2005

Web Site Quality and Usability in E-Commerce

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Chapter 4.14
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ABSTRACT

Web sites are being widely deployed commercially; however, the factors that affect the customer's perception on the quality and acceptance of Web sites are unclear. Through a literature review on information systems success, ServQual, and trust, this chapter examines and integrates four sets of factors to capture the quality of e-commerce Web sites: system quality (functionality), information quality (content), service quality, and attractor. Based on the Technology Acceptance Model in comparison with the Theory of Reasoned Action and the theory of Human-Computer Interaction/ Usability, a framework is developed relating the Web quality to customers' beliefs (perceived usefulness and ease of use of the site), attitudes (preferences for the site), and intentions (to revisit the site). A guideline for Web interface design is proposed for Web designers and managers.

INTRODUCTION

Web sites are being widely deployed commercially (Liu & Arnett, 2000; Robbins & Stylianou, 2003). There is ample anecdotal evidence that suggests the Internet is a fruitful tool for commercial purposes (Huizingh, 2000). However, just starting doing business on the Internet does not necessarily guarantee competitive advantages. On the one hand, electronic commerce (e-commerce) companies are dependent upon people visiting their Web sites, purchasing their products, and more importantly, being a repeat customer (Smith & Merchant, 2001). On the other hand, customers have too many Web sites that they can use as alternatives. There are almost no barriers for them to switch to another site if the performance of a Web site is unacceptable (Bhatti et al., 2000). So, in order to communicate with the potential customers through the Internet effectively, a well-designed, quality Web site is needed.

However, the implicit assumptions about the quality and usability of a Web site and the factors that influence the customer's perception on the acceptance of a Web site are unclear (Lin & Lu, 2000; Dhyani et al., 2002). In their work, Pollard and Blyth (1999) are much aware that it is often difficult to define what gives a Web site something extra that keeps people coming back for more. As Hoffman and Novak (1995) note, little is known about how to develop commercial Web sites to maximize profit. Berthon et al. (1996) call for research to reveal the nature and effectiveness of e-commerce (Huizingh, 2000). So, it is necessary to assess the factors that an e-commerce Web site must have to attract potential customers (Smith & Merchant, 2001). The purpose of this chapter is to explore these factors in the context of B2C e-commerce.

Most studies have focused on either the basic content management of Web sites or a specific set of functions of Web sites. In analyzing the Web site content, researchers evaluate the quality (Bhatti et al., 2000; Huizingh, 2000) and the relevance (Perkowitz & Etzioni, 1999) of online information. In exploring Web site functions, there are studies on search engines (Thelwall, 2000), waiting time (Weinberg, 2000), response time (Lin & Lu, 2000), and interface (Slatin, 2001; Wen et al., 2001). Some studies look at the level of customer feedback (Pollard & Blyth, 1999; Light & Wakeman, 2001). Most existing empirical research on the success factors influencing Web site quality is exploratory in nature (Liu & Arnett, 2000; Simeon, 1999). While there should be many factors associated with e-commerce Web site success, little effort has been done to combine these factors (Liu & Arnett, 2000). To paint a full picture of e-commerce Web site quality, this chapter examines and integrates four sets of determining factors: system quality, information quality, service quality, and attractor.

Measures/metrics are the *sine qua non* of solid, scientific research (Straub et al., 2002). Measuring attributes of a quality Web site in precise terms can enhance our understanding and advance our thinking of the state of science. The goal to be achieved by this chapter is to determine a subset of the many variables that define a quality Web site. First, the literature on different theoretical perspectives on user acceptance of information systems (IS) and dimensions of IS success model (including ServQual and trust) is reviewed. Second, a conceptual framework is developed relating e-commerce Web site quality to customers' perceptions, followed by a discussion on four essential factors capturing the Web site quality. Third, the implications are discussed and a guideline is set for Web interface design.

LITERATURE REVIEW

In this section, different theoretical perspectives on user acceptance of IS/Web site are first reviewed. They are followed by reviewing literature on dimensions of IS success model including ServQual and trust that may quantify various quality attributes of Web sites.

Theoretical Perspectives on User Acceptance of IS/Web Site

Many researches address the issues of IT design and evaluation to enhance usability and acceptance and try to identify the determinants of IT use and acceptance (Davis et al., 1989). User acceptance is a critical factor to determine the success of a Web design project. Both practitioners and researchers have a strong interest in understanding how people accept e-commerce Web sites so that better methods can be employed to design and evaluate Web sites and predict customers' response. The acceptance theory seeks to extend the model of customer/user-centered design, which is advocated in usability approaches (Nielsen, 2000), from interface improvement to predictions of likely usage (Dillon & Morris, 1996). To enhance our understanding of the determining variables

to explain the level of Web site acceptance, it is necessary to review different perspectives that touch on this issue: Theory of Reasoned Action, Technology Acceptance Model, and Human-Computer Interface/Usability Theory.

Theory of Reasoned Action (TRA)

TRA defines the relationships among beliefs, attitudes, norms, intentions, and behavior (Fishbein & Ajzen, 1975). TRA assumes that human beings are basically rational and make systematic use of information available to them when making decisions. TRA also assumes that the behavior being studied is under total volitional control of the performer (Chang, 1998). However, the prediction of behavior from intention is problematic because a variety of factors in addition to one's intention determine whether the behavior is performed.

TRA is a general model and may provide a common frame of reference within which to integrate various lines of inquiry. A substantial body of empirical data in support of TRA has accumulated (Bang et al., 2000; Chang, 1998; Jackson et al., 1997). TRA has broad applicability that spans behaviors in many fields including using a computer. The theory has gone through rigorous testing that shows its robustness in predicting a person's intention and behavior under volitional control (Bagozzi, 1992; Davis et al., 1989). However, TRA has some boundaries: (1) The behavior should be under volitional control; (2) Intent does not change prior to the performance of the behavior; (3) Intention measures should correspond to the behavioral criterion in terms of action, target, context, and time (Liker & Sindi, 1997). Free from these boundaries, TRA can be adapted to study e-commerce Web site design because most e-commerce Web site users are under volitional control and without influence from other factors such as supervisor's impact.

Technology Acceptance Model (TAM)

TAM of Davis (1989) is the most widely cited theory in the studies on user acceptance of technology. The goal of TAM is to predict the system acceptance and diagnose the design problems before users experience the system. TAM predicts that the user acceptance of a system is determined by two factors: (1) perceived usefulness and (2) perceived ease of use. Perceived usefulness is the degree to which a person believes that use of the system will enhance his or her performance. Perceived ease of use is the degree to which a person believes that use of the system will be free from efforts.

Since Davis's elucidation of TAM, numerous researchers have discovered that TAM yields consistently high-explained variance for why users use/accept systems. An adaptation of TRA, TAM is specifically tailored for modeling user acceptance of IS. Being parsimonious and theoretically justified, it provides a general justification for the determinants of computer acceptance and is capable of explaining user behavior across a range of end-user computing technologies. In contrast to TRA, in which the beliefs are considered idiosyncratic to a specific context, TAM's perceived usefulness and perceived ease of use are meant to be fairly general determinants of user acceptance. Therefore, TAM is more applicable to studying the user acceptance of an e-commerce Web site than TRA because Web site design is one kind of IT project which is always carried out in a specific context. Studies on the acceptance of Web sites using TAM theory and its refinement/extension are accumulating (Eighmey & McCord, 1998; Liu & Arnett, 2000; Mathieson et al., 2001).

Human-Computer Interaction (HCI) and Usability Engineering

HCI examines all aspects of user-interface design from the high-level concerns of organizational context and system requirements to the concep-

tual, semantic, syntactic, and lexical levels. HCI research concentrates heavily on the concept of usability. The usability of an application refers to the effectiveness, efficiency, and satisfaction with which specific users who are performing specific tasks in specific environments can use the application. Two major characteristics of usability engineering are prototyping and redesign in seeking to maximize the usability throughout the whole product development process. Nielsen (2000) provides a large number of related usability attributes: learnability, efficiency, memorability, errors, and satisfaction.

HCI/Usability theory is the most applicable to the Web site interface design (Behbunan-Fich, 2001; Gary, 1999; Nielsen, 2000; Smith et al., 1997). The usability of a Web site is about ease to use and usefulness. For example, it answers the question — does the audience think the site is easy to use? From the perspective of usability theory, a Web site has to be developed as friendly as possible, or customers will go elsewhere. Today's Internet users are savvier than ever, and a Web site needs to impress them if the site wants to keep them around. What impresses customers is not fancy presentation but the functionality. Such questions should be asked when developing a Web site, for example: Can users find what they need quickly and easily? Is there a site map or an index? Do pages load quickly? Is the Web site easy to navigate?

Dimensions of IS Success Model Including ServQual and Trust

IS Success

Many researchers attempt to identify IS success factors. Among them, the dimensions suggested by Delone and McLean (1992) receive the most attention. Based on Shannon and Weaver (1949) and Mason (1987), they postulate a multidimensional model of IS success. Shannon and Weaver (1949) define three communication levels: technical, semantic, and effectiveness (on the receiver). Mason (1978) re-labels it as production, product, and influence on recipient. By surveying 180 articles on IS success, Delone and McLean (1992) propose that existing measures be classified into six major dimensions: systems quality, information quality, use, user satisfaction, individual impact, and organizational impact.

The first four metrics of Delone and McLean's IS success model can be employed to evaluate the quality and usability of an e-commerce Web site. Systems quality means availability, response time, and usability. Information quality is completeness, relevance, and ease of understanding of information. Use means the number of site visits and the number of transactions executed. User satisfaction can be assessed as repeat purchases and repeat visits. The last two metrics refers to the impact of IS on employees and firms, which may not be useful to evaluate outside customers' perceptions on the Web site.

ServQual

The above discussed dimensions include only the system aspect of IS success but overlook the human interaction aspect (Li, 1997). This deficiency can be supplemented by the factor of service quality. Pitt et al. (1995) note that most IS effectiveness measures focus on the products rather than the services and IS effectiveness will be mismeasured if IS service quality is not included. Recently, most researchers agree that a service quality measure should be a part of IS success (Kettinger & Lee, 1995; Li, 1997; Delone & McLean, 2003).

Service quality is commonly defined as the extent to which a delivered service level matches customer expectations (Parasuraman et al., 1985). Parasuraman et al. (1985) identify ten dimensions of service quality, and these dimensions are then reduced to five dimensions (i.e., reliability, responsiveness, assurance, empathy, and tangibles), which are called the ServQual instrument (Parasuraman et al., 1988). The ServQual instrument as-

sesses the gap between what is expected and what is delivered. Pitt et al. (1995) argue that ServQual is an appropriate instrument for measuring service quality. Van Dyke et al. (1997) question the application of ServQual to IS service quality. They argue that the instrument for service perception is better than that for the difference score of the perception-minus-expectation. They propose it is preferable to use a perceptions-only method.

The ServQual instrument has been tested in IS context (Pitt et al., 1995). The instrument uses dimensions of tangibles (e.g., up-to-date hardware and software), reliability (i.e., dependable), responsiveness (i.e., prompt service to users), assurance (i.e., knowledge to do the job well), and empathy (i.e., IS has users' best interest at heart). There are some overlaps in the conceptual domains of service and system quality. In the e-commerce context, service quality covers assurance, reliability, and empathy while system quality covers tangibles and responsiveness.

Trust

In the e-commerce context, the reliability dimension of ServQual can also be explained or replaced by the critical concept of trust. Trust is crucial in the transactional buyer-seller relationship of customers and e-vendors because of the risk and uncertainty in the online environment (Reichheld & Schefter, 2000). Trust is the expectation that e-vendors will not behave opportunistically by taking the advantage of the situation (Gefen et al., 2003). It is customers' beliefs that e-vendors will behave in a reliable/dependable, ethical, and socially appropriate manner (Hosmer, 1995; Zucker, 1986).

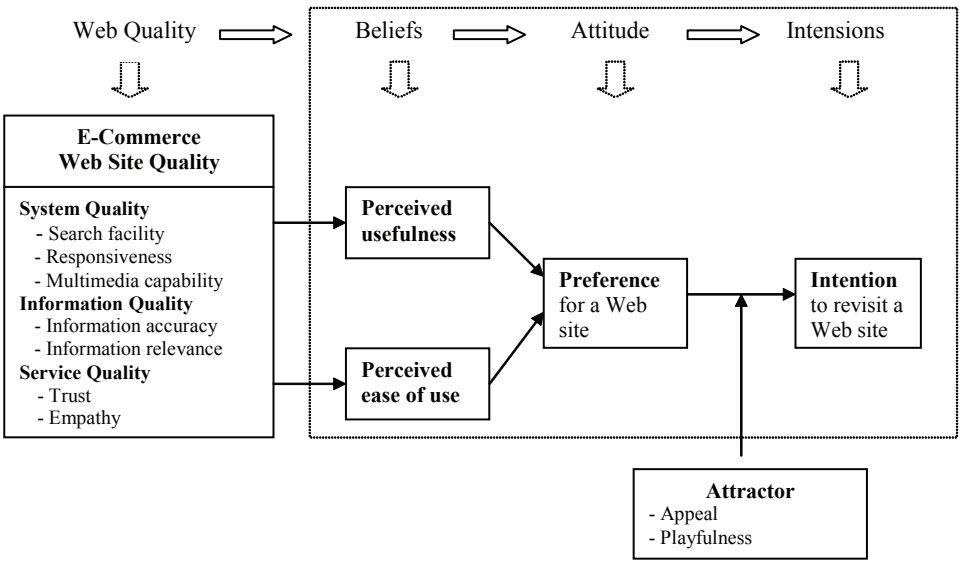
Trust is defined as the subjective probability that customers believe that an e-vendor's technology infrastructure is capable of supporting transactions (Pavlou, 2001). Pavlou (2001) posits that digital economy encourages the creation of institutional provisions to support transactions among entities that lack the traditional face-to-face context. There are many trust-building assurances provided by e-vendors, such as certification, https, guarantees, and policies. Such trust provides favorable impersonal conditions conducive to transactional success (Zucker, 1986). Gefen et al. (2003) believe that trust is critical because of the absence of proven guarantees that e-vendors will not engage in opportunistic behaviors such as unfair pricing, conveying inaccurate information, violations of privacy, and unauthorized use of credit card information.

CONCEPTUAL FRAMEWORK

Web site quality is important and widely studied in the e-commerce literature (Aladwani & Palvia, 2002; Koufaris, 2003). Liu and Arnett (2000) derive a framework from IS and marketing literature. They identify four factors that are critical to Web site success in e-commerce: information and service quality, system use, playfulness, and system design quality. Wan (2000) empirically categorizes the features of Web sites that can be evaluated from the customer's perspective. Barnes and Vidgen (2001) contend that WebQual should be used to evaluate a Web site from a customer's point of view. We think, from a customer's perspective, an attractive Web site can be addressed via four components: functionality, content, service, and attractor.

As shown in Figure 1, a framework is developed to relate the Web site quality (i.e., system quality, information quality, service quality, and attractor), to customers' perceived usefulness and perceived ease of use, and further to customers' preference and intention to reuse the site. The framework is built upon TAM, IS success model, ServQual, and trust concept (Delone & McLean, 1992; Parasuraman et al., 1985; Davis, 1989; Lin & Lu, 2000; Chen et al., 2002). In e-commerce Web sites, voluntary use is more common. Thus, the customer's perceptions of a Web site are considered by applying TAM (Davis, 1989). TAM

Figure 1. A framework for evaluating e-commerce Web site quality



indicates that perceived usefulness and ease of use will influence an individual's attitude and intention to use a Web site, and customers' beliefs (i.e., perceived usefulness and ease of use) are influenced by Web site quality (Davis, 1989; Eighmey & McCord, 1998; Liu & Arnett, 2000; Lin & Lu, 2000; Chen et al., 2002).

There are many discussions on beliefs, attitudes, and intentions based on TAM (i.e., the dotted-line box in Figure 1). For further discussion, please see Davis (1989), Lederer et al. (2000), Chen et al. (2002), and Lin and Lu (2000). Due to the restriction on the chapter space, this chapter devotes only to the discussion on the dimensions that capture the Web site quality. Based on the previous literature review section on dimensions of IS success and ServQual, four sets of factors which capture the quality of e-commerce Web site are identified: system quality, information quality, service quality, and attractor. Web site quality adapts IS success model by adding service quality, consisting of trust and empathy, and one new dimension of attractor.

For e-commerce applications, service quality is an important dimension to supplement system and information quality. Based on ServQual, any good service needs attributes of reliability, assurance, empathy, and responsiveness. In the context of e-commerce Web site, the reliability and assurance of a Web site make it possible to perform the promised service dependably and accurately, and to inspire trust and confidence (Loiacono et al., 2002). The empathy and responsiveness of a Web site include providing prompt service and caring, individualized attention to customers. Therefore, two attributes of service quality (i.e., trust and empathy) need to be included in examining a Web site quality. Service quality of a Web site, as well as system quality (functionality) and information quality (content), determines the customers' perceived usefulness and ease of using the site.

A good Web site also has a human touch — attractor (Watson et al., 1998). Attractor is a moderating variable, which includes the appeal and playfulness of a Web site. When the content and graphics of a Web site are arranged in an appealing manner and playful features are embedded in the site, users will enjoy navigating around. The users are also willing to introduce this particular site to acquaintances. This will create a source of steady and loyal customers to revisit the site. Therefore, a Web site with overall appeal (e.g., appropriate background and layout) is more likely to keep repeat customers than a site without appealing organization. Smith and Merchant (2000) recognize an appealing Web site will attract more buyers, and this will in turn increase the revenues generated from Web-based sales.

System Quality

System quality measures the functionality of a Web site: usability, availability, and response time (DeLone & McLean, 2003). Smith and Merchant (2000) find that online customers are very particular about having a Web site easy to read, as well as easy to navigate. A responsive Web site proves to be highly important to end-users (Robbins & Stylianou, 2003). Weinberg (2000) emphasizes that a page design should consider not only appearance but also loading time. Specifically the system quality of a Web site can be assessed by search facility, responsiveness, and multi-media capability.

Search Facility

Search facility reflects the extent to which a tool or structure actually helps a Web site user to find information as perceived by the user (Huizingh, 2000). One of the problems in Web site design, whereby Web site users lose track of the context and are unsure of how to proceed, is called the navigation problem (Levene, 2001). For example, participants in a study report that they are disconcerted in cases where they have to scroll to locate the selection and add an item to the shopping cart (Bhatti et al., 2000).

So, navigation tools should help users to maintain a mental map of where they are, and how various sections/pages are related to each other. Tools for navigation include: menus, directories, frames, buttons, site maps, subject trees, a search engine, image maps, and colors (Clyde, 2000). It is helpful to have a site map that Web site users can use to see the layout of the site and maneuver around it (Hudson et al., 2000). Some of the Web sites are large and this makes it difficult to find all the information on a specific subject. One way to mitigate this problem is to include a search engine on the site (Clyde, 2000).

Responsiveness

Responsiveness is defined as the willingness to help online customers. It can be measured by the time taken before replying to a customer's inquiries (Watson et al., 1998). Advances in the Internet and computer technology leave little excuse for any delay in responding (Wan, 2000). Wan (2000) considers the issue of responsiveness can be seen in at least two ways: load time and search time. Search time mostly relies on the size of the database. Many pages are designed with being aware of the load time problems and have small pictorial illustrations. Amazon.com puts a sign of text-only on its homepage.

One of the e-commerce challenges on the Web is when users experience intolerably long waits for a Web site's page to load. When the loading time exceeds the time that a Web user is willing to wait, the Web user will either redirect the Web-browser to another Web site or quit using the Web (Weinberg, 2000). Researchers have studied the significance of waiting time in service evaluations (Roslow et al., 1992). Schleifer and Amick (1989) report that system response time is inversely related to computer user satisfaction. Weinberg (2000) concludes, in terms of waiting

time on the Internet, that it is best if the homepage loads relatively fast, and that efforts toward achieving this result will be rewarded.

Multi-Media Capability

Multi-media capability refers to the non-verbal cues or features about the product and services that enhance the customer's feeling of preference for a Web site. Graphics, video clips, audio clips, and animation used to demonstrate products are examples of these features. These features can fulfill individual information needs, engender trust, and facilitate better learning experience (Chen, 2001). Non-text elements also enhance communication by helping visitors find or interpret the information presented. On the other hand, more multi-media enabled content takes more time to download. Designers must find a balance between an attractive design and providing information; this is not always easy (Huizingh, 2000).

It is probably not a good idea to go overboard with elaborate graphics, which add no more information. People may use the same site frequently. Graphics that may appear impressive when they are first seen and quickly become very tiresome when they have been viewed many times before (Hudson et al., 2000).

Information Quality

Information quality captures the e-commerce content issues. "Content is king" is a well-known slogan (Huizingh, 2000). Providing information is the basic goal of a Web site (Bhatti et al., 2000). Deciding what content to place on a Web site is extremely important. The reasoning stands that the target audience a company wants to attract drives the site content (Day, 1997; Iyer, 2001). Lin and Lu (2000) address the issue of how customers' acceptance is affected by the features and accurate information. Huizingh (2000) distinguishes content from design and operationalizes both concepts by using objective and subjective measures to capture features as well as perceptions. Perkowitz and Etzioni (1999) explore the importance of updated information with the notion of adaptive Web sites. Content is represented by two constructs: information accuracy and relevance.

Information Accuracy

The most fundamental capability of a Web site is the presentation of information about products, services, people, events or ideas. By providing the inappropriate information on the site, companies can endanger their precious business images. It is, thus, imperative for companies to extend their attentions to the possible factors to enhance the information quality (Lin & Lu, 2000). The information on the Web site should be accurate, informative, and updated. The extent to which the information is accurate determines, among others, whether the promise is fulfilled. In Ducoffe's (1996) terminology, it is the informativeness that matters. Updated information means both updating existing content and adding new content to the site. For example, amazon.com states, in its side bar, that its list of 100 hot books is updated hourly.

Information Relevance

Information relevance refers to the extent to which the information on the Web site is related to the information needs of the customer. It is unlikely that a company wants to provide the same information to different groups of customers (Huizingh, 2000). Different parts of the Web site should be designed to meet the needs of different groups of customers. The potential customers of the Web site should be identified and their needs investigated (Clyde, 2000). Thus the needs of customers, as well as the subject coverage, have guided the development of different sections of the Web site. For example, the content of an automaker's Web site should include information related to its branches in different regions or countries and

different models and features. In addition, a Web site represents an ongoing commitment. It has to be monitored and tended carefully, in the light of new developments in the company. If this does not happen, the site will become less and less relevant to the customers' needs (Clyde, 2000).

Service Quality

Service quality is an important dimension of IS success in the e-commerce environment where customer service is crucial (DeLone & McLean, 2003). Bhatti et al. (2000) present experiments designed to estimate customers' tolerance of quality of service in the context of e-commerce. Service quality measures the overall support delivered by the Web site. It includes trust and empathy. That is, the Web site should be secure and personalized.

Trust

Trust refers to the extent to which customers believe the Web site is legal, ethical, and credible and is able to protect their privacy (Wan, 2000). According to a survey conducted by the European Electronic Messaging Association, more than 79% of respondents said that reliability is the top concern of e-commerce customers (Shankar, 1996). Once users perceive that reliability has been compromised, no purchase will be made. It is therefore crucial for systems designers to understand the effect of cumulative frustration, especially as it is typically in the later stages of interaction that users are likely to commit to a purchase (Bhatti et al., 2000).

Empathy

Empathy refers to the extent to which a Web site provides caring, individualized information and attention to customers. Empathy is the presence of response mechanisms for improving the communication quality of Web sites. The nature of this dimension purports that two-way communication must exist. Features included in this dimension are email, chat rooms, bulletin boards, and mailing lists (Chen, 2001).

The concept of empathy involves the exchange of individualized messages regardless of distance or time. The Internet is well suited in this regard where users can virtually visit any Web site at any time and from any place. E-commerce is an interactive function between customers and business enterprises (Bakos, 1991). Web site users must be able to specify their needs; the site should produce the desired response (Light & Wakeman, 2001). For example, the supplier and customer may need to interact several times before all details of the order are agreed (Huizingh, 2000).

Attractor

Attractor consists of the issues of whether Web pages are fun to read and subjectively pleasing. Watson et al. (1998) coin the concept of "attractors." They use the metaphors to label/group sites into different potential attractors (e.g., entertainment park, archive, and club). Chen (2001) examines the playfulness and how it affects the quality of Web site design. His finding suggests that playfulness is an influential factor to attract customers.

Appeal

Watson et al. (1998) argue the overall appeal is a key component of Web site quality. No matter how well the content is or how interactive, reliable, and easy to search the Web site is, if users do not find the site appealing, they are not going to spend much time there (Smith & Merchant, 2001).

Playfulness

Playfulness includes the devices that attract the attention of Web site users with enjoyable constructs. Online games, software downloads, and

Q&A are examples of these devices (Chen, 2001). Embedding playful features within the Web site not only differentiates a site from others, but also enhances the user's perceived level of satisfaction (Eighmey, 1997). Watson et al. (1998) also suggests that online users seek gratification in escape, entertainment, and interaction. This suggests that there is a need for Web designers to cultivate pleasure in site design by motivating customers to participate, promoting customer excitement and concentration, and including charming features to attract customers and to help them enjoy the visit (Liu & Arnett, 2000). This will lead to increased customer activities (Schmidt, 1996).

SUMMARY AND DISCUSSION

This chapter reviews theories of Web interface designs. Through examining TRA, TAM, and HCI/Usability, their strengths and limitations are identified. For the Web site interface design, TAM and HCI/Usability are two most applicable theories. HCI shares the goal of achieving high usability for users. Usability includes ease of use plus usefulness, which is articulated by TAM theory. TAM yields consistently high-explained variance for why users use/accept systems.

This chapter also identifies and pools together four sets of factors influencing Web site quality, which in turn affects customers' perceptions, preferences, and intensions. These concepts and factors can be useful for researchers to study relationships between Web site quality and its related constructs. These factors and measures also have significant meaning for e-commerce Web site designers and managers. An attractive e-commerce Web site starts with quality information. The information provided in the Web site has to be accurate, informative, updated, and relevant to customers' needs.

A successful Web site not only contains sufficient and quality information, but also is user friendly. A Web site should have a search facility which helps users to maintain a mental map of the site and responds to the users' search quickly. Furthermore, it is necessary not only to protect the purchasers ethically and legally (i.e., trust), but also to provide caring and individualized information to customers (i.e., empathy). Besides, a superior e-commerce Web site also has an emotional dimension — attractor, which brings a human touch to the site. It is a significant factor to attract visitors to revisit the site.

Guidelines for Web Interface Design

In designing an e-commerce Web site, a designer should consider not only the software components, but also the capability of hardware. A Web user is likely to redirect the Web browser to another Web site if the page that he/she tries to access is not fully loaded within a tolerable length of time. For this reason, Clyde (2000) suggests online pages should be kept simple with limited use of graphics. This conflicts with the multi-media information requirements, and also limits the advancement of true two-way communications (Banks, 1997). Therefore, besides using simple graphics, the speed of the hardware supporting the Web site also needs to be considered.

In designing an e-commerce Web site, a more effective approach, which has been used in a limited way on the Web, is to see from the customers' perceptions (Katz et al., 1991; Weinberg, 2000). The physical design elements (i.e., type of information, links, layout, appearance, etc.) are important but insufficient; it is the customers' perception of a Web site that makes differences. For example, if a Web user perceives the loading time of a Web site to be intolerable, the user will direct the Web browser elsewhere and potentially, will not purchase any of the products. However, in circumstances where the feedback is provided during the loading, the tolerance of delay is significantly higher (e.g., an icon that indicates the proportion of information that has been loaded appears near the bottom of a Web browser).

Since trading partner trust or interpersonal trust is difficult to create for online B2C customers, the Web designer/managers should actively create an environment to enhance trust from a technological perspective. E-commerce vendors should adhere to technical standards, security procedures, and protection mechanisms that are conducive to supporting transactions. Trust can be enhanced by such mechanisms as digital signatures, encryptions, authorizations, and best business practices (Pavlou, 2001). Such mechanisms can facilitate customers' confident expectations toward a favorable outcome of the transactions in regards to the uncertainty of the technology infrastructure and control mechanisms.

In summary, for Web site developers and managers, the following guidelines are suggested: (1) Evaluate existing similar sites to gain insights into the behavior of a system and its users; (2) Compare design alternatives to determine the most efficient interface layout and the best representation; (3) Use the factors/measures developed in this chapter so that the usability goals can be specified quantitatively and competing alternatives can be compared; and (4) Check for conformance to interface style standards with proper design techniques.

CONCLUSION

With increased emphasis on conducting business via the Internet, an attractive Web site is critical to the success of e-commerce. A framework is proposed in this chapter to relate the Web quality to customers' perceptions and preferences. This chapter contributes to the existing literature by pooling together four sets of factors capturing e-commerce Web site quality: system quality, information quality, service quality, and attractor. The factors are viewed from a customer's perspective rather than a designer's view. For practitioners, the factors identified in this chapter can be used to evaluate the Web site quality. Practical guidelines for Web site design are suggested. The factors/measures and guidelines should help e-commerce companies to attract more repeat customers and thus achieve e-commerce success.

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This work was previously published in Web Systems Design and Online Consumer Behavior, edited by Y. Gao, pp. 107-124, copyright 2005 by IGI Publishing, formerly known as Idea Group Publishing (an imprint of IGI Global).