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ORIGINAL ARTICLE

Assessing the quality of web sites

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Abstract This paper reviewed the most recent evaluation criteria methods which were used in different e-business services. Furthermore, it proposes general criteria for evaluating the quality of any website regardless of the type of service that it offers. The dimensions of the criteria are content quality, design quality, organization quality, and user-friendly quality. These dimensions together with their comprehensive indicators and check list can be used by web designers and developers to create quality websites to improve the electronic service and then the image of any organization on the Internet.

1. Introduction

Since the introduction of the first electronic web service in the mid nineties of the last century, electronic services have spread across the globe in various shapes, changing the face of many business sectors. The new e-revolution is not only

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driving the global economics but also transforming societies into knowledge-based economics all over the world. In the last few years, the Internet has shown a rapid growth in terms of commercial trade volume, which led to a new definition of almost all aspects of business. The deployment of recent information and communication technologies enabled firms to provide higher quality services, lower prices for customers, and increase the profit margins for business. Also, the new technology created new trends in business and produced new era in business, finance, and economics (Sui and Rejeski, 2002; UNCTAD/WTO and JEDCO, 2001).

The Internet created a new business environment, far different from anything that has come before, enabling any company to conduct its entire set of business processes and practices online (Vlosky and Westbrook, 2001). E-business is any business process performed via an Internet-based, computer-mediated network (Moodle et al., 2000). There are many categories of e-business; for example Business to Business (B2B), Business to Consumer (B2C), Consumer to Business (C2B), and Consumer to Consumer (C2C). E-business and e-commerce tend to be used interchangeably leading to policy incoherence.

Recently, we have seen a proliferation of electronic websites with a tremendous amount of information either with high quality, or with low quality, as well as sites that are outright misleading (Fogg et al., 2001; Heimlich, 1999). The number of websites grew from 17 million in the middle of 2000 to 65 million in the middle of 2005 (Pew Internet and American Life Project, 2006). The explosion of the web has determined the need of measurement criteria to evaluate the aspects related to the quality in use, such as usability and accessibility of a web application. The objective is to make a website useful, profitable, user linking, and accessible (Signore, 2005). Awareness of quality issues has recently affected every industrial sector (Mich et al., 2003). An organization with a website that is difficult to use and interact with gives a poor image on the Internet and weakens an organization's position. Therefore, it is important for any organization to have the ability to make an assessment of the quality of their e-commerce service, in order to improve their offerings over time and benchmark against competitors and the best practices in any industry (Barnes and Vidgen, 2002).

In the last decade, numerous studies have focused on the designs of websites for general information seeking purposes and for electronic commerce purposes (Zhang and Dran, 2001). The design and commercial development of websites are very critical to e-commerce success (Barnes and Vidgen, 2002). Numerous practitioner reports and reviews have been published seeking to identify the good and bad features of websites. Site reviews range from theoretical and scientific opinions to surveys of successful sites and features to existing successful e-business. Although, there has been a significant research on supporting electronic commerce, most of the existing empirical research focusing on success factors of websites is mainly exploratory in nature (Liu and Arnett, 2000). Up to our knowledge, there is no standard framework or benchmark defining website effectiveness (Basu, 2002).

This paper reviewed the most recent evaluation criteria methods which were used in different websites, and proposes a general comprehensive framework for evaluating the quality of any web service regardless of the type of service that it offers. The remaining of the paper is as follows. Section 2 gives a brief review of the previous work. Section 3 discusses and analyzes the proposed framework. Section 4 defines the dimensions of the proposed framework and its indicators. Section 5 concludes the paper and suggests some future work.

2. Previous work

As the dependency on web services increases, the need to assess characteristics with website quality and success increases. Websites characteristics are important; they have been a constant concern of research in different domains and they were widely studied in the e-commerce literature (Hasan and Abuelrub, 2006). Although there has been a significant research on supporting e-commerce, many existing empirical studies focusing on the quality of websites is mainly exploratory in nature. Most of the current studies are either dealing with a limited number of quality factors or directed toward a specific web service. Thus, while there should be a considerable number and variety of factors associated with web site success, little research exists about the combination of these factors and services. Recently, research and studies are accumulating including different models and/or frameworks to evaluate the quality and performance of websites. We categorized the previous studies that investigated the quality dimensions of websites according to the type of service that the website offers; for example business and commercial, educational, banking, governmental, and others. This section briefly reviews the previous studies according to the website service.

Business and commercial websites were studied from different perspectives. Some researchers investigated website features or factors that are critical to e-business success, in which they called them critical success factors (Delone and Mclean, 2004; Lin and Joyce, 2004; Liu and Arnett, 2000; Madeja and Schoder, 2003; Molla and Licker, 2001). Other researchers address key issues, ideas and strategies to be considered in the management of online business from customer satisfaction perspective, and they assess whether a website has been built with a customer's goals in mind (Chanaron, 2005; Heimlich and Wang, 1999; Srivihok, 2000; Webpartner, 2005; Zhang and Dran, 2001). Another group of researchers investigated the perspective of web designers in order to elicit factors that they consider important when designing or developing effective websites (Chanaron, 2005; Tan and Tung, 2003). Other researchers developed generic tools or measurement frameworks for the assessment of website quality (Barnes and Vidgen, 2001, 2002; Fitzpatrick, 2000; Gledec, 2005; Lin et al., 2004; Mich et al., 2003; Signore, 2005). Some researchers concentrated on some important features; they either proposed a framework to measure the important features of the website or used previous models to find out to which extent e-business websites incorporate these

important features. (Basu, 2002), (Lim, 2002), and (Singh and Fisher, 1999) concentrated in their studies on website usability, (Heimlich and Wang, 1999) proposed key issues of website's structure, while (Cao and Zhang, 2002) examined factors that affect e-commerce website design. Heimlich (1999) discussed content evaluation of websites Hussin et al. (2005) studied the extent in which companies incorporate ethical and trustworthy elements on their websites, while Fogg et al. (2001) investigated how different elements of websites affect people's perception of credibility.

Educational websites were also studied from many different perspectives. Zhang and Dran (2001) developed a theoretical framework for evaluating website quality from a user satisfaction perspective. Others concentrated on some specific features of websites. For example Lautenbach et al. (2006) developed a framework to measure usability of websites, while Yoo and Jin (2004) investigated and evaluated the design of university websites. Other researchers, while assessing the university websites took in consideration other features. Osborne and Rinalducci (2002) designed the criteria to evaluate web resources for utilization within the context of scholarly research within the discipline of the art history. Singh and Sook (2002) attempted to find solutions to user problems and involved evaluating South African university websites on certain factors.

Banking websites were studied from many different perspectives using different models. Diniz et al. (2005) and Zhang and Dran (2001) proposed a model to evaluate and build digital business environment from the user's point of view, while other researchers proposed a specific framework to evaluate the Internet banking websites and the service quality of Internet banking (Achour and Bensedrine, 2005; Vijayan and Shanmugam, 2003; Wenham and Zaphiris, 2003). Other researchers adopted through their studies a number of previous models to evaluate Internet banking websites. For example, Awamleh and Fernandes (2005) used Diniz Model to evaluate websites of foreign and local banks in the United Arab Emirates. Guru et al. (2001) evaluated the web presence of banks in Islamic countries based on a Diniz Model too. Paynter and Chung (2002) examined how New Zealand banks enhanced their retail banking services through the Internet using Herey's Model for website evaluation.

Governmental websites were studied from different perspectives. Zhang and Dran (2001) developed a theoretical framework for evaluating website quality from a user satisfaction perspective through theoretical and empirical investigations. While Krauss (2003) identified seventeen comprehensive quality dimensions that can be used to rate website quality features that are important to e-government websites, other researchers concentrated on other features. For example Kokkinaki et al. (2005) presented a framework for evaluating existing e-government initiatives in Cyprus. It includes content characteristics, design characteristics, and common features of e-government websites. Choudrie et al. (2004) described the issues related to the accessibility, quality, and privacy of government

web using a common set of performance metrics and web diagnostic tools which are WebXact, Ntmechanic, and Vizcheck. Ma and Zaphiris (2003) studied the usability and content accessibility of UK e-government websites and investigated whether they are ranked high in terms of accessibility. The usability and accessibility of fifty selected UK e-government websites were measured using two automatic evaluation tools, Bobby and LIFT. Abanumy et al. (2005) investigated the issue that makes a website accessible and explored the importance placed on web accessibility with respect to e-government websites.

Other researchers addressed other kinds of web services from different perspectives. Lin and Joyce (2004) studied different e-commerce models of online auction websites. Six critical success factors for a successful online auction website were identified. They include design and content, consumer education, security, customer support, online community, and market positioning. Barnes and Vidgen (2001) deployed WEBQUAL in the domain of Internet auctions and identified three quality dimensions; information, interaction, and site design. Lim (2002) evaluated the impact of four relevant factors to e-shopping; usefulness, ease of use, enjoyment, and security. Results showed that perceived ease of use and usefulness of the e-shopping website have a significant direct impact on the success of the site.

3. Discussion and analysis

The objective of this research is to develop a theoretical, comprehensive, and measurable framework for assessing the quality of websites in order to provide straight forward criteria to encourage improvements of website design and its implementation. Furthermore, we aim to develop a framework that is capable of reliable applications across a broad range of websites regardless of the service they provide. A multi-phase approach was adopted that included a wide range of literature review, review of leading sites, identification of success factors from research and industry literature, comparison of factors with published industry scoring studies, and using our own experience in the field. Our process overlaid industry and academic research to identify quality factors in order to meet the objectives of this research.

After deep and comprehensive review of different evaluation methods and their elements that were used in different services over the Internet, we propose 4-dimensions criteria which are comprehensive and include all previous dimensions and elements, in order to be used as general criteria to evaluate all kinds of websites. The dimensions of the proposed criteria are *content quality, design quality, organization quality, and user-friendly quality*. In order to investigate how our proposed criteria were used in previous studies, we re-arranged each element of each dimension of the previous work to be under one of the four new dimensions. The result of re-arranging the dimensions of previous work into the proposed 4-dimensions criteria is shown in Fig. 1.

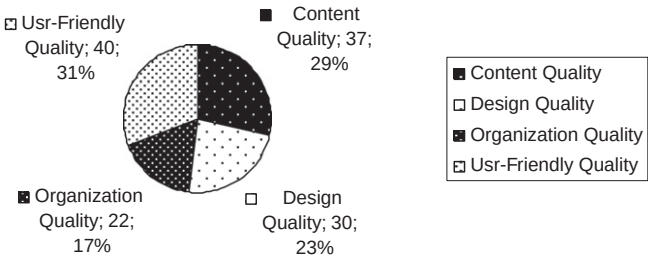

Figure 1 Common dimensions after re-arrangement.

We summarized the common quality dimensions according to the service that a website offers. Common dimensions that were used in evaluating e-business and e-commerce websites were concentrating on currency, accuracy, comprehensive and value added content, ease of use, reliability, availability of the needed information, speed of downloading, customization, effective internal search, different types of service and support to customers, security and privacy in all types of transactions, logical grouping of website elements, and attractive design that will attract the user and encourage him/her to spend more time in the website (Barnes and Vidgen, 2001, 2002; Basu, 2002; Cao and Zhang, 2002; Delone and Mclean, 2004; Fitzpatrick, 2000; Fogg et al., 2001; Gledec, 2005; Heimlich, 1999; Heimlich and Wang, 1999; Hussin et al., 2005; Lim, 2002; Lin et al., 2004; Lin and Joyce, 2004; Liu and Arnett, 2000; Madeja and Schoder, 2003; Mich et al., 2003; Molla and Licker, 2001; Signore, 2005; Singh and Fisher, 1999; Srivihok, 2000; Tan and Tung, 2003; Webpartner, 2005; Zhang and Dran, 2001).

Common dimensions that were used to assess the quality of educational websites were concentrated on currency, accuracy and comprehensibility of information, ease of use, clear layout of websites, and an attractive design (Lautenbach et al., 2006; Osborne and Rinalducci, 2002; Singh and Sook, 2002; Yoo and Jin, 2004; Zhang and Dran, 2001). Common dimensions that were used to assess the quality of banking websites focused on ease of use, customization, internal search function, security of transactions, aesthetic effects, and useful interaction between users and websites in order to get instant feedback from website to user (Achour and Bensedrine, 2005; Awamleh and Fernandes, 2005; Diniz et al., 2005; Guru et al., 2001; Paynter and Chung, 2002; Vijayan and Shanmugam, 2003; Wenham and Zaphiris, 2003; Zhang and Dran, 2001). Common dimensions that were used to assess the quality of governmental websites are quick response time, up-to-date, accurate information, effective search tool, easy to understand, and secure transactions (Abanumy et al., 2005; Choudrie et al., 2004; Kokkinaki et al., 2005; Krauss, 2003; Ma and Zaphiris, 2003; Zhang and Dran, 2001). Common dimensions that were used to assess the quality of auctions and e-shopping websites are design, content, security, support, and ease of use (Barnes and Vidgen, 2001; Lim, 2002; Lin and Joyce, 2004).

4. The proposed framework

The proposed framework attempts to integrate knowledge and experience from disparate sources, a range of reference disciplines and empirical practices. The objective is to identify measurable features and indicators that currently comprise a successful web site. A set of features are developed that comprise a current representation of a perfect website. The proposed framework can be used to compare between the quality of websites, to identify a path for improvement of a website, and to provide a guideline for designers and developers when creating new websites.

After we reviewed each evaluation criterion, we added its indicators to the suitable place of the proposed 4-dimensions criteria, besides adding some indicators in which we see them important from our own experience. Our criteria include all main indicators of the previous studies of evaluating the quality of websites. Fig. 2 summarizes the hierarchy of the proposed framework.

4.1. Content quality

It is generally agreed that content quality is an important dimension which deals with the characteristics of websites' information. Singh and Sook (2002) called this dimension the king dimension of any website, since it is the major source of value to customers (Molla and Licker, 2001). This dimension has been addressed by a variety of researchers in different ways. Some researchers studied the content of websites without taking into consideration other dimensions (Granath, 2005; Heimlich, 1999), while others considered content quality or information quality as one of the basic dimensions of their evaluating models (Achour and Bensedrine, 2005; Barnes and Vidgen, 2001, 2002; Basu, 2002; Delone and Mclean, 2004; Kokkinaki et al., 2005; Lin and Joyce, 2004; Liu and Arnett, 2000; Mich et al.,

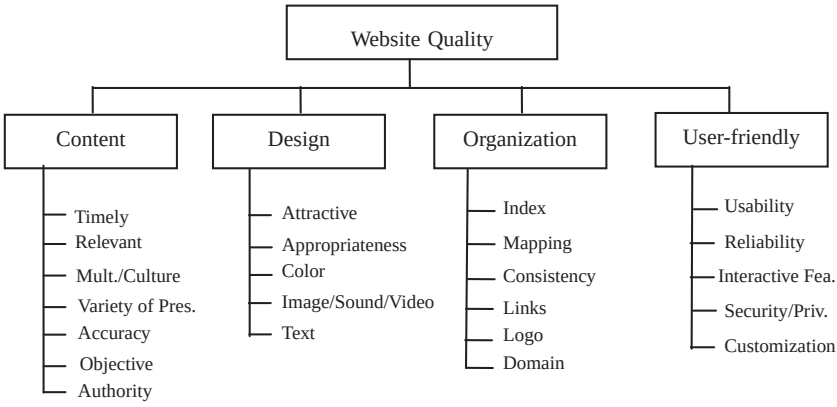

Figure 2 Hierarchy of the proposed framework.

2003; Molla and Licker, 2001; Paynter and Chung, 2002; Signore, 2005; Singh and Sook, 2002; Singh and Fisher, 1999; Tan and Tung, 2003).

The following indicators and check elements, which are summarized in Table 1 are the most important relating to the content quality dimension.

1. *Timely*: The currency of websites' information and how much it is up-to-date, how frequently the website is updated, and is it clear when the site was updated (Barnes and Vidgen, 2001, 2002; Cao and Zhang, 2002; Choudrie et al., 2004; Fitzpatrick, 2000; Fogg et al., 2001; Granath, 2005; Heimlich, 1999; Heimlich and Wang, 1999; Kokkinaki et al., 2005; Lautenbach et al., 2006; Liu and Arnett, 2000; Madeja and Schoder, 2003; Mendo, 2005; Molla and Licker, 2001; Osborne and Rinalducci, 2002; Signore, 2005; Srivihok, 2000; Zhang and Dran, 2001).
2. *Relevant*: The extent to which websites' information is comprehensive, complete and provide the right level of details (Barnes and Vidgen, 2002; Delone and Mclean, 2004; Fitzpatrick, 2000; Gledec, 2005; Granath, 2005; Heimlich, 1999; Mich et al., 2003; Molla and Licker, 2001; Osborne and Rinalducci, 2002; Tan and Tung, 2003; Zhang and Dran, 2001), informative, meaning, value added according to its audience (Kokkinaki et al., 2005; Webpartner, 2005), and fit to users' need (Cao and Zhang, 2002; Kokkinaki et al., 2005; Krauss, 2003; Mich et al., 2003; Osborne and Rinalducci, 2002; Singh and Sook, 2002). So, websites include information about the organization's objectives (Awamleh and Fernandes, 2005; Heimlich and Wang, 1999; Kokkinaki

Table 1 Indicators and check elements of the content quality dimension.

Indicators	Check list
Timely	Up-to-date information
	How frequency the website is updated
	When the website was updated
Relevant	Organization's objectives
	Organization's history
	Customers (audience)
	Products or services
	Photography of organization's facilities
Multilanguage/culture	Use different languages
	Present to different cultured
Variety of presentation	Different forms (text, audio, video, ...)
Accuracy	Precise information (no spelling, grammar errors)
	Sources of information is identified
Objective	Objective presentation of information
Authority	Organization's physical address
	Sponsor (s) of the site
	Manager (s) of the site
	Specifications of site's managers
	Identification of copyright
	Email to manager

et al., 2005; Paynter and Chung, 2002), organization's history (Awamleh and Fernandes, 2005; Basu, 2002), customers or audience (Granath, 2005; Heimlich and Wang, 1999; Paynter and Chung, 2002), products or services (Basu, 2002; Liu and Arnett, 2000; Paynter and Chung, 2002), and photographs of organization's facilities to reduce customer's fears of dealing with the website (Basu, 2002).

3. *Multilanguage/Culture*: The websites' information is available in different languages (Abanumy et al., 2005; Fitzpatrick, 2000; Fogg et al., 2001; Kokkinaki et al., 2005; Krauss, 2003; Lin et al., 2004; Vijayan and Shanmugam, 2003), suitable to different cultures (Fitzpatrick, 2000; Krauss, 2003), and meets the needs of all customers regardless of their county.
4. *Variety of presentation*: Information is presented in different forms (text (.doc, .pdf, ...), video, audio, ...), so that the user can download the form that suits him/her (Kokkinaki et al., 2005; Singh and Sook, 2002; Srivihok, 2000).
5. *Accuracy*: Information is precise, there is no spelling error or grammar error (Barnes and Vidgen, 2001, 2002; Cao and Zhang, 2002; Fitzpatrick, 2000; Gledec, 2005; Granath, 2005; Heimlich, 1999; Kokkinaki et al., 2005; Krauss, 2003; Liu and Arnett, 2000; Mich et al., 2003; Molla and Licker, 2001; Singh and Sook, 2002; Srivihok, 2000; Zhang and Dran, 2001), and the sources of information is identified (Fogg et al., 2001; Granath, 2005; Heimlich, 1999; Osborne and Rinalducci, 2002).
6. *Objective*: Information is presented in an objective manner without political, cultural, religious, or institutional biases (Granath, 2005; Heimlich, 1999; Osborne and Rinalducci, 2002).

Table 2 Indicators and check elements of the design quality dimension.

Indicators	Check list
Attractive	Innovative
	Aesthetic effects
	Emotional appeal
Appropriateness	Appropriate to the type of website
	Image used within it serve functional purposes
	Balancing (images, colors, and text)
	Number of screens per page
Color	Background color
	Text color
Image/sound/video	Number of image/sound/video
	Size of image/sound/video
	Provide alternative text for all non text elements
Text	Consistency (type, style)
	Readable
	Relative size
	Capital letters
	Breathing space
	Multiple headings
	Scrolling text
	Sequential appearance of text then images

7. *Authority*: The credibility or the level of user confidence of websites' information is clearly identified by providing information about: the organization's physical address (Fogg et al., 2001; Hussin et al., 2005; Kokkinaki et al., 2005), sponsor(s) of the site (Fitzpatrick, 2000; Granath, 2005; Heimlich, 1999; Heimlich and Wang, 1999; Lin et al., 2004; Mich et al., 2003; Osborne and Rinalducci, 2002), manager(s) of the site (Fitzpatrick, 2000; Heimlich, 1999; Heimlich and Wang, 1999; Osborne and Rinalducci, 2002), specification of sites' manager(s) (Fitzpatrick, 2000; Heimlich, 1999), identification of copyright (Osborne and Rinalducci, 2002), email to manager of the website exists (Fogg et al., 2001; Granath, 2005; Heimlich and Wang, 1999; Osborne and Rinalducci, 2002), and metadata elements exist (Choudrie et al., 2004; Fitzpatrick, 2000).

4.2. Design quality

This dimension concerns with the visual characteristics of websites' design that attract the users and encourage them to stay longer time viewing the website and reenter it. Most previous studies cover this dimension for its importance. All companies put a great effort to design their websites in an attractive and innovative way since poor design can mean that potential readers never see excellent material as they may become bored, confused, and eventually abort their attempt to view the information (Singh and Sook, 2002). Yoo and Jin (2004) explained extensively twelve characteristics that concentrate on website design dimension. Some researchers consider this dimension as an important dimension in their evaluating model. They called it design, display, or presentation of information (Barnes and Vidgen, 2001; Heimlich, 1999; Heimlich and Wang, 1999; Kokkinaki et al., 2005; Lin and Joyce, 2004; Signore, 2005; Singh and Sook, 2002; Singh and Fisher, 1999; Tan and Tung, 2003), while others described this dimension as part of the usability dimension of their criteria (Barnes and Vidgen, 2002; Basu, 2002; Lautenbach et al., 2006; Ma and Zaphiris, 2003).

The following indicators and check elements, which are summarized in Table 2 are the most important relating to the design quality dimension.

1. *Attractive*: The design of the website is innovative (Krauss, 2003) has an aesthetic effect by its graphics and animation (Achour and Bensedrine, 2005; Barnes and Vidgen, 2001, 2002; Basu, 2002; Cao and Zhang, 2002; Chanaron, 2005; Fogg et al., 2001; Heimlich and Wang, 1999; Kokkinaki et al., 2005; Krauss, 2003; Paynter and Chung, 2002; Singh and Sook, 2002; Tan and Tung, 2003; Wenham and Zaphiris, 2003). It has an emotional appeal which makes the user happy, pleasant, enjoyable, and cheerful when visiting the website (Barnes and Vidgen, 2001, 2002; Basu, 2002; Cao and Zhang, 2002; Fitzpatrick, 2000; Krauss, 2003; Lim, 2002; Liu and Arnett, 2000; Singh and Sook, 2002; Zhang and Dran, 2001).
2. *Appropriateness*: The design of the website is appropriate to the type of the website (Barnes and Vidgen, 2002). Images used within the pages serve their functional purposes (Heimlich, 1999; Osborne and Rinalducci, 2002) Images, colors,

and text are appropriately balanced on each page (Heimlich and Wang, 1999), and a fewer number of screens in each page (Kokkinaki et al., 2005; Yoo and Jin, 2004).

3. *Color*: This concerns with the effective use of background and text colors when designing the website (Abanumy et al., 2005; Basu, 2002; Chanaron, 2005; Heimlich and Wang, 1999; Kokkinaki et al., 2005; Lautenbach et al., 2006; Lin and Joyce, 2004; Singh and Sook, 2002; Singh and Fisher, 1999; Tan and Tung, 2003). According to background color, light colors are preferred to be used (Wenham and Zaphiris, 2003). Concerning text color, it shouldn't exceed four colors within the same page (Yoo and Jin, 2004).
4. *Image/Sound/Video*: It concerns with the non text elements which are used within the website (Achour and Bensedrine, 2005; Basu, 2002; Chanaron, 2005; Heimlich, 1999; Heimlich and Wang, 1999; Kokkinaki et al., 2005; Krauss, 2003; Lautenbach et al., 2006; Mich et al., 2003; Osborne and Rinalducci, 2002; Paynter and Chung, 2002; Singh and Sook, 2002; Singh and Fisher, 1999; Tan and Tung, 2003). Few number of image/sound/video should be used and size of image/sound/video should be small since large size of image/sound/video per page will slow downloading the page which is not preferred by users (Signore, 2005; Yoo and Jin, 2004). Alternative text should be used for all non-text elements (Kokkinaki et al., 2005; Ma and Zaphiris, 2003; Signore, 2005).
5. *Text*: It concerns with the characteristics of text used within websites' pages (Basu, 2002; Chanaron, 2005; Lautenbach et al., 2006; Singh and Fisher, 1999; Tan and Tung, 2003). There should be consistency in text, pages should use one font size except for titles (Yoo and Jin, 2004). Text font should be chosen among the most readable ones (Abanumy et al., 2005; Kokkinaki et al., 2005; Signore, 2005) with relative size (Heimlich and Wang, 1999; Signore, 2005). Pages should not use all capital letters unless in titles or headings since they are hard to read and are space wasting (Signore, 2005; Yoo and Jin, 2004). Pages should use white space or breathing space between page elements to avoid crowded pages (Lin and Joyce, 2004; Yoo and Jin, 2004). Different or multiple headings, such as titles, sub titles, sub sub titles are preferred as

Table 3 Indicators and check elements of the organization quality dimension.

Indicators	Check list
Index	Index or links to all website's pages
Mapping	Adequate website map or navigation bar/menu
	Current page
Consistency	General layout
Links	Working links
	Assistant links (back to home, top, back to original website)
	Worthy links (to other related websites, no dead links)
	Visiting pages
Logo	Organization's logo is clear and noticeable

appropriate (Yoo and Jin, 2004). If pages use scrolling text, it should not hide a large amount of information (Yoo and Jin, 2004). Pages should show the text first then the image(s) to see text while downloading image(s) (Yoo and Jin, 2004).

4.3. Organization quality

This dimension concerns with the logical grouping, categorization, or structure of websites' elements in order to help the user to reach the required information quickly, navigate easily within the website, feel comfortable within its layout consistency, and keep him/her informative that he/she is still in the same website (Abanumy et al., 2005; Kokkinaki et al., 2005; Mich et al., 2003; Tan and Tung, 2003; Webpartner, 2005). Heimlich and Wang (1999) proposed structure themes that extensively cover most elements of this dimension. Most researchers referred to the elements of organization dimension as part of usability dimension in their models (Achour and Bensedrine, 2005; Diniz et al., 2005; Paynter and Chung, 2002; Singh and Sook, 2002; Singh and Fisher, 1999; Wenham and Zaphiris, 2003), while others referred to the elements of organization dimension as part of other dimensions like information (Achour and Bensedrine, 2005), communication (Hussin et al., 2005), content (Molla and Licker, 2001), or navigation (Basu, 2002; Signore, 2005; Tan and Tung, 2003).

The following indicators and check elements, which are summarized in Table 3 are the most important relating to the organization quality dimension.

Table 4 Indicators and check elements of the user-friendly quality dimension.

Indicators	Check list
Usability	Easy to use, understand, operate, find, or navigate
	Easy to find using search engines
	What's new
Reliability	Appropriate and easy to remember URL
	Short download speed
	Multi browser support
	Work properly using different screen settings
	Fewer ads
	Measuring efficiency
	Availability
Interactive features	Clear instructions
	Help function
	FAQ
	Effective internal search tool
	Feedback between user and website (email, chat, online community, suggested forms)
	Review transactions
	Tracking order
Security/privacy	Secure transactions
	Privacy
Customization	Tailoring content to the needs of specific users

1. *Index*: An index or a link to all the website's pages is available from the main page, so that the user will have an idea about all main categories of the website (Fitzpatrick, 2000; Heimlich and Wang, 1999; Wenham and Zaphiris, 2003).
2. *Mapping*: Adequate website map or navigation bar/menu is available in each page to facilitate navigating the website (Achour and Bensedrine, 2005; Chanaron, 2005; Fitzpatrick, 2000; Kokkinaki et al., 2005; Lin et al., 2004; Paynter and Chung, 2002; Signore, 2005). A user can know the current page that he/she is in while browsing from the navigation title (Chanaron, 2005; Heimlich and Wang, 1999; Kokkinaki et al., 2005; Ma and Zaphiris, 2003).
3. *Consistency*: A general layout of each page is consistent through the website (Basu, 2002; Diniz et al., 2005; Heimlich and Wang, 1999; Kokkinaki et al., 2005; Lautenbach et al., 2006; Wenham and Zaphiris, 2003).
4. *Links*: Links work properly; it should take the user where he/she is intended to go (Fogg et al., 2001; Granath, 2005; Heimlich, 1999; Hussin et al., 2005; Kokkinaki et al., 2005; Liu and Arnett, 2000; Signore, 2005; Singh and Sook, 2002; Singh and Fisher, 1999). Assistant links are available in each page so that the user can get back to the main page from every section of the website, the links can help the user to return to top of the page within the long pages of the website, user can return to the original website when he/she follows external link of any page (Basu, 2002; Fitzpatrick, 2000; Heimlich and Wang, 1999). Worthy links that take user to other related websites are available (Achour and Bensedrine, 2005; Granath, 2006; Kokkinaki et al., 2005; Singh and Sook, 2002), no dead links (Hussin et al., 2005; Signore, 2005), and the link's color is changed after the user has visited it (Heimlich and Wang, 1999).
5. *Logo*: Organization logo is clear and noticeable in every page of the website (Lin et al., 2004).

4.4. User-friendly quality

Nearly all previous studies included this dimension or at least one of its indicators in their criteria model because of its importance. It concerns with many issues that help any user regardless of his/her education or experience to find the needed information within a reasonable time (Lautenbach et al., 2006), the capability of the website to maintain specific level of performance when used (Gledec, 2005), and interactivity or connectivity which emphasize the existence of interaction between user and website using different tools.

The following indicators and check elements, which are summarized in Table 4 are the most important relating to the design user-friendly dimension.

1. *Usability*: The website is easy to use, understand, operate, find information, or navigate (Abanumy et al., 2005; Awamleh and Fernandes, 2005; Barnes and Vidgen, 2001, 2002; Basu, 2002; Chanaron, 2005; Delone and Mclean, 2004; Diniz et al., 2005; Fitzpatrick, 2000; Fogg et al., 2001; Gledec, 2005; Heimlich,

1999; Heimlich and Wang, 1999; Kokkinaki et al., 2005; Krauss, 2003; Lautenbach et al., 2006; Lim, 2002; Lin and Joyce, 2004; Liu and Arnett, 2000; Ma and Zaphiris, 2003; Molla and Licker, 2001; Paynter and Chung, 2002; Signore, 2005; Singh and Fisher, 1999; Srivihok, 2000; Tan and Tung, 2003; Wenham and Zaphiris, 2003; Zhang and Dran, 2001). It is easy to find the website using external websites (Basu, 2002; Heimlich, 1999; Mich et al., 2003; Srivihok, 2000), and it is clear to the user that new information is added to the website.

2. *Reliability*: Website's address is appropriate and easy to remember (Fogg et al., 2001; Granath, 2005; Mich et al., 2003; Vijayan and Shanmugam, 2003), short download time (Choudrie et al., 2004; Delone and Mclean, 2004; Fogg et al., 2001; Kokkinaki et al., 2005; Mich et al., 2003; Molla and Licker, 2001; Paynter and Chung, 2002; Singh and Sook, 2002; Srivihok, 2000; Tan and Tung, 2003; Webpartner, 2005), multi browser support (Abanumy et al., 2005; Kokkinaki et al., 2005; Ma and Zaphiris, 2003), and work properly using different screen settings. Few ads are in the website's pages to avoid long time downloading of website's pages (Achour and Bensedrine, 2005) and there is a way to measure its efficiency by counting the number of visitors (Basu, 2002; Delone and Mclean, 2004). Also, the website is available 7 days/week, 24 h/day (Abanumy et al., 2005; Awamleh and Fernandes, 2005; Basu, 2002; Delone and Mclean, 2004; Diniz et al., 2005; Fogg et al., 2001; Gledec, 2005; Molla and Licker, 2001; Webpartner, 2005).
3. *Interactive features*: The website has clear instructions to use different parts/sections/forms of it (Vijayan and Shanmugam, 2003). Help function and clear error messages are available to help users (Achour and Bensedrine, 2005; Granath, 2006; Heimlich, 1999; Lin and Joyce, 2004; Liu and Arnett, 2000; Signore, 2005; Singh and Sook, 2002; Srivihok, 2000; Wenham and Zaphiris, 2003). FAQ is available that summarizes frequently asked questions and their answers (Achour and Bensedrine, 2005; Hussin et al., 2005; Lin et al., 2004; Lin and Joyce, 2004; Molla and Licker, 2001; Paynter and Chung, 2002; Vijayan and Shanmugam, 2003). Effective internal search tool to search the content of the website is available(Achour and Bensedrine, 2005; Awamleh and Fernandes, 2005; Basu, 2002; Cao and Zhang, 2002; Diniz et al., 2005; Fogg et al., 2001; Guru et al., 2001; Heimlich, 1999; Heimlich and Wang, 1999; Hussin et al., 2005; Kokkinaki et al., 2005; Krauss, 2003; Lin et al., 2004; Liu and Arnett, 2000; Paynter and Chung, 2002; Yoo and Jin, 2004; Zhang and Dran, 2001). Communication channel and feedback exist between user and website through email, chat rooms, online community, or suggestion form (Achour and Bensedrine, 2005; Awamleh and Fernandes, 2005; Barnes and Vidgen, 2002; Basu, 2002; Cao and Zhang, 2002; Delone and Mclean, 2004; Diniz et al., 2005; Fitzpatrick, 2000; Fogg et al., 2001; Gledec, 2005; Guru et al., 2001; Heimlich, 1999; Heimlich and Wang, 1999; Hussin et al., 2005; Kokkinaki et al., 2005; Krauss, 2003; Lin et al., 2004; Lin and Joyce, 2004; Madeja and Schoder, 2003; Mich et al., 2003; Molla and Licker,

2001; Paynter and Chung, 2002; Singh and Sook, 2002; Vijayan and Shanmugam, 2003; Webpartner, 2005). Follow-up service is offered and users can track their order easily (Liu and Arnett, 2000).

4. *Security/Privacy*: In order to gain users' trust, effective mechanisms are used to keep the transactions secure (Achour and Bensedrine, 2005; Awamleh and Fernandes, 2005; Barnes and Vidgen, 2001, 2002; Delone and Mclean, 2004; Diniz et al., 2005; Fitzpatrick, 2000; Gledec, 2005; Granath, 2005; Hussin et al., 2005; Kokkinaki et al., 2005; Krauss, 2003; Lim, 2002; Lin et al., 2004; Lin and Joyce, 2004; Liu and Arnett, 2000; Molla and Licker, 2001; Paynter and Chung, 2002; Singh and Sook, 2002; Zhang and Dran, 2001). In order to gain users' confidence, privacy of personal information is needed so that information cannot be handled or read by unauthorized users (Achour and Bensedrine, 2005; Barnes and Vidgen, 2002; Basu, 2002; Diniz et al., 2005; Granath, 2006; Kokkinaki et al., 2005; Krauss, 2003; Lim, 2002; Lin et al., 2004; Lin and Joyce, 2004; Liu and Arnett, 2000; Molla and Licker, 2001; Paynter and Chung, 2002).
5. *Customization*: The process of tailoring the content of the website according to the needs and performances of specific users (Achour and Bensedrine, 2005; Awamleh and Fernandes, 2005; Barnes and Vidgen, 2001, 2002; Basu, 2002; Delone and Mclean, 2004; Diniz et al., 2005; Fogg et al., 2001; Guru et al., 2001; Madeja and Schoder, 2003; Mich et al., 2003; Singh and Sook, 2002; Webpartner, 2005).

5. Conclusions and future work

Recently, the Internet has shown a rapid growth in terms of commercial trade volume which led to a new definition of almost all aspects of business. The deployment of recent information and communication technologies produced new era in business, finance, and economics. The Internet created a new business environment far different from anything that has come before. The explosion of the web has determined the need of measurement criteria to evaluate the aspects related to the quality of web applications. Awareness of quality issues has affected every industrial sector in recent years, since an organization with a website that is difficult to use and interact with gives a poor image on the Internet and weakens an organization's position. Therefore, it is important for an organization to assess the quality of its e-commerce service, in order to improve its services over time and benchmark against competitors and best practices in any industry.

This paper reviewed the most recent evaluation methods which were used in evaluating the quality of different websites, and proposes a comprehensive framework for assessing the quality of any website regardless of the type of service that it offers. The dimensions of the framework along with their indicators and check list are summarized in the Appendix below. Furthermore, our framework is capable of reliable applications across a broad range of websites regardless of the service they provide. These dimensions with their indicators, after being given certain

weights, could be operationalized and converted into a questionnaire. The questionnaire could be applied to different website domains, such as business, education, banking, commerce, government, and others. Results from the analysis of the questionnaire will help in evaluating these dimensions and their indicators and make the needed update on them.

Appendix A

Dimensions, indicators, and check list of the proposed framework.

Dimensions	Indicators	Check list
Content	Timely	Up-to-date information
		How frequency the website is updated
		When the website was updated
	Relevant	Organization's objectives
		Organization's history
		Customers (audience)
		Products or services
		Photography of organization's facilities
	Multilanguage/culture	Use different languages
		Present to different cultured
	Variety of presentation	Different forms (text, audio, video, ...)
	Accuracy	Precise information (no spelling, grammar errors)
		Sources of information is identified
	Objective	Objective presentation of information
	Authority	Organization's physical address
		Sponsor (s) of the site
		Manager (s) of the site
		Specifications of site's managers
		Identification of copyright
		Email to manager
Design	Attractive	Innovative
		Aesthetic effects
		Emotional appeal
	Appropriateness	Appropriate to the type of website
		Image used within it serve functional purposes
		Balancing (images, colors, and text)
		Number of screens per page
	Color	Background color
		Text color
	Image/sound/video	Number of image/sound/video
		Size of image/sound/video
		Provide alternative text for all non text elements
	Text	Consistency (type, style)
		Readable
		Relative size
		Capital letters
		Breathing space
		Multiple headings
		Scrolling text
		Sequential appearance
		of text then images

(*continued on next page*)

Appendix (*continued*)

Dimensions	Indicators	Check list
Organization	Index	Index or links to all website's pages
	Mapping	Adequate website map or navigation bar/menu
		Current page
	Consistency	General layout
	Links	Working links
		Assistant links (back to home, top, back to original website)
		Worthy links (to other related websites, no dead links)
		Visiting pages
	Logo	Organization's logo is clear and noticeable
User-friendly	Usability	Ease to use, understand, operate, find, or navigate
		Easy to find using search engines
		What's new
	Reliability	Appropriate and easy to remember URL
		Short download speed
		Multi browser support
		Work properly using different screen settings
		Fewer ads
		Measuring efficiency
		Availability
	Interactive features	Clear instructions
		Help function
		FAQ
		Effective internal search tool
		Feedback between user and website
		(email, chat, online community, suggested forms)
		Review transactions
		Tracking order
	Security/privacy	Secure transactions
		Privacy
	Customization	Tailoring content to the needs of specific users

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