quality websites model, the analytic website quality model, Berkeley model, a Comprehensive Model for Websites Quality, and Websites Assessment index model. The characteristics, the advantages and disadvantages, and limitations for each model are also presented. Discussion between quantitative research methods and qualitative research methods are presented. The strengths and the weaknesses for each method are highlighted. This is followed by a discussion of the quality of the e-commerce websites. The categories of quality and the consumer behavior are also presented such as quality of the system, quality of information, and the quality of services.

3 METHODOLOGY

3.1 Introduction

The purpose of this chapter is to explain the research methodology that will be used in this research to achieve the research objectives. Research methodology in this study consists of four phases to achieve the research objectives which the aim of constructing a new quality evaluation framework for e-commerce applications based on consumer perspectives.

Deductive approach will be used in this study. It mainly refers to a suggestion by Page & Meyer (2000), where the concepts and theory are derived from the literature and empirical finding. In addition, before applying and testing the model in real environment, it moved from general to specific concepts, such as from thinking up a theory about software or websites evaluation to specific topic or model needed to be tested in real environment.

3.2 Research Methodology Phases

This section explains the research phases. Each phase in this research has inputs, activities and deliverables in order to illustrate the aim of each phase, and finally to achieve the aim of this research. Each phase is discussed respectively in the following sections.

3.2.1 Phase One: Theoretical Study

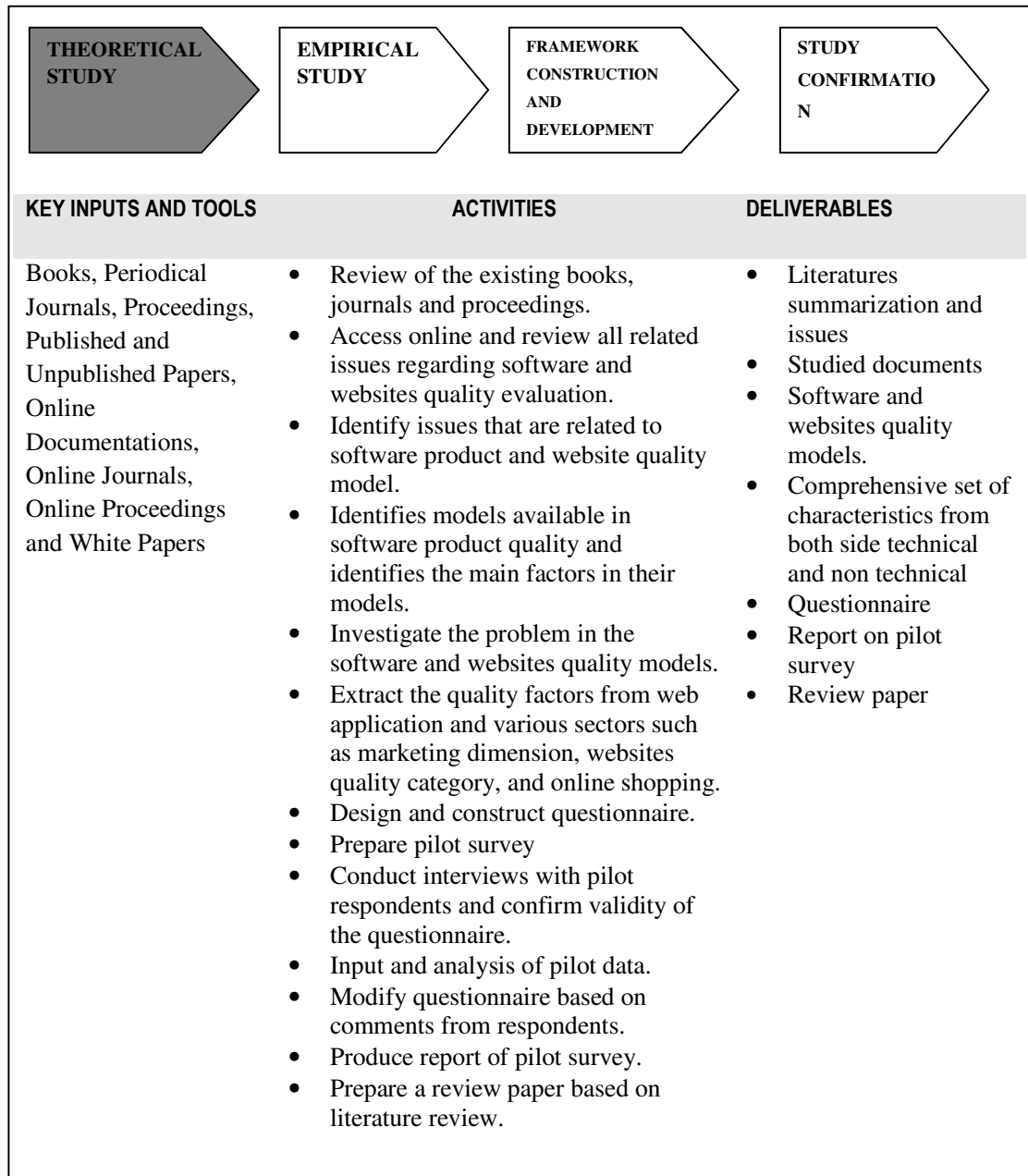


Figure 10 - Input, Activities and Deliverable of Theoretical Study Phase

Figure 10 illustrates Phase one of the research. The first essential phase of the research begins with the literature review on the existing research related to software evaluation, websites evaluation, online consumer characteristics, quality categories,

and the characteristics that affect the quality of evaluation, including the 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 websites quality models, to identify the characteristics of software quality models, to identify the characteristics of websites quality models, to investigate the problem in the software and websites quality models, to investigate the problem associated with determining the characteristics that affect quality from consumer perspective, to identify the technical and non-technical characteristics from the previous models, to extract the quality factors from web applications and e-commerce applications, product and websites quality category, and to determine the characteristics that affect quality from various sectors such as marketing dimensions.

The characteristics from software quality models and websites quality models were identified and combined with the consumer characteristics quality characteristics that will be found from other dimensions (online consumer characteristics, e-commerce application, and product and websites quality category). The result will be a comprehensive set of characteristics supported with human characteristics. Reviewing the current models would enable the researcher to have a comprehensive understanding of the subject matter. The literature review is reported in greater depth in Chapter two. The research proceeds with designing questionnaires based on the literature review and tests it through conducting a pilot survey. The data from pilot study will be analyzed to produce pilot reports. Any modification on the items in questionnaires is implemented in this stage before the real survey is conducted.

3.2.2 Phase Two: Empirical Study

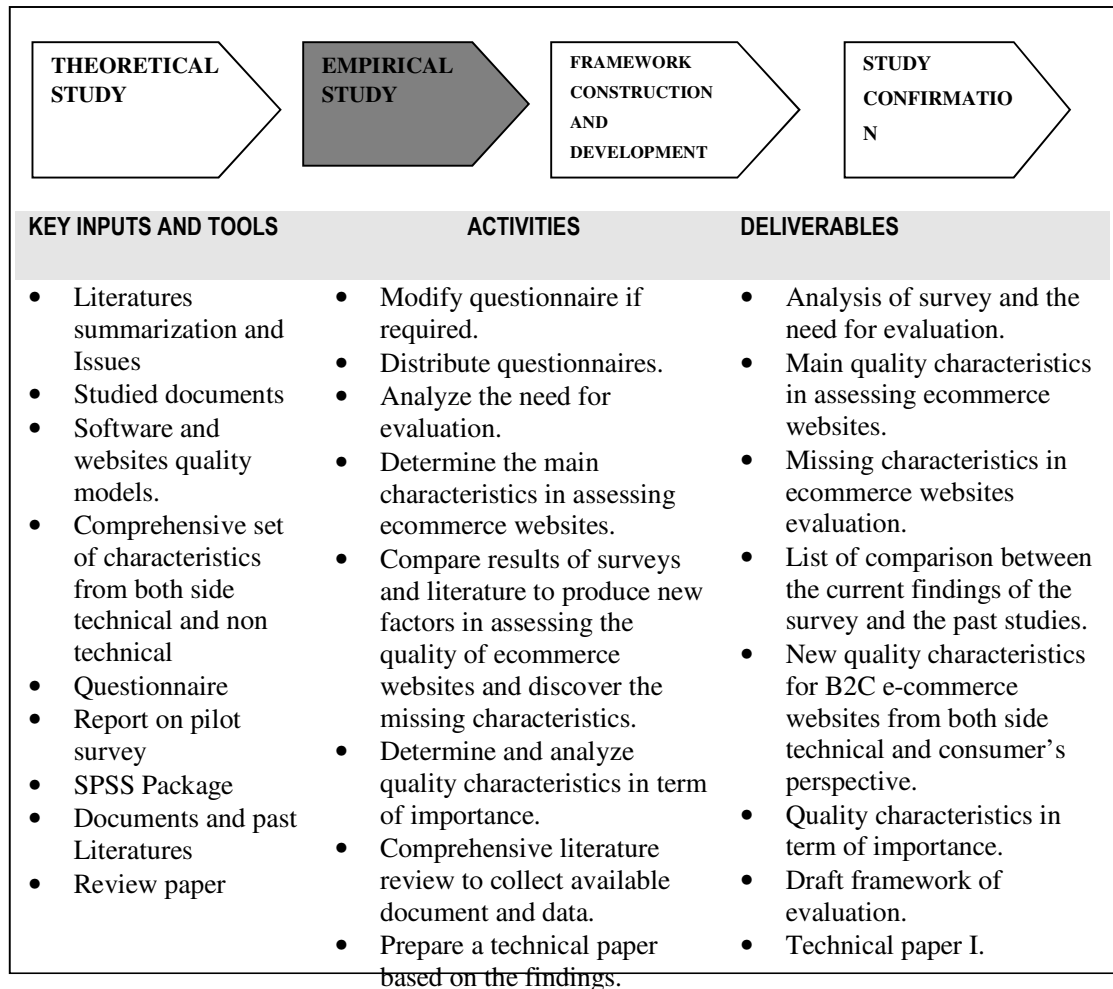


Figure 11 - Inputs, Activities and Deliverable of Empirical Study Phase

Figure 11 illustrates Phase two of the research. Based on the output of the pilot study and the finding from the first phase, the research conducted a survey 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. The survey was conducted to gather factors and characteristics from various dimensions such as software quality characteristics, websites quality characteristics, and the characteristics from marketing dimensions,

such as consumer online shopping characteristics, quality categories, and the characteristics that affect the quality of the product, services, and websites from marketing dimensions. The characteristics were analyzed in terms of importance, and were a comprehensive set of characteristics from the consumer perspective. Analysis from this phase provides an input to the following phase of this research.

3.2.3 Phase Three: Framework Construction and Development

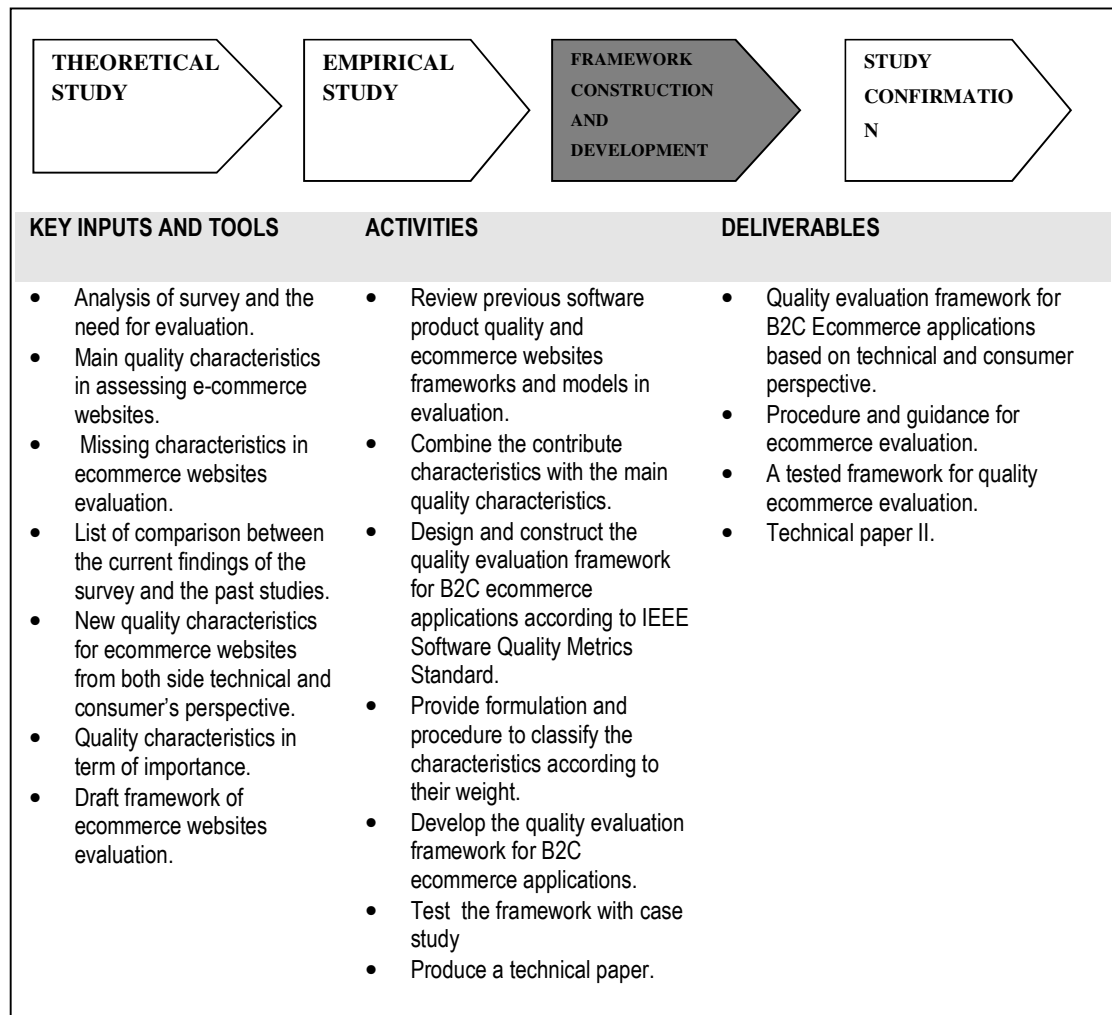


Figure 12 - Inputs, Activities and Deliverable of Framework Construction and Development Phase

Figure 12 illustrates the Framework Construction and Development phase. The third phase of the research was to construct and develop framework. Based on the empirical and literature findings and considering the ISO 9126 and PQM quality models as a baseline models, an initial evaluation framework for quality e-commerce applications based on consumers' perspectives was constructed. The concept, definition, and the contributing characteristics was used to evaluate the e-commerce websites. This led to the framework development. The proposed framework focused on the attributes of quality from users' perspective that deals with user expectation and satisfaction toward quality e-commerce applications. The architecture of the characteristics is organized and designed according to IEEE Software Quality Metrics Standard (Figure 13).

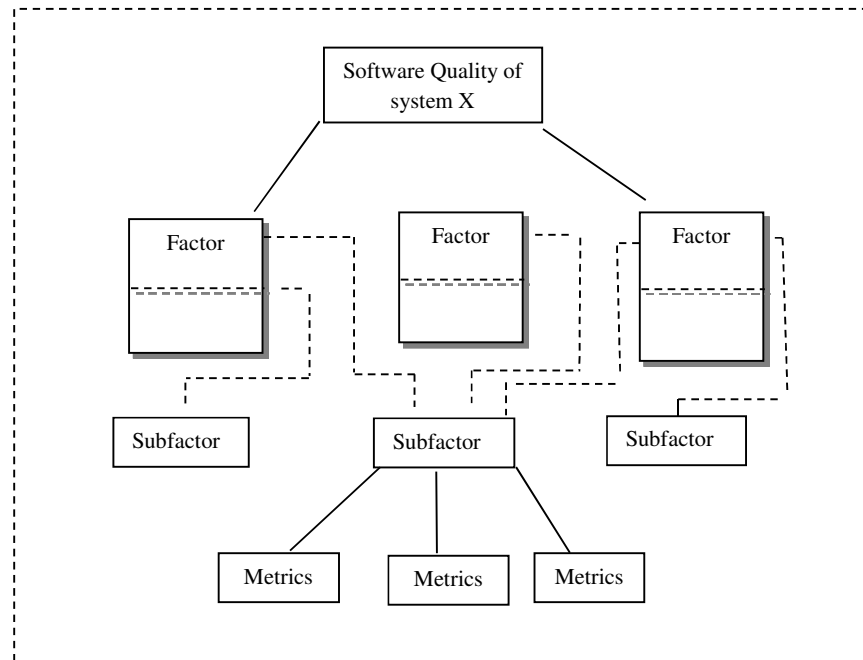


Figure 13 - Software Quality Metrics Framework (adopted from IEEE 1993)

3.2.4 Phase Four: Confirmation Study

The fourth phase of the research was the confirmation study. The proposed framework was applied to six Malaysian e-commerce websites. Feedback from the case study was used to refine the framework. Figure 14 illustrates the phase.

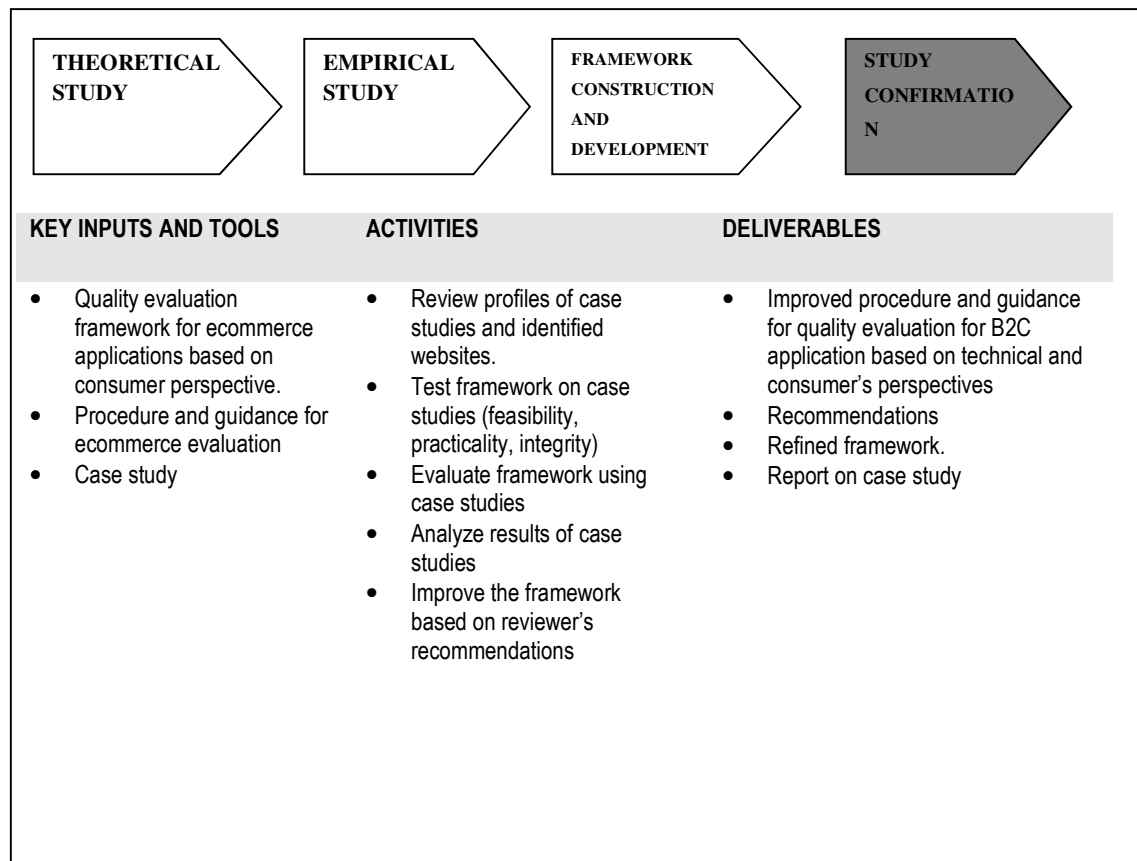


Figure 14 - Inputs, Activities and Deliverable of Study Confirmation Phase

The objectives of this phase were to validate and test the feasibility, practicality and integrity of the new framework in the real environment. In terms of feasibility and practicality, the quality characteristics, sub-characteristics, and metrics included in the framework should be understandable and answerable by the responsible assessor. The metrics should be capable of being gathered and collected during assessment exercise. Having a successful application of the case studies showed that the framework is feasible and practical in the real world environment. By looking at the analysis and results provided by the application, users were able to assess and evaluate the framework to justify whether the framework reflects a real quality picture of the websites.

3.3 Summary

The research was conducted in four phases: theoretical study, empirical study, framework construction and development, and confirmation study. Each phase had key input, activities, and deliverables to achieve the research goal. Case studies were used to evaluate the proposed framework in real environment which in turn would ensure the feasibility, practicality, and integrity of the new framework.

4 EMPIRICAL STUDY

4.1 Introduction

This chapter presents findings from an empirical study that was conducted to investigate the current practice toward quality development on Jordanian e-commerce websites. The study was conducted using both quantitative and qualitative methods in order to yield richer perspectives, leading to a more useful judgment on issues of websites quality evaluation. The survey technique was carried out to understand the preliminary issues underlying the websites quality evaluation and at the same time find out the degree of consumers' satisfaction. The data was collected randomly from e-commerce consumers in Jordanian firms.

A part from that, face to face interviews with users and developers were conducted to increase the reliability of the questionnaires and present opinions from companies' perspectives. The discussions with the developers, users and other staffs were done based on a specific issue or module of the e-commerce websites. Findings from this study were useful to help generate the conceptual structure of websites characteristics and formulate an initial evaluation framework. All the possible and related obstacles and constraints that bounded on e-commerce websites were clearly identified. In addition, results related to aspects such as the degree of satisfaction, online buying habits of e-commerce consumers, obstacles and the constraints surrounded e-commerce websites, and factors that consumers' consider when evaluating e-commerce websites are detailed out in the following section. The empirical study was conducted to achieve the following objectives:

1. To investigate the current practice of e-commerce website quality evaluation in Jordanian firms.
2. To determine the consumer factors related to Business to consumer adoption.
3. To determine the need of websites quality evaluation for e-commerce websites in Jordan.
4. To identify and determine the importance of consumer perspectives toward the quality of e-commerce websites in evaluation and development.
5. To investigate the mechanisms and guidance or the procedure that the companies used or follow in websites development.
6. To investigate and rank the obstacles and constraints surrounded e-commerce websites.

4.2 Results of the Survey Approach

As mention earlier, survey technique was used for conducting an empirical study in Jordanian firms. Particularly, this technique was chosen because of several reasons. Firstly, the study was focused on descriptive based data collection. It was aimed to describe the current models and practices that were used for evaluating the quality of e-commerce websites and described the online buying habits for Jordanian consumers. Secondly, the technique was an appropriate approach to gain answers for “what” or “how many/much” kind of research questions (Yin, 1994). The survey involved three main activities:

Activity 1: Questionnaire design and formulation

Activity 2: Data collection

Activity 3: Data analysis.

4.2.1 Questionnaire Design and Formulation

Questionnaire was used as the medium for data collection in this study due to several reasons: cost effectiveness; ease to analysis the data, coverage a wide area, and also it supports a high degree of secrecy (Kirakowski, 2000; Robson, 1993). The questionnaire consisted of forty seven items which were divided into four main sections:

- Section A: Respondent background
- Section B: Current quality models for business to consumer's e-commerce websites
- Section C: Websites quality and the obstacles surrounded business to consumers' websites
- Section D: Quality attributes

The following sections discuss in detail the design and formulation of the questionnaire.

4.2.1.1 The current quality models for e-commerce websites

This section intends to present the current quality models that were used for developing e-commerce websites, identify the degree of consumers' satisfaction toward the websites, and identify the consumer needs. Five *Likert scale* was used to ask consumers about the degree of satisfaction and participations. The scales were: *very dissatisfied (1)*, *somewhat dissatisfied (2)*, *neutral (3)*, *somewhat satisfied (4)*, and *very satisfied (5)*.

4.2.1.2 *Websites quality and the obstacles and constrains surrounded e-commerce websites in Jordanian firm*

This section was designed to investigate the obstacles and constrains surrounded e-commerce websites, and the quality characteristics for e-commerce websites selection. The five *Likert scale* used are *strongly disagree (1)*, *disagree (2)*, *neutral (3)*, *agree (4)* and *strongly agree (5)*. Apart from that, some questions were designed using “yes” and “no” format and several questions were designed using “multiple choice” format.

4.2.1.3 *Quality factors*

A list of quality attributes from past literatures that were considered vital and commonly used in e-commerce websites evaluation and online shopping attributes were identified. Respondents were asked to rank the level of consideration of the related quality attributes using the following five *Likert scale*: *not considered (1)*, *low consideration (2)*, *average (3)*, *high consideration (4)* and *very high consideration (5)*. Table 5 provides the list of quality attributes together with the description of each attribute and source of references.

Table 5 - e-Commerce Quality Attributes

Websites quality factors		Source
1	Competition and market situation	Current status or attitude of the organization websites in market space and the degree of the competition amongst websites
2	Clarity	Clearness of websites to consumers and the ability of the websites to provide as many details as possible to customers. What website offer to the customer

3	Resilience	Flexibility issues provided by the websites. That is, the ability of the websites to provide as many options and alternatives as possible to achieve the works required by consumers properly with no fees	(Ullah, & Zaidi, 2009)
4	Playfulness, Enjoyment and Entertainment	The capability of the websites to provide user' pleasure and leisure issues as well as entertaining them.	(Liu, & Arnett, 2000; Koufaris, 2003; Hausman, & Siekpe, 2009; Loiacono, Chen, & Goodhue, 2002; Wu, Mahajan, & Balasubramanian, 2003; Al-Momani, & Noor, 2009)
5	Impartiality	Organization websites are suitable and available for all consumers' levels and needs	(Wu, Mahajan, & Balasubramanian, 2003)
6	Degree of participation	The degree of the users' Cooperation and negotiation in the websites	
7	Coverage	If you can view the information properly-not limited to fees, browser technology, or software requirement. (the degree to which topics are observed, analyzed, and reported)	(Kapoun, 1998; Dragulanescu, 2002).
8	Objectivity	If the webpage provides information with limited advertising and acceptable status of promotion so that it is objective in presenting the information, i.e. the degree of the objectivity of sites' authors versus their subjectivity.	(Kapoun, 1998; Dragulanescu, 2002).
9	Currency of Web Documents	Page is current and updated regularly (as stated on the page) and the links (if any) are also up-to-date. List the new features that are provided by the websites. Example: tutorial, assurance, bills, feedback feature, and extra features	(Lee, & Kozar, 2006; Kapoun, 1998)
10	Accuracy and Authority of Web Documents	The ability of websites to list the names of the author and institution that published the page. In this way, consumers can find ways to contact them. And the ability to handle relevant information related to the author credentials and domain as edu, gov, org, etc.	(Lee, & Kozar, 2006; Kapoun, 1998)

11	Safety	The ability of the websites to provide safety requirements such as “Are the safe website conditions as warnings available?”	(Zeithaml, Berry, & Parasuraman, 1988)
12	Relevance	Do the information presented in the content of the webpage related to each other, i.e. there is no redundancy in the presentation of the detailed information in the website.	(Lee, & Kozar, 2006; Webb, & Webb, 2004).
13	Degree of care (empathy)	It refers to the degree of care and attention provided by the retailer to its customers.	(Behkamal, Akbari, & Kahani, 2008; Barnes, & Vidgen, 2001; Devaraj, Fan, & Kohli, 2002; Webb, & Webb, 2004). (Madu, & Madu, 2002)
14	The reputation of organizations websites	Is the website well-recognized by online customers?	(Lee, & Kozar, 2006; Madu, & Madu, 2002; Zhou, 2009)
15	Price savings	Does the website provide lower cost of online purchasing and help the consumers to save as much money more possible than other websites? Or other way on marketing?	(Lee, & Kozar, 2006; Devaraj, Fan, & Kohli, 2002; Hasslinger, Hodzic, & Opazo, 2008; Lin, 2006).
16	High responsiveness and Time saving	Does the website application reply to the consumers’ asking as appropriate and fast as the application can? Does it deal with the ability to provide prompt services and support to customers.	(Cox, & Dale, 2002; Zeithaml, Berry, & Parasuraman, 1988; Lee, & Kozar, 2006; Yang, Wu, & Wang, 2009; Sun, & Lin, 2009; Yang, & Fang, 2004)
17	Online shops credibility	Can the website raise services integrity and be depended upon by consumers to do their purchasing?	(Wang, Liu, & Cheng, 2008; Fitzpatrick, 2000; Wu, Mahajan, & Balasubramanian, 2003; Yang, & Fang, 2004)
18	Promotive activities, website promotion	Does the website provide promotive activities that can encourage the consumers to purchase?	(Behkamal, Akbari, & Kahani, 2006; Behkamal, Akbari, & Kahani, 2008; Turban, King, Lee, & Viehland, 2004; Wang, Liu, & Cheng, 2008; Wang, & Huarng, 2002; Agarwal, & Venkatesh, 2003)
19	Tangibility	Degree of product tangibility such as “Does the website provide physical appearance and concrete facilities, equipment, and communication materials?” Represents the physical facilities	(Zeithaml, Berry, & Parasuraman, 1988; Webb, & Webb, 2004; Kim, & Lee, 2002; Madu, & Madu, 2002; Lin, 2006; Cho, & Park, 2003)

		and appearance of e-commerce systems.	
20	Courtesy	Is the website respected by all consumers when it provides content that is not restricted to certain class of the society or certain religion and does it rises special attention to its users?	(Zeithaml, Berry, & Parasuraman, 1988; Yang, & Fang, 2004)
21	Trust or Trustworthiness	Related to privacy and secure transaction provided by the websites organizations to consumers.	(Behkamal, Akbari, & Kahani, 2006; Behkamal, Akbari, & Kahani, 2008; Turban, King, Lee, & Viehland, 2004; Sun, & Lin, 2009; Hasslinger, Hodzic, & Opazo, 2008; Lin, 2006).
22	Compatibility	The capability of the webpage to return to its last position and display everything as it is found usually in the webpage, i.e. the website has the ability to recover all the information missed due to any problem which occurs to load or browse the webpage.	
23	User-friendly Web interface	The nature of communication or interaction should be friendly between the consumers and the website.	(Behkamal, Akbari, & Kahani, 2006; Behkamal, Akbari, & Kahani, 2008; Turban, King, Lee, & Viehland, 2004; Wang, Liu, & Cheng, 2008)
24	Convenience in contact	The consumers feel comfortable when they find results of saving time, producing less effort when they shop any time.	(Hasslinger, Hodzic, & Opazo, 2008; Cho, & Park, 2003)
25	Diversity of goods, services and information	The variation of products purchased on the websites, i.e. Are there different types or kinds of services, goods and information for the consumers.	(Liu, & Arnett, 2000; Spremi & Strugar, 2008)
26	Speed of responses to changes in market conditions	The modifications that may be created by the website in accordance with new changes in marketing.	(Spremi & Strugar, 2008)
27	Durability	It measures the usefulness of the websites and any benefits can be gained as long as the website works. measure the useful life of the product or services	(Madu, & Madu, 2002)
28	Web site	The ability to view or browse the	(Wang, Liu, & Cheng, 2008;

	visibility and Promptness	website clearly and easily. Is the website being searched found in plausible period of time or is it delayed for longer time to display the required webpage? Communicating with web sites	(Fitzpatrick, 2000)
29	Aesthetics	Deal with sensitive characteristics and outward appearance of the websites such as feel, and looks	(Madu, & Madu, 2002; Zhou, 2009; Yang & Fang, 2004)
30	Serviceability (e-services quality)	Deal with the ease of servicing of the websites when necessary or when there is a need to resolve conflict and complaint made by customers	(Behkamal, Akbari & Kahani, 2006; Ahn, Ryu & Han, 2007; Cao, Zhang & Seydel, 2005; Lin, 2006; Madu & Madu, 2002; Al-Momani & Noor, 2009)
31	Storage capability	How easy is it for the users to retrieve information from the website when needed?	(Madu & Madu, 2002)
32	The Value of the web	Is the website valuable in the consumer's view and does it reach positive standards?	(Marsden, Tung & Keeney, 1999; Lin, 2006).
33	Websites information or e-information quality		(Liu & Arnett, 2000; Ahn, Ryu & Han, 2007; Cao, Zhang & Seydel, 2005; Spremi & Strugar, 2008)
34	Engaging the visitor	The extent to which a web site can fully engage a visitor by providing a complete and comprehensive web site experience	(Fitzpatrick, 2000)
35	Attractiveness and interactivity		(Tan & Tung, 2009)

4.3 Data Collection

4.3.1 Pilot Survey

According to Greenfield (1996), there were two main purposes of conducting a pilot survey: i) to ensure that the reliability and validity of the questionnaire were checked by the respondents, and ii) to fine-tune a design. During the pilot survey, the questionnaires were distributed to 70 respondents chosen randomly from Jordan

telecom list. Questionnaires were also sent via email to companies and universities selected at random. Face-to-face interview was also conducted. Out of 70 questionnaires, only 56 questionnaires were returned and analyzed. During the interview session, the time required to answer the questionnaire was measured and any difficulties on answering ambiguous questions were discussed and refined. In addition, the reliability of the questionnaire was also checked. Minor modifications on some items in the questionnaire were conducted based on the feedback obtained from the pilot survey.

4.3.2 The Actual Survey

In the actual study, questionnaires were distributed to three hundred and eighty four (384) respondents. The respondents were selected randomly from various categories. Simple random sampling was used for data collection. Out of 384, only two hundred and ninety five (295) respondents responded to the survey. The collected data were analyzed using SPSS package (SPSS Version 14.0 for Windows) (Coakes & Steed, 2003).

4.4 Survey Results

The following section discusses the demographic and general information of the respondents.

4.4.1 Demographic

- i) Respondents' age

Table 6 demonstrates the distribution of respondents' age. The majority of the respondents (36.6%) are from twenty-two (22) to thirty (30) years old. 34.6% respondents are from thirty one (31) to forty (40) and 15.8% are from seventeen (17) to twenty one (21). 10.1% of the respondents are above forty years old (Table 3.2).

Table 6 - Age distribution for respondents

Respondent age	Frequency	Percent
Less than 17	6	2.0
From 17 to 21	47	15.8
From 22 to 30	109	36.6
From 31 to 40	103	34.6
Above 40	30	10.1
Total	295	100.0

ii) Distribution of the respondents' educational level

In terms of educational level, most of them have university degree (45.8%) and 23.9% of the respondents have advance degree (Table 7).

Table 7 - Distribution of educational level

Degree of education	Frequency	Percent
Middle school	10	3.4
High school	25	8.4
University degree	136	45.8
Advance degree	71	23.9
Seminary studies	53	17.8
Total	295	100.0

iii) Online buying habits

Most of the respondents (46.78%) were using Internet for searching the best deal. 32.88% were experimental users who would like to know the product before purchased and 12.54% were using Internet for pleasure (Figure 15).

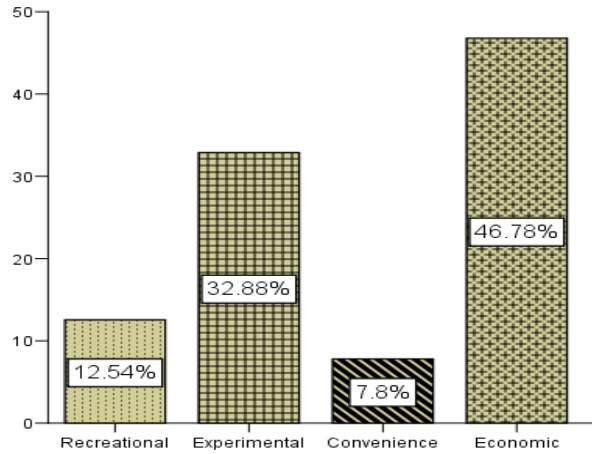


Figure 15 - Online Buying Habits

iv) Type of most visited websites

Table 8 shows that privates' sites are the most visited websites compared with government and semi-governments sites (79.8%). This is because consumers are always searching for the best deal.

Table 8 - Websites type distribution

Websites type	Frequency	Percent
Government sites	22	7.4
Semi-government	36	12.2
Private sites	237	79.8
Total	295	100.0

4.4.2 Current Practice on e-commerce websites quality developments

The findings were organized based on the objectives that were defined to be achieved.

Table 9 shows the results.

- Objective 1: To study the existence models, mechanisms, procedures, and techniques holds from the companies for their websites developments

To achieve this objective, respondents who had knowledge and experience about software quality and websites quality need to answer a set of constructed questions. Respondents were asked to indicate the models, mechanisms, and technique that were currently implemented by companies to evaluate or/and developed their websites. The table shows that 69.8% of companies do not follow any specific model or standards to develop their websites. 6.1% of the respondents followed certain model such as ISO 9126 and the rest were unsure if their websites were developed based on certain model or not.

Next, the respondents were asked on their experience in using any mechanisms or procedures for obtaining consumers' needs. Findings indicate that 56.6% of respondents are using mechanisms such as feedback from customers directly through their websites, help desk services, polls, SMS, forums to write comments, and some special procedures. 23.3% of the respondents do not use any mechanisms or procedure to gather consumer's needs.

In terms of the methods used or process provided by the country to validate the companies' websites, findings found that 73.8% of the respondents are not using any methods provided by the country. 3.0% of them are using certain methods provided by the country such as payment gateways and other organization site, for example, markup validation services and 9.1% of the respondents do not know or do not have enough knowledge to answer the questions. Furthermore, the respondents were asked on the use of technique by their companies to validate and verify their websites. Results show that 50.8% of respondents do not implement any specific technique to validate and verify their websites. Whilst, 27% of the respondents use website

auditors or standard quality measure and process to verify their websites. 7.7% of the respondents do not have knowledge to answer this question.

Table 9 - Existences practice on websites quality developments

Current practice	Answer	Frequency	Percent
Quality models or framework used for websites evaluation and development	No	206	69.8
	I don't know	32	10.8
	yes	18	6.1
	Missing	39	13.2
Mechanisms or procedures followed to meet the consumers' needs	No	69	23.3
	I don't know	19	6.4
	yes	167	56.6
	Missing	40	13.5
Methods provided by country to validate organization websites	No	218	73.8
	I don't know	27	9.1
	yes	9	3.0
	Missing	41	13.9
Techniques used to validate e-commerce websites	No	150	50.8
	I don't know	23	7.7
	yes	81	27.4
	Missing	41	13.8

- Objective 2: To investigate the overall satisfaction of the consumers on their websites quality

Findings indicate that majority of the respondent (88.4%) agree that well-qualified websites applications help companies to gain more consumers and income, and 11.6% of the respondents disagree. Unfortunately, majority of them (86.4%) answered negatively that their websites provide special or unexpected features such as multimedia explanation may satisfy customers. In addition, the respondents were asked about their opinion on how they found the structure and organization of the websites, and classify them according to the levels, excellent, good, mediocre, and poor. Majority of the websites are mediocre (62.3%). The rest are good (17.2%) and poor (5.1%) (Please refer to Table 10).

Table 10 - Respondents' opinion on their websites

Websites classification	Frequency	Percent
Poor	15	5.1
Mediocre	184	62.3
Good	51	17.2
Excellent	4	1.3
Total	254	85.5
Missing	41	13.8
Total	295	100.0

Table 11 illustrates the satisfaction level of organizations' websites from Jordan and websites from other countries. It shows that majority of respondents (86.1%) are dissatisfied with the quality of other country organization websites.

Table 11 - Jordan Websites Satisfaction Degree Compared To Other Country Satisfaction Degree

Degree of satisfaction	Percent of user satisfaction toward Jordan organization websites	Percent of user satisfaction compared with other country organization websites
Very dissatisfied	4.7	32.9
Somewhat dissatisfied	26.2	53.2
Neutral	54.9	11.2
Somewhat satisfied	14.2	2.7
Total	100.0	100.0

According to above scenario, the respondents were asked if the organization websites did offer what the consumers need or not. Table 12 shows majority of respondents (86.1%) are dissatisfied and this gives another clue that the organization neglected the consumers' needs in the websites developments.

Table 12 - Offer percentage result for organizations website

	Frequency	Percentage
NO	265	89.8
YES	30	10.2
Total	295	100.0

i. To study the fact of consumers participation on websites development and evaluation

Table 13 shows the consideration of Critical Success Factor for companies to reach their goals'. The majority of respondent agree and strongly using CSF to reach their organizations' goals and 5.1% of the respondents disagree.

Table 13 - CSF agreement degree

Agreement degree	Frequency	Percent
Strongly disagree	5	1.7
Disagree	10	3.4
Neutral	36	12.2
Agree	128	43.4
Strongly agree	111	37.6
Total	290	98.3
Missing	5	1.7
Total	295	100.0

60.7% of respondents (refers as organization) agree that consumers' requirements should be considered when developing websites (Table 14).

Table 14 - Consumers' perspective concern

	Frequency	Percent
NO	116	39.3
YES	179	60.7
Total	295	100.0

The study also focused on the consideration of consumers' assessment on the websites developments. Majority of respondents (60.4%) indicate that the organizations do not take consumers' consideration in their websites assessments (Table 15).

Table 15 - Consumer assessment consideration

	Frequency	Percent
NO	178	60.4
YES	78	26.4
Total	256	86.7
Missing System	39	13.2
Total	295	100.0

The respondents were also asked about the need of the consumers' participation in websites assessment. Findings shown in Table 16 indicate that majority (77.3%) agreed that the consumers' participation is extremely required to guarantee consumers' satisfaction on the websites (Table 16).

Table 16 - Consumer assessment participation

Degree of agreement	Frequency	Percent
Disagree	6	2.0
Neutral	31	10.5
Agree	228	77.3
Strongly agree	30	10.2
Total	295	100.0

Table 17 shows users participation level in testing and evaluation of the organizations websites. Most (64.1%) organization does not include users in the process. 14.1% respondents said that they participated and they found that their inclusion has helped their companies. 6.1% respondents participated but they found that their inclusion has not helped their companies. 6.8% participated but they found that their inclusion has not helped their companies.

Table 17 - Users participation level testing and evaluating website

Participation level	Frequency	Percent
Yes and very helpful	45	14.1
Yes and not very helpful	20	6.8
No, they do not participate	189	64.1
Total	254	86.1
Missing System	41	13.8
Total	295	100.0

ii. The current position of the quality of Jordanian websites

The quality of the website can affect users' impression of an organization because the website represents a portal through which the transactions are conducted (Hernandez et al. 2009). Quality is the key for any organization to keep it competitive, sustainable and retain customer loyalty. Quality covers all factors and significant features of a product or service or an activity for given requirements to get consumers' satisfaction (Leahy 2004; Milicic 2005; Cote et al. 2006). The respondents were asked if the quality of the websites play a main role in helping the organizations to gain more consumers and retain customer's loyalty (1 = strongly disagree, 2 = disagree, 3 = natural, 4 = agree and 5 = strongly agree). 88% of respondents agreed (Figure 16).

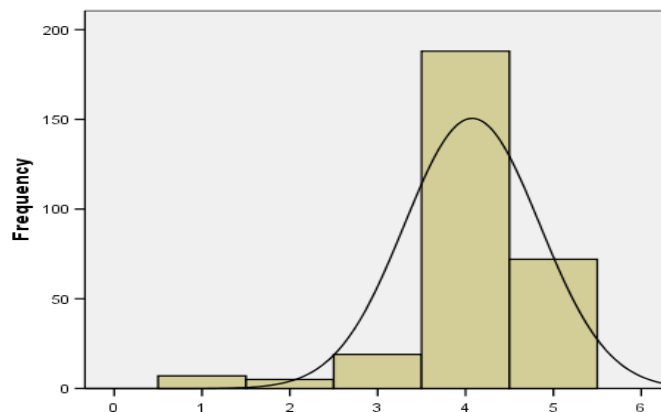


Figure 16 - distribution of quality level agreement

In terms of decision making in websites selection, the respondent were asked if they considered website quality issues before selection and the importance of the websites before selection. The analysis of cross tabulation pointed that majority of the respondents (92.5%) consider websites' quality before selection and 44.4% of the respondents highlighted the importance of web quality before selection (Table 18).

Table 18 - Websites quality importance vs Quality of the websites prior selection

		The importance of the web quality before selection			Total
		Not sure	Somewhat important	Very important	
Quality of the website prior to selection	NO	2	12	8	22
	YES	20	122	131	273
Total		22	134	139	295

Figure 17 presents descriptive analysis on distributions of quality metrics that organization followed to achieve their quality target. Findings from the analysis indicate that most organizations in Jordan considered *achieve the organization objectives* as a metric to ensure that the websites applications has met the quality target and is followed by *organization websites owner* and *feedback from developers*.

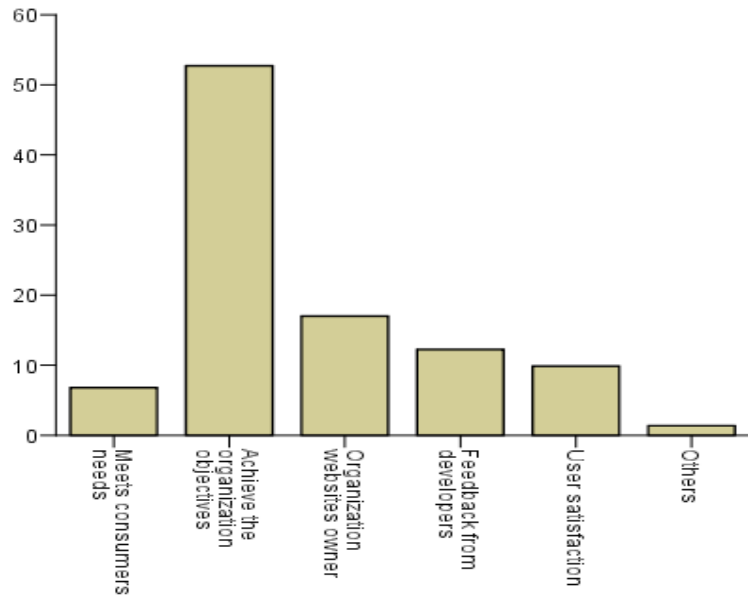


Figure 17 - Distributions of quality metrics that organization followed to achieve their quality target

Generally, good websites should offer all quality requirements. However, when the respondent were asked about the quality requirements of websites, results from the analysis indicate that around 90% of the respondents said that company’s websites do not offer all quality requirements. Therefore, the findings strongly pointed out that evaluation of these sites is extremely needed.

iii. The importance of websites evaluation

In terms of evaluation, Leahy (2004) defined websites evaluation as a process of collecting, analyzing, and evaluating data and this indirectly informs how well a website meets its objectives. In other words, evaluation of websites means understanding the value of websites and judging whether the website is good or otherwise. Evaluation of websites is an important issue and accurate evaluation is

urgently needed (Wang & Zhou 2009). By evaluating the websites, organizations' success or failure can be known, new methods for improvement can be searched, and the operation condition can be clearly identified (Liu & Hu 2008). In the survey, the respondents were asked if they have knowledge about the websites evaluation. Based on Table 19, 67.1% of respondents have experience or knowledge regarding to websites or software's evaluation.

Table 19 - Experience or knowledge on websites evaluations

Experience/ knowledge	Frequency	Percent
No	92	31.2
Yes	198	67.1
Total	290	97.6
Missing System	5	1.7
Total	295	100.0

Related to that, the respondents were also asked if the website evaluation can help create a higher quality product that meets consumers' needs and organization objectives. Most of them (76.5%) consider that websites evaluation were very helpful for organization to create higher quality products while only 6.5% respondents consider it as not helpful (Table 20).

Table 20 - The website evaluation helps to create a higher quality product

Degree of agreement	Frequency	Percent
Strongly disagree	4	1.4
Disagree	15	5.1
Neutral	43	14.6
Agree	138	46.7
Strongly agree	88	29.8
Total	288	97.0
System Missing	7	2.4
Total	295	100.0

4.4.3 The Constraints Surrounded in e-Commerce Websites

Knowing e-commerce website constraints surrounded it is very important issue for the organizations. Organizations must consider this constrains in their websites developments and assessments. Therefore, the respondents were given a list of constraints that surrounded the e-commerce websites from literatures review and were asked to rank and indicate their strength of agreement from strongly disagree to strongly agree from their perspectives for each one of constrains. The findings found from this study are as follows (Table 22):

- a) In terms of lack of financial resources of the organizations, the results show 16.6% of the respondents strongly disagree, followed by 25.4 % who disagree, 28.1% are neutral. Whilst 16.6% claim that the lack of financial resources is not a constraint.

- b) In terms of ignoring consumers' factors in websites development such as safety, follow up services, time saving and cultural factor, the results show that 7.1% disagree and 5.7% are neutral. 86.1% agree that ignoring consumers' factors in websites development is a constraint.

- c) In term of ignoring human aspect in the website development by designer and developers, the results show the majority of respondents (60.6%) agree that the constraint can influence e-commerce websites development. 11.5% which respondents disagree with this constrain.

- d) In terms of lack of institutional guidance for evaluation, the result show that 48.5% of respondents agree, followed by 30.2% strongly agree.
- e) In terms of lack of contributed quality factors, results show that 16.7% of respondent disagree, 32.5% are neutral, 36.6% agree and 12.9% strongly agree.
- f) Neglecting consumers' needs in websites development analysis show that majority of respondents (86.4%) fully agree that the consumers' needs were neglected and 4.1% disagree.
- g) In terms of external environmental factors, 33.2% disagree that this constraint plays an important role in e-commerce websites developments. 26.1% however, agree that this constraint play an important role.
- h) E-commerce websites evaluation is still in the initial phase where the models are inefficient because the evaluation is mostly considered from a subjective view that cannot be measured. Results show that 10.8% of respondents disagree. The majority of them (51.9%) were agreed. Table 21 shows the results.

Based on the above list, the mean of each constraint is calculated and shown in Table 21. The following constraints: Ignoring consumer factors in websites development, Neglecting consumers' needs in websites development, and the lack of institutional guidance for evaluation were found as the most important constraints that effect of e-commerce websites development.

Table 21 - constraints surrounded e-commerce websites developments

Constrains or obstacles	Degree of respondents agreement	Frequency	Percent
Financial resources lack	strongly disagree	49	16.6
	disagree	75	25.4
	neutral	83	28.1
	agree	49	16.6
	strongly agree	32	10.9
	Missing value	2	2.4
Mean 2.79			
Ignoring consumer factors in websites development	strongly disagree	7	2.4
	disagree	14	4.7
	neutral	17	5.7
	agree	170	57.6
	strongly agree	84	28.5
	Missing value	3	1.0
Mean 4.06			
Ignore human aspect by designers and developers	strongly disagree	15	5.1
	disagree	19	6.4
	neutral	79	26.8
	agree	140	47.4
	strongly agree	39	13.2
	Missing value	3	1.0
Mean 3.58			
lack of institutional guidance for evaluation	strongly disagree	12	4.1
	disagree	14	4.7
	neutral	35	11.9
	agree	143	48.5
	strongly agree	89	30.2
	Missing value	2	0.6
Mean 3.97			
lack of contributed quality factors	strongly disagree	9	3.1
	disagree	40	13.6
	neutral	96	32.5
	agree	108	36.6
	strongly agree	38	12.9
	Missing value	4	1.3
Mean 3.43			
Neglecting consumers' needs in websites development	strongly disagree	3	1.0
	disagree	9	3.1
	neutral	25	8.5
	agree	151	51.2
	strongly agree	104	35.2
	Missing value	3	1.0
Mean 4.18			
Ignoring the quality of website in development	strongly disagree	7	2.4
	disagree	41	13.9
	neutral	103	34.9
	agree	107	36.3
	strongly agree	32	10.8
	Missing value	5	1.7
Mean 3.40			
External environmental	strongly disagree	36	12.2

factor		disagree	62	21.0
		neutral	114	38.6
Mean	2.92	agree	43	14.6
		strongly agree	34	11.5
		Missing value	6	2.0
Initial phase for Websites evaluation		strongly disagree	3	1.0
Mean	3.50	disagree	29	9.8
		neutral	98	33.2
		agree	129	43.7
		strongly agree	24	8.2
		Missing value	12	4.1
		Total	295	100.0

4.4.4 Users – related quality attributes of e-commerce websites

The following analysis was carried out to determine the main quality attributes of e-commerce websites. The respondents were asked to distinguish the importance of each quality attribute. Results from the survey indicate that clarity, enjoyment and entertainment, safety, price savings, high responsiveness and time saving, online shops credibility, activities and website promotion, web site visibility and promptness, serviceability (e-services quality), the value of the web, and finally websites information or e-information quality are the main attributes with high and very high consideration in assessing e-commerce websites.

The results were established by calculating the mean interval score. Examples of the mean interval score obtained for selected attributes are: clarity = 4.00, enjoyment and entertainment = 4.14, safety = 4.36, price savings = 4.29, high responsiveness and time saving = 4.22, online shops credibility = 4.19, activities and website promotion = 4.04, web site visibility and promptness = 4.39, serviceability = 4.31, value of the web = 4.08, and websites information or e-information quality = 4.12. Other attributes

with mean interval score of less than 3.43 were treated as not commonly used and denoted as “average, low or no consideration”. Detailed results are shown in Table 22.

Table 22 - Websites quality attributes

Websites quality attributes	Mean
Speed of responses to changes in market Conditions	3.25
Diversity of goods, services and information	3.30
storage capability	3.43
Resilience	3.43
Trust or Trustworthiness	3.49
Degree of care (empathy)	3.55
Coverage	3.55
Compatibility	3.59
Tangibility	3.60
Objectivity	3.60
User-friendly Web interface	3.60
Impartiality	3.68
Currency of Web Documents	3.69
The reputation of organizations websites	3.70
Accuracy and Authority of Web Documents	3.70
Competition and market situation	3.71
Convenience in contact	3.77
Relevance	3.79
Durability	3.80
Degree of participation	3.81
Courtesy	3.83
Clarity	4.00
Promotive activities and website promotion	4.04
The Value of the web	4.08
Websites information or e-information quality	4.12
Web site visibility and Promptness	4.39
High responsiveness and Time saving	4.22
Online shops credibility	4.19
Price savings	4.29
Enjoyment and Entertainment	4.14
Serviceability (e-services quality)	4.31
Safety	4.36

Table 23 demonstrates the results of respondent's perception on each website quality attributes. In this part of the survey, respondents were asked to assess e-commerce websites in their organizations and indicate the levels of consideration for each quality attributes which are by means of 1=not considered, 2=low consideration, 3=average, 4=high consideration and 5=very high consideration. For the purpose of this research, total score and weight of the attribute were calculated based on the value of high consideration (*High*) and very high consideration (*VHigh*). Weight was calculated by using the following equation:

$$\text{TotScore} = \sum_{j=1}^n (\text{score})_j$$

(3.1)

where:

score represent number of score given for attribute with *High* or *Very High* level,
n represent the number of attributes.

$$\text{Weight}_j = \text{VHigh}_j / \text{TotScore}, j = \{1,2,3,\dots,n\}$$

(3.2)

and

$$\% \text{Weight}_j = (\text{VHigh}_j / \text{TotScore}) * 100, j = \{1,2,3,\dots,n\}$$

(3.3)

The analysis shows that *serviceability* and *safety* were the most important criteria compared to other quality attributes with weighting equal to 12.83% and 12.54%

respectively, followed by *price savings* (10.61%) and *online shops credibility* (10.13%). Table 23 presents the results.

Table 23 - Software quality attributes and their relative weights

Attributes	High	V High	Total	Total (H + VHigh)		V High	
				Weight	%	Weight	%
Clarity	220	40	260	0.090	9.03	0.0385	3.857
Promotive activities and website promotion	174	68	242	0.084	8.40	0.0655	6.557
The Value of the web	143	101	244	0.085	8.47	0.0973	9.740
Websites information or e-information quality	216	57	273	0.095	9.48	0.0549	5.497
Web site visibility and Promptness	177	99	276	0.096	9.58	0.0954	9.547
High responsiveness and Time saving	166	100	266	0.092	9.24	0.0964	9.643
Online shops credibility	150	105	255	0.089	8.86	0.1012	10.13
Price savings	164	110	274	0.095	9.51	0.1060	10.61
Enjoyment and Entertainment	162	94	256	0.089	8.89	0.0906	9.065
Serviceability (e-services quality)	128	133	261	0.091	9.06	0.1282	12.83
Safety	143	130	273	0.095	9.48	0.1253	12.54
Total (TotScore)	1843	1037	2880	1.00	100.0	1.000	100.00

High = High consideration

V High = Very High Consideration

The reliability of the attributes analysis were obtained using SPSS package (SPSS Version 14.0). The Cronbach's Alfa value (0.78) showed that all the quality factors are considered as an acceptable percentage of reliability.

4.5 Discussion

This survey investigates several issues on e-commerce websites quality evaluation in Jordan. The issues are as follows: -

- a) Lack of using well defined standards or models to construct a website. The survey indicates that most of Jordanian companies (69.8%) do not follow certain model to develop their websites; very small percentage (6.1%) of Jordanian companies had followed certain model such as ISO 9126. This result is consistent with the result of other studies (Chen et al. 2005; Behkamal et al. 2006). They point to a lack of standard models for developing e-commerce website. Moreover, large percentage of them develops or constructs their websites without following certain procedures or mechanisms. 23.3% of the companies do not take any mechanisms or procedure to ensure the consumer's needs. In addition, there is no guidance or standardization for websites development that the organizations can follow when they developed their websites. Furthermore, there is a lack of techniques and mechanisms that the companies must follow to construct their websites. While 56.6% of respondents followed several mechanisms such as: feedback from customers directly through their websites, help desk services, tickets, polls, SMS, forums to write comments, and some special procedures. These findings fulfil the first objective of this survey.
- b) Lack of performing software validation process. The study found that Jordan country do not perform any process or method to validate the companies websites as finding from the study indicates that 73.8% of the respondents answered negatively and denied if there any methods provided by the country. Moreover, most of companies don't have any specific techniques to validate

and verify their websites and very few of them used technique such as website auditors and quality measurement process. This finding fulfils the first and five objectives of this survey (refer to section 4.4.2 and

c) Table 9).

d) Thirty five (35) attributes from literature reviews were chosen. These attributes were measured and ranked. The analysis showed that serviceability and safety were the most important criteria compared to other quality attributes defined in this survey with weighting equal to 0.128 or 12.83% and 0.125 or 12.54% sequentially. This Followed by Price savings or 10.61% and online shops credibility 10.13% which considered more important. These findings fulfil the second objective of this survey.

e) The consumer considered the key success factor for companies to reach their goals'. The majority of respondent agreed and strongly agrees with per cent 81%, that the consumers' considered the CSF for the organizations to reach their goals. Since the consumers' plays significant role on the success of the organizations, his perspective must take in to the organization consideration. Therefore, all companies concern to take the consumers perspective in to their accounts in their websites developments.

Although the organizations concern to take the consumers' perspective in consideration in the websites developments, the majority of them do not considered the consumers assessment in their websites developments. (60.4%) of respondents were answered that the organizations do not take their

consideration in their websites assessments, where the rest claimed that they take the consumers assessment in consideration (26.4%). The analysis show that the Consumers needs or consumers' perspectives were absolutely ignored in websites development and evaluation in Jordan industry and considered the main constrain that may cause the failure for Jordan organization websites. And this shown in (Table 13, Table 14, Table 15, Table 16), and this result is consistent with the result of other studies (Nielsen 2000; Schubert and Dettling 2001; Rosen and Purinton 2004; Gamon et al. 2005; Joia and Olivera 2005; Lee and Kozar 2006; Olivera and Joia 2008; Wang & Zhou 2009). (Refer to section 4.4.2). This finding fulfils the forth and the six objectives of this survey.

f) The quality of the websites plays main role to gain more consumers and to keep the websites sustainable and competitive (80%) figure (4.2) also, the analysis showed that the majority (88.4%) of respondent were agreed that well-qualified websites applications help the companies to gain more consumers and income. Also, in term of Decision Making in websites Selection, The analysis that shown on cross tabulation Table 18 point that the majority of consumers take the quality of the websites in to account before selection and purchasing. However, excellent websites offered all quality requirements' but the majority of the Jordan e-commerce websites (90%) do not offer all quality requirements'. Therefore, the evaluation for these sites is extremely needed and required.

This difference between Jordan organization websites satisfaction and other country organizations websites satisfaction regard to the Jordanian users is

clue of the lack of quality requirement and quality attributes of Jordanian organization websites. This clearly appeared due to the big differentiation between the satisfaction percentages. The descriptive analysis for the survey have explored that the most of organizations in Jordan using achieve the organization objectives metrics to ensure that the websites applications meet the target of the quality more than meets consumers' needs or get the consumers satisfaction which mean that Jordanian organization websites do not considered the consumers perspective in websites developments. They considered achieve the organization objective metrics followed by organization websites owner, then feedback from developers. Consumers' satisfactions and meeting users need come on the last place for more information's.

In conclusion, most of Jordan organization websites were developed without taking the quality of the websites in consideration. This result is consistent with the result of other studies (McGovern et al. 2002; Thornton and Marche 2003; Gebauer and Ginsburg 2003; Lau 2006; Lee and Kozar 2006; Allahawiah and Altarawne 2009). This finding fulfils the third and the six objectives of this survey.

- g) The analysis showed that the following constrains: Ignoring consumer factors in websites development (4.06), Neglecting consumers' needs in websites development (3.97), and the lack of institutional guidance for evaluation were the most important constrains that effect of e-commerce websites development (4.18). Followed by important constrains shown in Table 21. This finding fulfils the second objective of this survey

4.6 Conclusion

This chapter describes the formulation, data collection method and analysis of the survey conducted in this research. Findings from the survey demonstrated that the objectives of this survey have been achieved. Results of the survey can be summarized as follows:

- i. Websites help the organization to gain more income in above 50% per cent.
- ii. E-commerce websites are suffering from the lack of quality requirement.
- iii. Consumers' perspectives are ignored in websites developments in Jordanian industry.
- iv. Quality of the websites are ignored form the organizations in the websites developments.
- v. Most of Jordanian organization websites do not follow certain framework or model to develop their websites. Therefore, there is urgent need to guidance, process, technique, and mechanisms for websites developments in industry.
- vi. E-commerce websites evaluation framework has a positive impact and demand in the near future.

The identification of websites quality factors that are relevant to this environment, led to the development of e-commerce websites evaluation framework from consumers perspectives.

5 THE DEVELOPMENT OF E-COMMERCE QUALITY AND EVALUATION FRAMEWORK

5.1 Introduction

The development of e-commerce quality and evaluation framework was based on our previous work in software quality and certification. The model referred was SCM-Prod model which was a certification model for software product (cited). Figure 18 illustrates the e-commerce quality and evaluation (ECQE) framework. ECQE framework consists of the following components: e-commerce quality attributes, assessment entity, quality level and assessment specification.

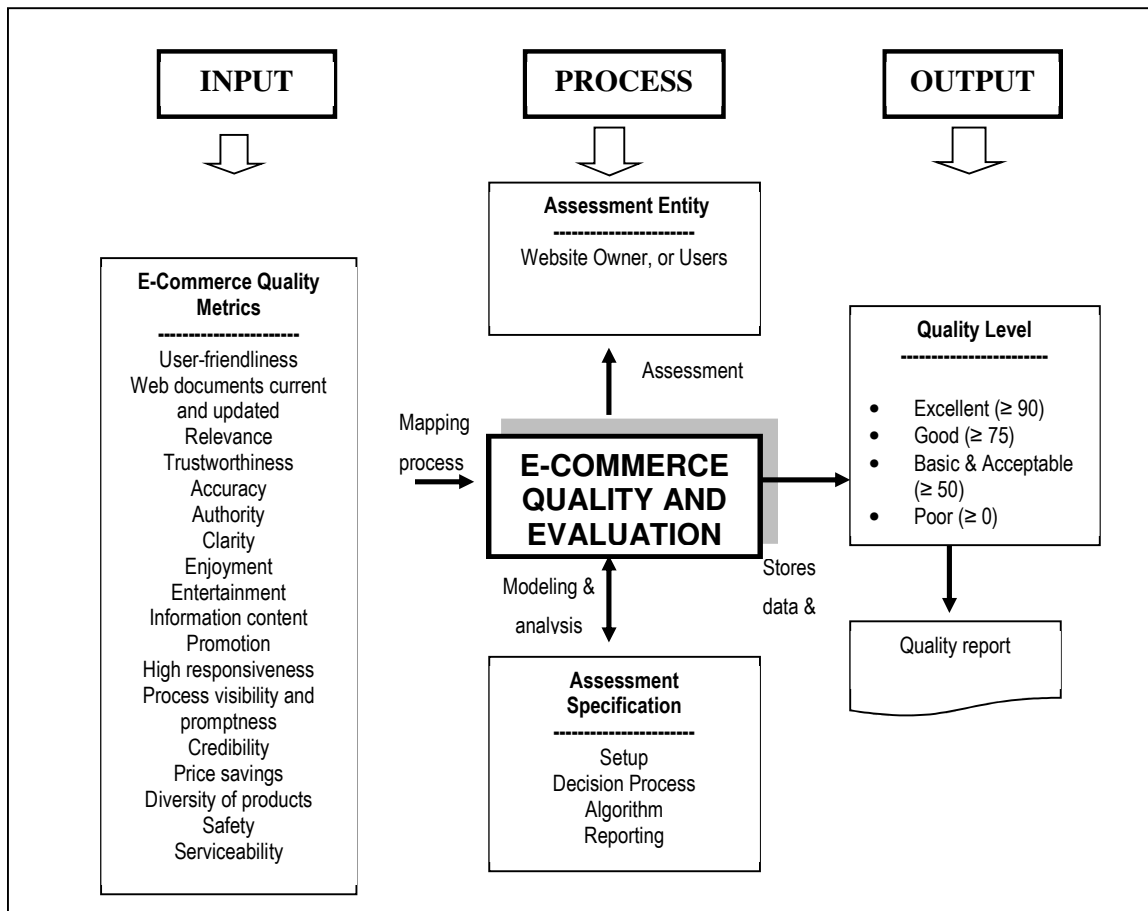


Figure 18 - The e-commerce quality and evaluation (ECQE) framework

5.2 The Component of E-Commerce Quality and Evaluation Framework

5.2.1 E-Commerce Quality Attribute

Based on our previous empirical study, several quality attributes have been identified.

The findings from the empirical study are discussed in Chapter 4. The attributes are shown as follows:-

- **User-friendliness:** The nature of communication or interaction should be friendly between the consumers and the website.
- **Web documents current and updated:** The ability to view or browse the website clearly and easily. Is the website being searched found in plausible period of time or is it delayed for longer time to display the required webpage?
- **Relevance:** Do the information presented in the content of the webpage related to each other, i.e. there is no redundancy in the presentation of the detailed information in the website.
- **Trustworthiness:** Related to privacy and secure transaction provided by the websites organizations to consumers.
- **Accuracy:** The ability of websites provides accurate information.
- **Authority:** The ability of websites to list the names of the author and institution that published the page. In this way, consumers can find ways to contact them. And the ability to handle relevant information related to the author credentials and domain as education, government, organization, etc.
- **Clarity:** Clearness of websites to consumers and the ability of the websites to provide as many details as possible to customers.
- **Enjoyment:** The capability of the websites to provide user' pleasure and leisure issues.

- Entertainment: The capability of the websites to provide user' pleasure and entertainment.
- Information content: The information content of the website is useful.
- Promotion: The website regularly provides promotion information.
- High responsiveness: The website provides appropriate and fast response to customer's request.
- Process visibility and promptness: The ability to view or browse the website clearly and easily. The website is noticeable.
- Credibility: The website provides contact information such as email address, phone numbers, etc. The website is professionally design.
- Price savings: The website offers price savings.
- Diversity of products: The website offer diversity of goods and services.
- Safety: The transaction through the website is conducted in secure and safe.
- Serviceability: The after sale service and warranty provided by the website is satisfied and guaranteed.

From these attributes, we categorised them into three main constructs which are information quality, service quality and system quality. Each attributes are broken down into several metrics (Table 24).

Table 24 - Table of metrics of attribute

Construct	Attribute	Metric
Information Quality	Authority	- The website provides information that has some reputable expert behind it.
	Web documents current and updated	- The websites provide timely information (current).
	Relevance	- The websites provide relevant information.
	Accuracy	- The website provides accurate information.
	Clarity	- The website provides information that is clear and precise.
	Information content	- The information content of the website is useful.
System Quality	User-friendliness	- I feel that is easy to find information on the website.
	High responsiveness	- The website provides quick response to my inquiries.
	Safety	- I feel secure when I do transactions through the website
Service Quality	Trustworthiness	- I feel very confident when I use the website.
	Enjoyment & Entertainment	- The website promotes customer excitement such as online games.
	Promotion	- The website regularly provides promotion information.
	Process visibility and promptness	- The website is noticeable.
	Credibility	- The website provides contact information such as email address, phone numbers, etc. - The website is professionally design.
	Price savings	- The website offers price savings
	Diversity of products	- The website offer diversity of goods and services.
	Serviceability	- I feel satisfy with the after sale service and warranty provided by the website

5.2.2 Assessment Entity

Assessment entity refers to users and website owner. The website assessment by the users of the e-commerce website product is beneficial because they experience of the website and will reduce the time taken for assessment process. On the other hand, the

website could also be assessed by the owner of the website. This is useful to know and justify the quality status of the website.

5.2.3 Assessment Specification

Checklist technique has been used as an instrument to evaluate the quality of e-commerce website. Checklist technique has been selected to evaluate the quality of e-commerce websites for many reasons. The check list technique is considered as one of the several techniques that can be used with different approaches. This technique is the easy way to ensure that business benefit statements will be understood by target respondents and easy to manipulate and customize. It is considered as a good technique of software evaluation. Moreover, this technique involves formal reviews of intermediate and final websites as software products. For each websites characteristics or factor, a checklist would list a various questions to be asked. Checklist can be used as an instrument for websites evaluation because it can address quantitative as well as qualitative subjects. Behkamal et al (2009) used the five Likert scale evaluation technique to evaluate the quality of B2B application. This technique is preferable to be used on developed websites.

Likert scale of 1 to 5 has been used as a measurement to express the agreement degree given to a developer. The scale used were 1 = unacceptable website, 2 = poor website, 3 = acceptable website, 4 = good website, 5= excellent website. Outcome from this process is the assessment report.

This section explains the method of calculating individual quality attributes. Each attributes defined in this model need to be assessed and then quality is computed through the assessment exercise.

As discussed in Section 5.15.2, the ECQE comprises of attributes, sub attributes and metrics. The architecture of ECQE is demonstrated in Figure 19.

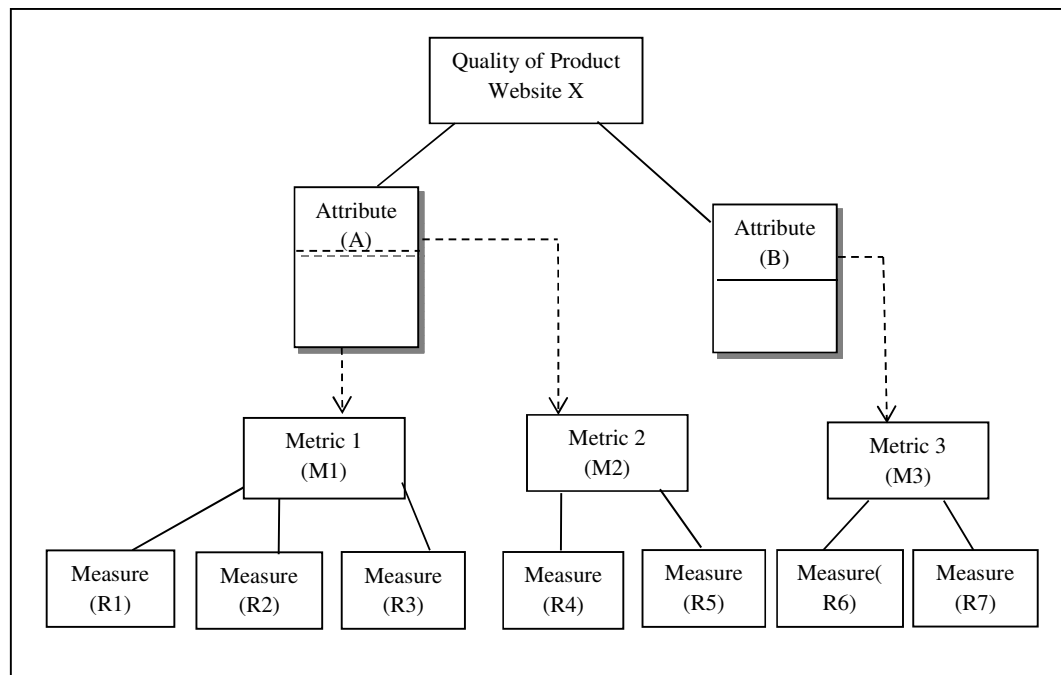


Figure 19 - The architecture of website quality attribute

The quality score is calculated using the following algorithms (Table 25). This table represents metrics of individual attribute. M_1 , M_2 and M_3 represent metrics in specific attributes, R_1 , R_2 , R_3 ... R_n represent measures in specific metrics, S_1 , S_2 ... S_n represent assessor in this model which either user, developer or independent assessor. P_{12} , P_{21} , P_{n1} are the perspective value given by the assessor for each of the metrics.

Table 25 - Table of metrics of attribute

<i>Measures</i>	R ₁	R ₂	R ₃	R ₄	R ₅	...	R _t
<i>Assessor</i>							
S ₁	P ₁₁	P ₁₂	P ₁₃	P ₁₄	P ₁₅	...	P _{1t}
S ₂	P ₂₁	P ₂₂	P ₂₃	P ₂₄	P ₂₅	...	P _{2t}
•							
•							
•							
S _n	P _{n1}	P _{n2}	P _{n3}	P _{n4}	P _{n5}	...	P _{nt}
Average (T)							

The average score for each of measure is calculated as follows: -

$$T_k = \left(\sum_{j=1}^n p_{ij} \right) / n, \quad k=1,2,\dots,t \quad (4.1)$$

where n represents number of assessor, i represents the number of measure and t represents number of metrics.

Then, the average perspective score (aps) of attribute *a*, is calculated as the following:-

$$aps_a = \left(\sum_{i=1}^t T_k \right) / k, \quad k=1,2,\dots,t \quad (4.2)$$

Each attribute calculated using formula 4.2 can be used to measure its certification

level by:

$$QS_a = (aps_a / 5) * 100 \quad (4.3)$$

where a, represent specific attribute. The constant 5 represents the maximum possible value of quality score. The QS score is mapped to a certification representation model to obtain its associate level.

5.2.4 Quality Level

The quality levels are identified and characterised in four distinct levels: excellent, good, basic and acceptable, and poor. The quality level of product is determined by comparing the score value obtained in equation (4.3). For QS value greater than 90% and less than 100%, the product obtains a certification level of *excellent*. This means that the software product satisfies all quality criteria and achieves quality level of excellent and satisfactory. Whilst if the QS score is greater than or equal to 75% and less than 90, the product is classified as “*good*” which means that it satisfies the quality level of good. If the product gains QS score greater and equal to 50 and less than 75, the product is identified as *basic and acceptable* which means that the software satisfies the quality level of basic or average and acceptable. Whereas, if the QS score obtained was less than 50, the product is identified as poor and unsatisfactory. The classification level is shown in Table 26. The similar classification technique is used in Ortega (2003).

Table 26 – Ranking of quality level

QS Score (<i>QS</i>)	Quality Level	Quality Status	Description
$90 \leq TQP \leq 100$	4	Excellent	Software satisfies all quality criteria and achieves quality level of excellent.
$75 \leq TQP < 90$	3	Good	Software satisfies and achieves the quality level of good.
$50 \leq TQP < 75$	2	Basic and Acceptable	Software satisfies and achieves the quality level of basic which also means average and acceptable.
$0 \leq TQP < 50$	1	Poor	Software attains quality level of poor and unsatisfactory.

It is important to note that the ranking of quality level mentioned above is flexible and does not fixed to the stated figures. They are opened for customisation and tailored to requirement by the organisation. The organisation and the owner of the products may decide to modify and customise the classification levels based on their maturity and the readiness of the organisation itself.

6 A CASE STUDY ON SIX E-COMMERCE WEBSITES

6.1 Introduction

This chapter discusses the implementation of the e-commerce quality and evaluation (ECQE) framework. A case study was conducted on six e-commerce websites representing four different categories of e-commerce namely online banking, online ticketing, online payment and online auction. The aim of the case study was to test the practicality and feasibility of the proposed framework in the real environment.

6.2 Profiling Of E-Commerce Websites

This section presents the overview of the e-commerce websites selected for the case study. Out of six e-commerce websites selected, two represent Internet banking; two represent online ticketing while the last two represent online payment and online auction respectively. These e-commerce websites were selected base upon their popularity among Malaysian citizen (ComScore, 2011).

6.2.1 *CIMB Clicks*

CIMB bank is a subsidiary of CIMB Group which focuses on consumer banking. Being the second largest financial services provider in Malaysia and one of Southeast Asia's leading universal banking groups, it offers a full range of banking products and services to over 5.3 million customers in Malaysia (Chong, 2010). CIMB bank offers their online presence through CIMBClicks.com. According to ComScore Media Metrix (2011), CIMBClicks has outgrown other banks as the second most visited online banking websites. In addition to managing their account, CIMB clicks customers can use the Internet banking facility to pay their utility bills, town council fees, and credit cards, apply for initial public offerings and transfer funds.

6.2.2 Bank Islam

Bank Islam Malaysia Berhad (BIMB) was established in 1983 with the aim of providing Shariah-compliant financial products and services to Malaysians regardless of their religion (Amin et al., 2008). Since June 2000, with the approval of Central Bank of Malaysia (BNM), Bank Islam offers value added services such as online banking to its customer in order to stay competitive in the banking industry (Mansor et al., 2012). The BIMB online banking services currently available include balance inquiry, fund transfer, online payment, personal profile update, management of investments, cheques and Bank Islam Card. Beside, Bank Islam's online banking website also serve as a kiosk for mobile prepaid top-up.

6.2.3 Malaysian Airlines

Malaysia Airlines System Berhad (MAS) is Malaysia's national carrier that has been in the airline industry over sixty years (Wikipedia, 2012). After recorded a total loss of approximately RM134 million in 2005, MAS introduced a radical programme of business transformation that includes Passenger Services System (PSS) which enable MAS to offer passengers a more convenient, efficient and hassle free travelling experience in cost effective manner (Abd Razak and Ilias, 2011). The PSS programme included 5 streams of ICT enabled solutions including a reservation and an e-ticketing system. Through the new systems, MAS customers not only able to buy tickets but also are able to manage their reservations and check-in electronically.

6.2.4 AirAsia

AirAsia is Malaysia's second national carrier and the leading low-cost carrier in Asia. Since its establishment in 2001, AirAsia has grown its fleet with just two to 83 aircrafts. According to Ministry of Science and Technology (2010), approximately

80% of AirAsia sales came from e-commerce channels namely its website and mobile platform. The AirAsia website, www.airasia.com is one of the top e-commerce sites in Asia. Besides offering ticketing services online, the website allows users to pre-order their food, choose their seat and add access luggage. In 2007, AirAsia launched the web check-ins where customers were able to check-in and print out boarding passes through its website and kiosk.

6.2.5 E-filing

Tax e-filing or simply e-filing is one of the e-government services in Malaysian that provides convenience to taxpayers for tax assessments and payment. It was introduced in 2006 by the Malaysian Inland Revenue Board (IRB) (Kamarulzaman and Che Azmi, 2010). One of the purposes of the e-filing is to encourage all taxpayers to submit their income tax returns online, thereby reducing manual paper-based submission method. The e-filing service and the details of how to get started and fill the tax return form are available through the following website: <https://e.hasil.org.my/>.

6.2.6 Malaysia Online Shopping and Auction – Lelong.com.my

Lelong.com.my is the first online auction in Malaysia. Online auction is a type of dynamic pricing mechanism that allows direct interaction between buyers and sellers. The auctioning process involves either sellers to place items for buyers to make bids or buyers asking to bid for items that interest them. Due to the competitive nature of online auctioning, buyers and sellers will be able to pick the best bids (Ministry of Science, 2010).

Lelong.com.my was started by K.S.Wei and Richard Tan, who established the History Interbase Resources Sdn. Bhd in 1999. Being Malaysia's premier auction site, the company strive to improve and develop Lelong's functionality without imposing high costs to costumers. Currently, Lelong.com.my only charged customers for membership and transactions fees.

6.3 The Evaluation Approach

This section discusses the activities performed to test the practicality of the ECQE framework though a case study on six e-commerce websites. The evaluation was conducted in three main phases:

6.3.1 Phase I

In Phase I, a meeting was held among the researchers to establish the goals of the evaluation, to discuss the plan of activity and to select suitable e-commerce websites. As discussed above, six e-commerce websites were chosen based on their type and popularity. Since all the researchers have experience in using the selected e-commerce websites, it was agreed in the meeting that the researchers will conduct the evaluation.

6.3.2 Phase II

The evaluation was conducted as scheduled. A briefing on the procedure for e-commerce websites evaluation was given to all evaluators at the beginning of the evaluation by the project leader. The evaluators were asked to rate their perceptions of each website using 1 to 5 scale which the anchor for 1 was "strongly disagree" and for 5 was "strongly agree". Before completing the checklist form, the evaluators were asked to browse and familiarise themselves with the features of the websites.

6.3.3 Phase III

The data collected via the checklist were analysed by the Microsoft Excel™ software. A simple average score for each main attributes which are information quality (IQ), system quality (SQ) and service quality (SQ) were calculated. The radar charts were used to compare the performance of each websites. Lastly, the quality score was calculated based on the average and total score of each quality attributes to determine the quality level of each e-commerce websites.

6.4 Results and Discussion

This section presents the findings and discusses the results of the case study evaluation with respect to other findings in the literature.

The average score obtained by the main quality attributes of each e-commerce website are shown in Table 27. Based on Table 27Table 28, *CIMB clicks* obtained the highest average score in terms of information quality and service quality, whilst *Malaysian Airlines* obtained the highest average score in terms of system quality. Table 27 also shows that *E-filing* obtained the lowest average score for both system quality and service quality, while *Lelong*© obtained the lowest average score for information quality. It can be seen in Table 27 that in terms of all constructs (information quality, system and service quality, only *AirAsia* is perceived as having a quality website based on the average score of 4, which indicate a customer's perception of strongly agree.

Table 27 - Quality score for each e-commerce websites

	Information Quality (IQ)	System Quality (SQ)	Service Quality (EQ)
CIMB clicks	4.83	4.33	3.88
Bank Islam	4.33	3.67	3.63
Malaysia Airlines System (MAS)	3.83	4.67	3.63
AirAsia	4.33	4	4
E-filing	4.33	2.33	1.88
Lelong	2.5	3.33	3.5

Figure 20 presents the radar graph that illustrates the quality attributes' scores for each of the selected e-commerce websites. In Figure 20, abbreviated IQ refers to the information quality; SQ refers to the system quality whilst EQ refers to the service quality. The attributes that fall near the centre are considered to have lower quality score compared to the attributes that fall on the outer layer of the graph. The radar graph clearly demonstrates the quality attributes that the e-commerce websites' owners needed to pay close attention to. For example, Figure 20 shows that *BankIslam* and *E-Filing* each needed to improve on their website system quality and service quality while *Malaysian Airlines* needed to improve on their website information and service quality. *Lelong*© on the other hand, needed to improve on information quality since the websites' average score of information quality fall on the inner layer of the graph.

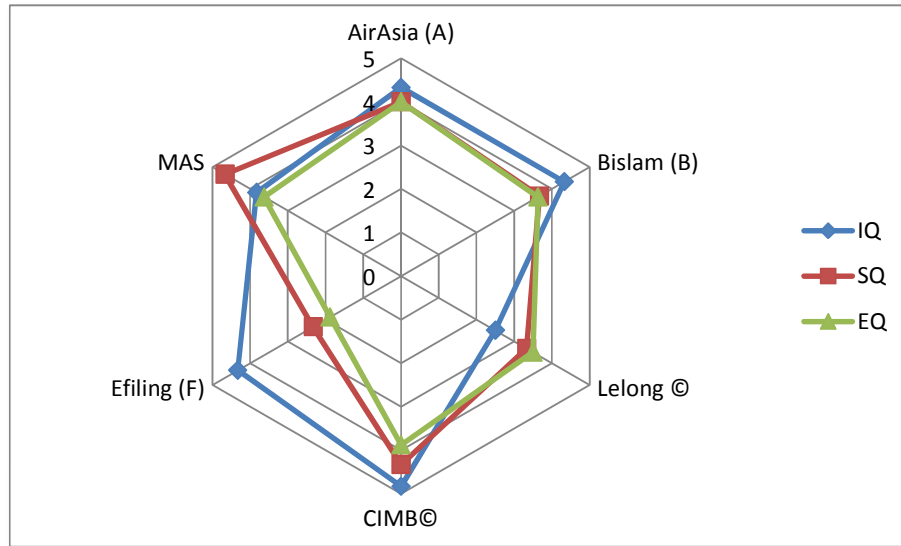


Figure 20- Radar graph for selected e-commerce websites' attributes scores

Table 28 presents the quality level for each of the e-commerce websites which was determined based on the total quality score. As discussed in the previous chapter, there are four levels of quality status ranging from “excellent” to “poor”. A score of 90 to 100 is regarded as “excellent” whereas a score of less than 50 is regarded as “poor”. Based on Table 28, *CIMB clicks*, *Bank Islam*, *Malaysian Airlines* and *AirAsia* gained level 3 of the quality level which indicates the quality of the websites as “GOOD”, whilst *E-filing* and *Lelong©* obtained level 2 of the quality level which indicates the quality of the website as “Basic and Acceptable”.

Table 28 – Total quality score and quality level

	Total Quality Score	Quality Level
CIMB clicks	86.93	GOOD (level 3)
Bank Islam	77.53	GOOD (level 3)
Malaysia Airline System (MAS)	80.87	GOOD (level 3)
AirAsia	82.20	GOOD (level 3)
E-filing	56.93	Basic & Acceptable (level 2)
Lelong	62.20	Basic & Acceptable (level 2)

Based on the above discussion, the following conclusion can be made:

- (i) clearly **Bank A** is the industry leaders in terms of website quality. Particularly in terms of information quality, the other sides can learn a lot from **Bank A's** experience;
- (ii) **PaymentWeb** needs major improvements mainly in terms of system and service quality and finally
- (iii) **AuctionWeb** is in a bad condition and drastically need to improve its' website in all areas.

6.5 Summary

The ECQE framework was developed to fill the gap in the area of e-commerce evaluation by providing comprehensive guidance and standard procedures for the evaluation of e-commerce websites. The researchers believe the primary benefit of formalizing e-commerce evaluation is that it ensures that the quality of the e-commerce websites can be measured and justified in a standardised manner.

The case study was intended to provide practical experience in applying the framework in the real environment and to provide some indication of its feasibility in practice. The case study seemed to indicate that the framework is feasible and practical, and it provides the websites owners with information about the quality level of their websites, and the quality attributes that need improvement. This objective information can then be used to make strategic decisions on how to improve the efficiency and performance of their websites. Furthermore, the successful completion of the case study also demonstrates the reliability of the metrics and associated measures used to assess the quality attributes of e-commerce websites.

7 CONCLUSION

7.1 Introduction

The study was conducted in four phases. The empirical study provides some insight on the current level of software evaluation in Jordan. It offers an insight into perspectives and perception on websites/software evaluation in Jordan from the consumers' view. It covers some factors that determine e-commerce application quality and issue in software evaluation.

Based on the survey results and literature findings, the ECQE framework based on non-technical perspective was constructed. The ECQE framework consists of four components, i.e. e-commerce quality factors, assessment entity, assessment specification and quality level. The framework covers only the consumer aspect (non- technical aspect). The factors, sub-factors, and metrics of the framework were verified by experts and were found to be understandable, and acceptable. The ECQE framework consists of important factors, supported by a set of mathematical formulae and mechanisms to measure the total quality of the websites objectively. In addition, the ECQE framework provides a set of procedures. The procedures explain how to implement the framework in real environment. This makes the evaluation process applicable and realistic. The framework provides a guidance and standard procedure for website quality evaluation since the literature shows a lack of standard procedure for websites evaluation. Using a standard procedure can remove unfairness in evaluation.

The ECQE framework was verified using a case study involving two e-banking and two online ticketing companies, one online payment and one online auction company.

7.2 Future Scope

The analysis of software quality factors and issues particularly in software development in general is an important area that will be investigated. Different companies may experience different software development problems and to come up with a good, reliable and robust software quality model that incorporates measures would be a challenge and fruitful. The framework developed would be the basis for building the intended model.

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