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Hangjung Zo

University of Wisconsin - Milwaukee

K. Ramamurthy

University of Wisconsin - Milwaukee

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A CHOICE MODEL FOR ASSESSING AND SELECTING E-COMMERCE WEBSITES IN A B2C ENVIRONMENT

Hangjung Zo and K. Ramamurthy

University of Wisconsin – Milwaukee

hangjzo@uwm.edu

ramurthy@uwm.edu

Abstract

Despite the claims of friction-free information availability (Brynjolfsson and Smith 2000), price dispersions for the same product are not uncommon across online retailers in the B2C segment. This study presents a model to argue that (perceived) website quality and consumer differences (in terms of prior web experience) are key variables in explaining the price dispersions.

Keywords: Website quality, consumer choice, B2C e-commerce, price dispersions

Introduction

Electronic commerce (E-commerce or EC) in business-to-consumer (B2C) environment is growing explosively. A recent report from Forrester estimates that online retail sales of products and services will be about \$269 billion (7.8 percent of total retail sales) in 2005. The report further indicates that more than 10 percent of regular retail sales (about \$378 billion) will be influenced by the Internet in 2005 additionally because consumers are likely to depend more on the Internet to get information about products and services (Dykema 2000). At some point in the future, online retail sales will even exceed traditional “brick and mortar” sale channels.

In a B2C environment, the much lower information search costs, arising from developments in information technology (IT), have been expected to induce electronic markets to be more efficient (Bakos 1997, 1998; Smith, Bailey and Brynjolfsson 1999). However, some empirical results indicate that numerous price dispersions exist in B2C electronic markets even for homogeneous products (Brynjolfsson and Smith 2000; Clemons, Hahn and Hitt 1999). For instance, Clemons et al. (1999) find that different online travel agents (OTA) offer airline tickets with different prices. They conclude that OTA use both horizontal product differentiation and price discrimination to compete with one another in electronic market. Brynjolfsson and Smith (2000) compare the prices of identical books and CDs in the Internet vis-à-vis conventional markets, and find price dispersion in the Internet markets to be no lower than that in the conventional markets.

To explain price dispersions in electronic markets, Smith et al. (1999) present that (1) awareness of the website (electronic store), (2) convenience and shopping experience on the Internet website, (3) trust about retailers, (4) lock-in (due to loyalty programs of retailers), and (5) ease of price discrimination are some of the sources of price dispersion. They suggest that the dimension of convenience in web design and the importance of trust and awareness in online markets could be the potential topics for future research to examine the phenomenon of price dispersions in the Internet markets.

Based on these ideas, this paper suggests that an e-commerce website’s characteristics will influence the perceived value of the products (offered on the website) and the consumer’s choice behavior for the website. The characteristics of the website include the level of website quality and the awareness of website, and these factors are closely related to online shopping experience and trust. This paper attempts to provide theoretical support for the price dispersion phenomenon in electronic markets through the level of website quality. Website planners and web designers can get practical insights in the event empirical support can be demonstrated for the model proposed in this research. The remainder of this paper is organized as follows: Section 2 reviews the components of B2C e-commerce environment based on the previous literatures; Section 3 develops and presents the research model; and some potential implications appear in Section 4.

Components of B2C E-Commerce

We classify the components of B2C e-commerce environment into three major categories: product characteristics, website characteristics, and user (consumer) characteristics.

Product Characteristics

Jarvenpaa and Todd (1996/97) identify three factors related to product perceptions – product quality, product variety, and price. Product quality is defined as “the expected standard of product or service excellence” (Jarvenpaa and Todd 1996/97: p.61). In electronic markets, consumers may assess product quality in different ways compared to conventional markets because they cannot assess the product quality directly. Perceived product quality is derived from product presentation through the website and any previous knowledge of the product.

In addition, price is one of the key factors for inducing consumers to purchase products. Since search costs are significantly lowered in B2C e-commerce environment, lower pricing is a strong motivator to derive competitive advantage for Internet retailers. Brynjolfsson and Smith (2000) find that prices of books and CDs on the Internet are on average 9-16% lower than prices for the same items in conventional markets. Thus, in terms of pricing, the Internet markets are expected to be more competitive than traditional channels.

Product variety is another salient factor related to product perception. Product variety refers to the range of products available from a specific retailer (Jarvenpaa and Todd 1996/97). Even though product variety as defined here influences consumers’ perception of product, it may be noted that this is more likely related to retailer (or website) rather than to product characteristics.

B2C E-Commerce Website Characteristics

This paper focuses on website quality and awareness of website as website characteristics.

Website Quality

Lohse and Spiller (1998, 1999) identify 35 attributes of Internet retail websites and group them into four categories: merchandise, promotion, convenience, and store navigation. They point out that effective customer interfaces significantly influence the traffic and sales of online retail stores. Smith et al. (1999) discuss that convenience and shopping experience on the Internet websites is one of the most important factors to explain price dispersion in the Internet markets. Convenience and store navigation (Lohse and Spiller 1999) and convenience/shopping experience (Smith et al. 1999) are closely related to website quality.

Olsina, Lafuente and Rossi (2001) develop a framework of web quality to evaluate websites of universities. Their framework includes usability, functionality, site reliability, and efficiency. Levi and Conrad (1996) propose usability principles (heuristics) for evaluating website prototypes. In addition, Lincke and Schmid (1998) suggest a logical structure for intelligent electronic product catalogs (EPC) that is composed of four components: presentation layer, semantic layer, relational model, and generic market services. Presentation layer is the user interface of website, and semantic layer is related to the meaning of data or contents. Generally, the intelligent agents search the semantic layer of EPC to find product information. Their relational model refers to the traditional database information system (IS), and finally, the generic market services include payment, logistics, etc. Their proposed logical structure of EPC also serves as a key input to determining the key components of e-commerce website quality.

Based on the foregoing brief review of previous studies, we identify four dimensions of website quality as *information (content) quality*, *presentation quality*, *service quality*, and *functional quality*. Information quality is related to the content that is provided on the site. For e-commerce sites, product information is one of the main issues related to information quality. Good product information should be accurate, current, complete, and reliable. Information about various comparable products is also a critical aspect to enhance information quality of websites. Presentation quality includes the appearance and usability of websites. It is more than just a pretty website design. Information should be well organized and convenient navigation structure should support the website, and appropriate and relevant visual design should be provided for the users. In addition to quality information and effective presentation, service quality becomes another key aspect. Over and beyond offering various alternatives to consummate the transaction during-the-sale, such as for example choices on payment or delivery mode or providing clarifications to consumers on refund policy, it is necessary to provide effective after-the-sale service, for instance, addressing return claims or resolving conflicts as well. These dimensions are closely related to shopping experience and convenience for B2C e-commerce websites. Finally, functional quality is the use of technology to provide and support appropriate services to users. Powerful search function

and secure payment processes are basic foundations for e-commerce websites. Most websites provide consumers with shopping cart metaphor to enhance the convenience of shopping.

Awareness of the Website

Awareness of the website, as noted earlier, may be another important factor for explaining price dispersions on the Internet. Many Internet retailers spend millions of dollars on advertising or reserving premium spots in portal sites to gain competitive advantages in terms of public relations (Smith et al. 1999) given that millions of e-commerce websites are doing their business on the Internet.

Economists have examined the phenomenon of traffic concentration to a few websites. Analyzing American Online (AOL) log files, Adamic and Huberman (2000) show that website popularity is highly concentrated among a few sites. Their model explains such behavior based on brand loyalty and network effects. Ogun, de la Maza and Yuret (1999) also find that brand loyalty and network effects explain high concentration in Internet markets.

User (Consumer) Characteristics

Individual differences among users (consumers) are another major component in B2C e-commerce environment. Individual differences are considered as external factors to influence consumers' behaviors in marketing context. Demographic factors such as age, income, gender, and education have been extensively examined in consumer behavior area. Within the IS field, user experience and attitudes toward computer or IS (self-efficacy) have been considered as major individual differences. In this paper, we choose users' prior web experience as a key user characteristic because we believe that prior web experience would, to a large extent, encapsulate the attitudes toward computers and is expected to influence the choice behavior for websites on the Internet more strongly than general demographic factors.

Prior Experience

Horrigan (2000) finds that the level of users' experience influences their Internet usage. He classifies Internet users into two groups (new users and experienced users) and shows that new users are more engaged in entertainment and that they hesitate more to conduct transactions on-line than experienced users.

Prior experience has also been quite extensively investigated within the context of technology acceptance model (TAM). Venkatesh and Davis (1996) find that the prior experience of information system (IS) has a positive impact on perceived ease-of-use (PEOU). Igarria, Parasuraman and Baroudi (1996) note that prior computer experience influences perceived usage and variety of use directly and indirectly through PEOU and perceived usefulness (PU). Taylor and Todd (1995), likewise, show that there is a stronger relationship between behavioral intention and behavior for experienced than for inexperienced users. In addition, Thompson, Higgins and Howell (1994) examine the direct and indirect effects of experience on personal computer (PC) utilization. They find a moderating influence for "experience" on the relationship between the antecedent constructs (in their study) and PC utilization. These findings suggest that prior user experience is one of the critical (individual-difference) factors to explain IS usage.

Research Model

In this paper, we assume that a consumer is required to choose one website from among competing Internet retailers to buy a certain product. We further assume that there is more than one website that sells the identified product and that each website has a different price for that product. We believe our basic assumption is realistic because there are hundreds of e-commerce websites on the Internet that sell various products at different prices. Figure 1 shows the proposed research model.

Model Variables

Product Price

Considering to be valid our basic assumption that a consumer is looking for a specific product to purchase on the Internet and that many e-commerce websites (Internet retailers) sell the product, it may be noted that the inherent quality of that specific product is the same. For example, suppose that a consumer wants to buy the specific model of digital camera (e.g. Kodak, Canon, Nikon, etc.), and that several websites are selling that specific model of digital camera. Given that the digital camera is made from the manufacturer (Kodak, Canon, Nikon, etc.) the inherent quality of the digital camera is the same.

However, as noted, the price of the specific product can be different across the e-commerce websites. Product price is “the total monetary cost to the consumer purchasing a product” (Jarvenpaa and Todd 1996/97: p.61). In a situation of extremely low search cost for products, lower pricing is one of critical strategies for the Internet retailers. In addition, since the phenomenon of price dispersions can be observed frequently in the Internet market (Brynjolfson and Smith 2000; Clemons et al. 1999), it is easily recognized that Internet retailers may use low pricing strategy (at least in the short to medium-term) to gain competitive advantages. Thus, we have chosen product price as one of model variables related to product value.

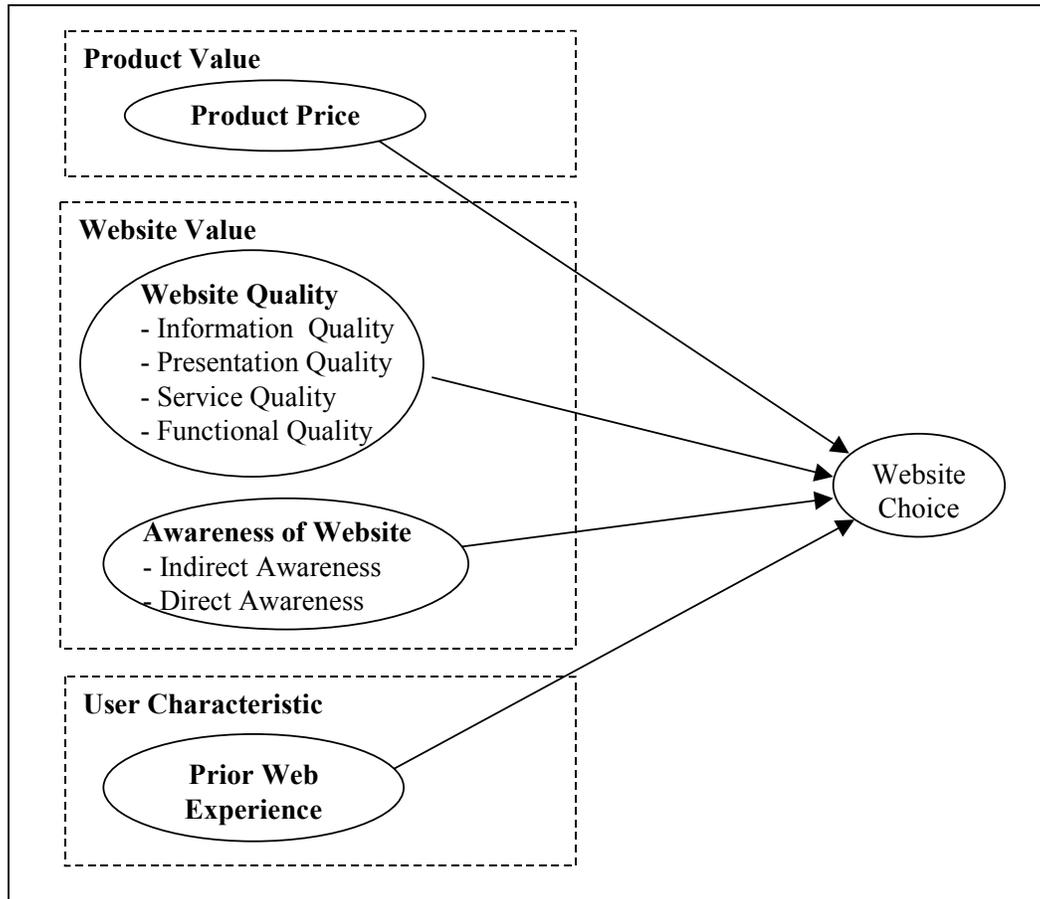


Figure 1. Research Model

Website Quality

As noted earlier, website quality is measured in terms of four different quality dimensions: information quality, presentation quality, service quality, and functional quality. We discuss these four quality dimensions next.

Information quality of a website is related to the usefulness of its contents. Wang and Strong (1996) identify four dimensions of information quality: intrinsic, contextual, representational, and accessibility. Among these four dimensions, intrinsic quality and contextual quality are related to the information quality of websites. Intrinsic quality includes accuracy, objectivity, reputation, and believability; contextual quality includes value-added, relevancy, timeliness, completeness, and amount of data (Strong, Lee and Wang 1997; Wang and Strong 1996). Another stream of research literature on information quality is website evaluation in library Sciences. Kapoun (1998) identifies five criteria for website evaluation: accuracy, authority, objectivity, currency, and coverage. Alexander and Tate (1999) use the same criteria for evaluating website and they suggest specific checklists for the different categories of websites. Coincidentally, these two research streams have similar criteria to evaluate information quality. From these literatures, we propose that the five dimensions – accuracy, objectivity, currency, value-added, and amount of information cover quite comprehensively the measure information quality of B2C e-commerce websites. We suggest that

authority, believability, and reputation belong to or are captured by the awareness of the website, and that completeness and coverage have similar connotation as “amount of data”. Furthermore, we point out that timeliness is related to currency and that product information is relevant to purchase decision-making. It is logical to expect that higher information quality would influence consumers’ choice of e-commerce sites.

Presentation quality is about how well the site presents the content and supports navigation. Several Researches and well known website award agencies provide quality criteria for evaluating websites (Olsina et al. 2001, Webby awards 2001, World Best Website Awards 2001). Among the numerous items that are included to address these quality criteria, we have chosen site structure understandability, design consistency and uniformity, professional visual appearance, and aesthetic preferences to be important dimensions of presentation quality. Again, it is logical to expect that, for instance, greater design consistency and easier navigability (representing higher presentation quality) imposes less cognitive burden on the consumers and would favorably influence their choice of the e-commerce site.

Even with good quality information that is presented well on the e-commerce site, *service quality* assumes extreme importance especially in today’s faceless commerce sites. Consumers often have a number of concerns that span the entire range from choice on payment and delivery modes, to clarifications on return policy, security of payment card data and assurance on privacy of information provided by them. Furthermore, a number of issues including the need to return back the consignment, report delivery or product quality problems, repair, maintenance and warranty issues surface. Service quality may encompass things as simple as communicating the company/site’s various policies (on return, refund, security, privacy) to frequently asked questions (FAQ), a 24-hour or 12-hour turnaround via e-mail of any clarifications/concerns, or walking-the-consumer through simple set-up/repair sequences. *Ceteris paribus* (all other things being equal), it is logical to expect that the e-commerce site with higher service quality would instill greater confidence in consumers and favorably influence their choice of that site.

Generally, in terms of *functional quality* of websites, accessibility, navigability, searchability, and download speed are considered to be salient factors to enhance the performance of websites. The World Wide Web Consortium (W3C) provides accessibility guidelines for web contents (Chisholm, Vanderheiden and Jacobs 1999). Even though websites may have good information, it may be useless if the users cannot access the information. Navigability and search capability in websites are also important because proper navigation schemes support users’ orientation in websites and give users control to find appropriate information in the websites (Olsina et al. 2001, Webby awards 2001, World Best Website Awards 2001). Dellaert and Kahn (1998) investigate how consumers’ waiting times affect their retrospective evaluation of websites, and argue that waiting time negatively affects (but not always) their evaluations of websites. Traditional human factors guidelines suggest that 10 seconds is about the maximum duration before users lose their attention (Nielsen 1996). Hence, the download speed for web pages is a critical factor for users while evaluating websites.

The primary function of B2C e-commerce websites is to handle consumers’ purchase transactions. In order to handle these transactions, most sites provide shopping cart functionality and payment process. Thus, easy shopping cart operation and simple checkout process are important, and the whole purchasing process should be secure (IBM 2000). Therefore, we choose shopping cart functionality, checkout process, and secure enabling of these aspects as criteria for functional quality of websites additionally. Finally, *ceteris paribus*, it is logical to expect that more robust functional quality (in the form, for example, Amazon.com’s patented one-click shopping) can simplify the buying process of the consumers and favorably influence their choice of the e-commerce site. Table 1 shows the detailed items for the four dimensions of website qualities.

Table 1. Dimensions of Web Quality

Web Quality Dimensions	Detailed Items
Information (content) Quality	Accuracy; objectivity; currency; value-added; amount of information
Presentation Quality	Site structure understandability; design consistency and uniformity; professional visual appearance; aesthetic preferences
Service Quality	Frequently asked questions; policy guidelines on returns, shipment guarantees, privacy; payment mode delivery mode choices; turnaround time for after-sale concerns
Functional Quality	Accessibility; navigability; download speed; search; shopping cart; check out process; security

Awareness of the Website

Running a business on the Internet is no more difficult than operating a traditional business. In fact, relatively fewer resources are required to have a store on the Internet resulting in much lower entry barriers compared to offline business. Thus, thousands of retailers open businesses on the Internet. In this extremely competitive situation, brand awareness of website may strongly influence consumers' purchase behavior, and awareness of website can be a key explanatory variable to explain price dispersion phenomena in the Internet markets (Smith et al. 1999). This may also (indirectly) attest to the trust with the site.

The awareness of a website can be divided into two aspects: *indirect awareness* and *direct awareness*. Indirect awareness of the website is formed from third-party information about the site such as advertising, word-of-mouth, news, etc. On the other hand, direct awareness of the website is formed by users' own experience of the website. While we employ the degrees of both these kinds of awareness (as measures of overall awareness of website) we would speculate that direct awareness is likely to have a stronger influence on website choice behavior.

Prior Experience

According to Horrigan (2000), users show different behaviors on the Internet depending on their Internet experience. In addition, as noted earlier, prior (information technology/systems) experience has been observed to play a key role in the context of the TAM model (Igarria et al. 1996; Venkatesh and Davis 1996). In our research model, we include users' prior web experience to explain users' web choice behavior. Web experience can be measured in terms of duration of Internet use, comfort with the Internet, and satisfaction with their Internet skills similar to GVU's 10th WWW user survey (1998). It is also necessary to identify and control for consumers' prior (favorable/ unfavorable) experience with the specific websites being investigated.

Discrete Choice Model

Discrete choice models have been widely used to explain consumers' choice behaviors of discrete alternatives (Agresti 1990; Tam and Hui 2001). In the discrete choice theory, stochastic utility models assume that consumers make decisions that are consistent with (their) utility maximization (McFadden 1974, 1980). Multinomial Logit (MNL) model is one of the popular modeling approaches in stochastic utility models. In this study, we propose MNL model as a base to investigate the consumer choice behavior of e-commerce websites.

Let $\mathbf{x}_{ij} = (P_j, IQ_{ij}, PQ_{ij}, SQ_{ij}, FQ_{ij}, IA_{ij}, DA_{ij}, EX_i)'$ denote the values of explanatory variables where,

- P_j = Price of specific product in website j
- IQ_{ij} = Perceived information quality of consumer i toward website j
- PQ_{ij} = Perceived presentation quality of consumer i toward website j
- SQ_{ij} = Perceived service quality of consumer i toward website j
- FQ_{ij} = Perceived functional quality of consumer i toward website j
- IA_{ij} = Indirect awareness of consumer i toward website j
- DA_{ij} = Direct awareness of consumer i toward website j
- EX_i = Prior web experience of consumer i .

Given the research model in Figure 1, the utility function of consumer i toward website j can be modeled as:

$$U_{ij} = f(\mathbf{x}_{ij}) + \epsilon_{ij} \quad (1)$$

where, ϵ_{ij} = Sampling error.

We formulate a mixed logit model, containing both the characteristics of consumers, and the characteristics of choices (Agresti 1990; McFadden 1974). In equation (1), P_j is the website-specific explanatory variable, EX_i is the characteristic of consumer, and the remaining variables depend on both the consumer and website choices.

Let $\pi_j(\mathbf{x}_{ij})$ denote the probability of choice response j . Given the set of response choices C_j for consumer i , the model is

$$\pi_j(\mathbf{x}_{ij}) = \frac{\exp(f(\mathbf{x}_{ij}))}{\sum_{h \in C_i} \exp(f(\mathbf{x}_{ih}))} \quad (2)$$

For each pair of websites a and b , the model (2) has the logit form

$$\log \left[\frac{\pi_a(\mathbf{x}_{ia})}{\pi_b(\mathbf{x}_{ib})} \right] = f(\mathbf{x}_{ia}) - f(\mathbf{x}_{ib}) \quad (3)$$

To reiterate, the model presented in this study proposes the effects of product price, (perceived) website quality and consumers' prior experience on their choice of e-commerce retailers (i.e., their sites). One approach to test the proposed model would be to employ a laboratory experiment. It is also possible to design a study that examines participants (actual consumers) in a natural (real-world purchasing) situation, observing their decisions, and asking them to respond to the measures of the model's constructs. However, as can be visualized, in such real-world situations not only will it be extremely difficult if not impossible to get (all) participants to consider one or few common products and common websites with price dispersion. Moreover, it will not be possible to control environmental settings such as computer performance, Internet connection, browser version, etc. Environment settings might influence users' perceptions of website quality. Thus, it may be that researchers wishing to test the proposed model may need to employ a free simulation experimental method, where treatments are not programmed and subjects are allowed to act freely within the experimental boundaries, and asked to respond to the experimental tasks (Gefen et al., 2000). A key advantage of free simulation experiments is that it is possible to conduct a "natural" experiment in a laboratory setting (Babbie, 2001).

Potential Implications

This study has several implications to researchers and practitioners. For researchers, first, we have outlined substantive theoretical support and rationale to explain the phenomenon of price dispersion in the Internet markets by linking it to website (quality) characteristics and individual difference of consumers. In addition, we have provided a well-grounded theoretical basis for measuring website quality in terms of four different quality layers. It will be interesting to examine if there is empirical validity to this model. Furthermore, we have added another application for the choice behavior literature by applying MNL model to the contemporary and technologically advanced context, namely the Internet environment.

For practitioners, we provide theoretical and empirical reasons why they should invest for realizing a better website quality. This study implies that higher quality e-commerce websites will result in favorable consumer choice (of that site) and, thus, lead to higher revenue.

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