AN EMPIRICAL INVESTIGATION OF ANTECEDENTS OF B2B WEBSITES’ EFFECTIVENESS

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Vishal Lala
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ABSTRACT
The purpose of this study was to identify the factors that influence customers’ perceptions of the effectiveness of business-to-business Websites and to test empirically the significance of these factors. Based on a review of academic and trade press literature, we identified eight factors that are thought to influence business-to-business Website effectiveness. Following standard scale development procedures, we developed valid and reliable scales for measuring each of these eight factors. A Web survey-based field study was conducted in which 540 business customers of a power tool company gave their opinions about one of eight construction industry Websites with which they were most familiar. We simultaneously tested the significance of these eight factors in

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explaining the effectiveness of Websites. Our results suggest that of the eight factors considered, informativeness, organization, transaction-related interactivity, and personalization are significant predictors of Website effectiveness. We found no direct relationship between the other factors (non-transaction-related interactivity, privacy/security, accessibility, and entertainment) and Website effectiveness.

The growth of and the hype associated with Internet commerce in both business-to-business (herein referred to as B2B) and business-to-consumer (herein referred to as B2C) domains have been discussed extensively in both academic and trade press literature (Day, 1998; Lohse, Bellman, & Johnson, 2000; Peppers & Rogers, 2001; Peterson, Balasubramanian, & Bronnenberg, 1997; Porter, 2001; Seybold, 2001). Although commerce may be conducted on the Internet in a multitude of ways, one of the commonly used methods for generating commerce involves selling goods and services through a company’s Website. While some researchers have expressed concerns about commoditization of undifferentiated products on the Internet (Alba et al., 1997; Bakos, 1997; Lynch & Ariely, 2000), others have found that Websites play important roles in overcoming commoditization and introducing price heterogeneity (Brynjolfsson & Smith, 2000). Beyond commerce, a company’s Website is also used for communicating, entertaining, and interacting with customers, prospects, and other stakeholders. Thus, one of the important issues for managers is to be able to understand, measure, and track the different factors that influence the effectiveness of their Websites.

Normative prescriptions abound in the popular press literature for what makes a Website effective. Some of these prescriptions are based on sound communication principles, while others are common-sense approaches to Website design (Nielsen, 2000). While we are aware that many consulting companies have conducted extensive empirical research on Website effectiveness, the results from such studies are, unfortunately, not available in the public domain. Published studies in academic literature have attempted the following: determination of factors that affect consumers’ evaluation of a Website (Chen & Wells, 1999; Eighmey, 1997), importance of specific features such as interactivity in a Website (Ghose & Dou, 1998; Olson & Widing, 2002), personalization agents (Ansari, Essegai, & Kohli, 2000; Iacobucci, Arabie, & Bodapati, 2000), privacy and security issues (Milne & Boza, 1999; Phelps, D’Souza, & Nowak, 2001; Yoon, 2002), importance of delay in accessing of Websites (Dellaert & Kahn, 1999; Weinberg, 2000), and importance of Website background (Stevenson, Bruner, & Kumar, 2000). Unfortunately, most published academic studies are somewhat limited by their use of B2C Websites, student/faculty samples, and small sample sizes.

Although B2C Websites have received more than their fair share of media and research attention, a recent study by the U.S. Department of Commerce claimed that B2B Websites outperformed B2C Websites in terms of commerce by more than three times in the year 2000 (www.ecommerce.gov). Recognition of the operational efficiencies and effectiveness that emerges from utilizing the Internet is driving an increasingly large number of B2B marketers to switch to the Internet for conducting transactions (Sharma, 2002). Furthermore, the impact of the Internet in international marketing is expected to be much greater for B2B than for B2C (Samiee, 1998). In general, forecasters agree that the gap between B2B and B2C commerce will only widen over the next three to five years (Forrester Research, The Gartner Group, and The Boston Consulting Group).

Given the consensus about the importance of B2B e-commerce, it is surprising that little academic research has empirically demonstrated what factors lead to the success of B2B Websites. This gap in knowledge is critical because the findings from B2C Website research may not translate well to B2B Websites due to differences between the two types of sites. For exam-
ple, Sawhney and Kaplan (1999) as well as Peppers and Rogers (2001) argued that most B2B situations differ markedly from B2C situations with respect to transaction volume, average transaction amount, number of customers, the nature of relationship between buyer and seller, logistics, and fulfillment issues associated with transactions, etc.

The objective of our research is to address the voids in the knowledge as described above. Specifically, we want to develop a reliable and valid scale for measuring and understanding the factors that lead to effective B2B Websites. In the next section, we first briefly review prior research about predictors of Website effectiveness. Based on this review, we develop operational definitions of constructs that influence Website effectiveness and propose hypotheses by relating these constructs to Website effectiveness. This is followed by a discussion of the design of our survey instrument and method of data collection. The results from a survey using a large sample of B2B customers in the construction industry are discussed in the next section. Finally, we discuss the implications of our research, consider its limitations, and identify future research directions.

CONCEPTUAL FRAMEWORK AND HYPOTHESES DEVELOPMENT

We view a B2B Website as an interface between a company and its prospects, customers, and other stakeholders. This differs from B2C Websites in that the prospects and customers are other businesses rather than consumers. Our goal is to understand the effects of prospects’ and customers’ perceptions about different dimensions of a company’s Website on its effectiveness. In considering the perceptions of prospects and customers of a B2B Website, we focus more on broader perceptual constructs (such as organization, personalization) than very specific Website design features (such as exact color combinations, font size). Consequently, our literature review ignores academic and popular press literature that has focused on very specific Website design features. Instead, we build our conceptual model by drawing upon academic and popular press literature that proposes relationships among broader perceptual constructs as shown in Figure 1. Each of the eight perceptual constructs in Figure 1 has been identified by prior researchers (Table 1 provides a summary of prior research) as antecedents that influence Website effectiveness as discussed next.

Antecedents of Website Effectiveness

Personalization. Personalization in the context of a Website involves treating each visitor as an individual, recognizing visitors when they revisit a site, and serving up information based on his/her explicit or implicit preferences (Peppers & Rogers, 1999). In general, personalization helps screen out unwanted information or product options, reduces user effort by...
eliminating the need to provide personal information or preferences, improves the accuracy of searches, and speeds up the completion of transactions. Two related sets of issues are represented in this construct (Redmond, 2002; Wind & Rangaswamy, 2001). The first set of issues relates to the idea that personalized Websites attempt to treat a visitor not as a faceless statistic but as an individual by recognizing when a visitor returns to a site, often by addressing a person by name. This is usually achieved by the use of a registration tool (user ID and password) in conjunction with cookie technology. The second set of issues relates to the idea of customization of content in a Website. That is, one is allowed a greater degree of control

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**Relevant Literature**

Personalization: Huffman & Kahn, 1998; Peppers & Rogers, 1999; Ansari, Essegaier & Kohli, 2000; Iacobucci, Arabic, & Bodapati, 2000; Waltner, 2000; Holland & Baker, 2001; Seybold, 2001; Wind & Rangaswamy, 2001; Redmond, 2002


Informativeness: Hoffman & Novak, 1996a; Bakos, 1997; Eighmey, 1997; Chen & Wells, 1999; Keeney, 1999; Brynjolfsson & Smith, 2000; Lohse, Bellman, & Johnson, 2000; Peppers & Rogers, 2001; Seybold, 2001; Sheehan & Doherty, 2001

Organization: Eighmey, 1997; Chen & Wells, 1999; Keeney, 1999; Stern, 2000; Stevenson, Bruner, & Kumar, 2000; Coyne & Hurst, 2001; Nielsen, 2001; Bauer, Grether, & Leach, 2002; Leong, Ewing, & Pitt, 2002


Accessibility: Dellaert & Kahn, 1999; Hanson, 2000; Weinberg, 2000; Bauer, Grether, & Leach, 2002

Entertainment: Eighmey, 1997; Chen & Wells, 1999; Bruner & Kumar, 2000; Peppers & Rogers, 2001
over the type of information one is exposed to when one visits a Website. Consequently, individuals get more relevant and targeted news, information, and even ads. These in turn enhance the visitor’s experience with the Website and increase the effectiveness of the Website (Peppers & Rogers, 1999; Seybold, 2001).

The explicit preference method of customization allows visitors to select both the type of information they want to see and how such information is displayed on the site. This is similar to the concept of customerization where little prior information about customers exists, but the Website is tailored based on the explicit preferences of the customer (Wind & Rangaswamy, 2001). Explicit personalization is widely practiced by many Websites, including portals (such as Yahoo, MSN, etc.), financial services (such as Schwab and E*Trade), large retailers (such as Amazon and Wal-Mart), and B2B sites (such as Cisco, Dell, Grainger). Concerns about the inability of intelligent agents to mimic human behavior, their tendency to distort information (Redmond, 2002), reduction in level of consumer control (Hoffman, Novak, & Schlosser, 2000), and privacy issues (Milne & Boza, 1999; Phelps et al., 2001; Yoon, 2002) are important reasons for the continued use of explicit personalization.

The implicit preference method of customization usually involves serving up different information to different visitors to the same Website in either of the two ways. First, information at a Website may be changed on the fly based on the past behavior of a visitor at the Website along with business rules established by the company (Peppers & Rogers, 1999; Waltner, 2000). Personalization software engines from companies such as BroadVision are based on this principle and have been used in both B2C (American Airline’s AA.com) and B2B (Rockwell’s PTplace.com) Websites. Second, information at a Website can also be changed on the fly based on recommendations systems that use collaborative filtering applications (Iacobucci et al., 2000) or Bayesian preference models (Ansari, Essegaier, & Kohli, 2000).

Case study-based evidence from corporate Websites has suggested that personalization increases the likelihood of users revisiting a Website (Holland & Baker, 2001). Empirical evidence also suggests that consumers are more satisfied when they are allowed to specify their attribute preferences in selecting products (Huffman & Kahn, 1998). In summary, whether the explicit or the implicit methods of personalization (or a combination) are employed by a Website, the fundamental goal of personalization is to increase visitors’ quality of experience at a Website, which in turn increases the Website’s effectiveness. Based on this review, we propose the following hypothesis.

- **H1:** The greater the level of perceived personalization in a Website, the higher is the Website’s effectiveness.

**Interactivity.** Many researchers have argued that the uniqueness of the Web as a communication medium over other mediums such as television and radio stems from the interactive nature of the Web (Coviello, Milley, & Marcolin, 2001, Deighton, 1997; Peterson et al., 1997). Interactivity reflects the ability of an organization to use information technology to address an individual, gather and remember the response of an individual, and address the individual once more in a way that takes into account his/her unique response (Deighton, 1996). Machine-mediated interactivity, the form of interactivity seen on the Internet, has the added advantage of ensuring real-time communication (Hoffman & Novak, 1996a). In general, interactivity frees customers from their traditional passive roles as receivers of marketing communication, gives them greater control over the information search and acquisition process, and allows them to be active participants in the marketing process (Hoffman & Novak, 1996b). This leads to a more satisfying Website experience, which in turn increases the effectiveness of Websites (Novak, Hoffman, & Yung, 2000).

While most considerations of interactivity involve a dialogue between a company and a customer or prospect (e.g., McKenna, 1995), published studies are beginning to appear about interactivity among consumers at a company’s
Website (Bickart & Schindler, 2001, Holland & Baker, 2001). It has also been noted that interactivity lies on a continuum with certain Websites being more interactive than others. Based on the degree of interactivity, the marketing practices of companies have been broadly classified as transaction, database, e-marketing, interaction, or network marketing (Coviello et al., 2001; Day, 1998; Hagel, 1999; Iacobucci & Hibbard, 1999). Our conceptualization of interactivity takes these characteristics into consideration.

Berthon, Pitt, and Watson (1996) suggested that the level of interactivity of a Website is critical in converting site visitors from “lookers” to “buyers.” In other words, interactivity at a Website influences Website effectiveness. Ghose and Dou (1998) studied interactive functions in Websites and found that the greater the degree of interactivity in a Website, the higher is the Website’s attractiveness. They found that interactivity in a Website can take many forms, including customer support activities (such as order status tracking, feedback options), market research activities (such as taking product surveys), personal choice helpers (such as key word searches, dealer locators), advertising/promotion/publicity activities (such as sweepstakes, multimedia shows, and user groups), and even entertainment activities (such as playing games). Much research on interactivity focuses on one or more of these interactive functions. Customer service and market research functions through a company’s Website are convenient, easy, available 24/7, and capable of saving the consumer time and money (Hanson, 2000; Rayport & Jaworski, 2001). Personal choice helpers such as interactive decision aids have been found to reduce the consumer’s consideration set, improve decision quality (Haubl & Trifts, 2000), and result in better overall evaluation of the decision task (Olson & Widing, 2002). User groups or online communities provide a forum for interactions among consumers. The information obtained from such online interactions has been found to generate higher levels of interest than information obtained from the Website (Bickart & Schindler, 2001). Furthermore, these interactions seem to influence the level of satisfaction (Bauer, Grether, & Leach, 2002) and site loyalty (Holland & Baker, 2001).

Although the interactive functions studied by Ghose and Dou (1998) cover most facets of interactivity, we believe their study placed relatively less emphasis on e-commerce activities as a form of interactivity due to the nature of the study (all consumer goods companies) and the time period when the research was conducted. Specifically, we believe the ability of a Website to perform transaction-related tasks, such as purchase and order tracking, are an important facet of interactivity. This is confirmed by a recent study in the B2B domain by Bauer et al. (2002), who found the ability of a site to perform transaction-related tasks to influence consumer satisfaction with the site, albeit negatively.

In view of the preceding discussion, we conceptualized two dimensions of interactivity: transaction-related and non-transaction-related. Transaction-related interactivity focuses on prospects’ and customers’ activities (at a Website) that culminate directly into commerce. Examples of such activities include the ability to place orders, make payments, and track orders. Non-transaction-related interactivity focuses on activities that do not lead directly to e-commerce, such as the ability to interact with other users and the ability to compare competitor’s product features. Regardless of whether interactivity leads directly to commercial transactions, based on a review of prior research we posit that such activities will enhance customers’ experiences at a Website and consequently lead to higher Website effectiveness. Thus, we hypothesize the following.

- \( H_2 \): The greater the perceived transaction-related interactivity in a Website, the higher is the Website’s effectiveness.
- \( H_3 \): The greater the perceived non-transaction-related interactivity in a Website, the higher is the Website’s effectiveness.

**Informativeness.** Marketing practitioners and academic researchers contend that one of the primary purposes of a company’s Website is to
provide information to prospects, customers, and other stakeholders (Chen & Wells, 1999; Eighmey, 1997; Lohse et al., 2000; Peppers & Rogers, 2001; Seybold, 2001). In fact, a recent content analysis revealed that Websites are being used by firms as a part of an integrated communication strategy to serve higher objectives such as creating desire and action (Sheehan & Doherty, 2001). This suggests that managers attribute high importance to Website information. Consequently, the ability of a Website to make a visitor feel that the Website has communicated something of value is viewed as one of the most important predictors of Website effectiveness.

Although informativeness and interactivity might seem to be similar constructs, it must be noted that informativeness is the ability of a Website to make information available. In this sense, informativeness may be looked upon as static information available on a Website (Hoffman & Novak, 1996a). Interactivity, on the other hand, reduces consumer search costs by helping to access the information available on a Website more efficiently (Bakos, 1997; Brynjolfsson & Smith, 2000). Furthermore, it must be noted that a site may score high on informativeness regardless of the manner in which is presented. Thus concerns of information overload or formatting are unrelated to the ability of the site to provide information of value. Finally, we conceptualize informativeness as a perceptual construct. Therefore, informativeness is not the same as the actual amount of information available on a Website, even though we would expect them to be correlated.

In an exploratory study by Keeney (1999), a need to maximize product information was expressed as one of the main objectives related to e-commerce. Eighmey (1997) conducted a pilot study and a field study of Website perceptions and concluded that effective Websites demonstrate the productive intersection of information and entertainment. Chen and Wells (1999) found perceived informativeness of a Website to be the second most important factor in explaining variance in visitors’ attitudes toward the Website. Lohse et al. (2000) found that the search for product information is the most important predictor of whether someone would make an online purchase. Therefore, we propose the following hypothesis.

H₄: The higher the level of perceived informativeness in a Website, the higher is the Website’s effectiveness.

**Organization.** In the early days of Internet adoption by the business world, Website designers had little concern for organization of information (Nielsen, 2001). Over time, good Website design practices evolved. These include the chunking of information, the effective use of hyperlinks, the use of contrasting background to increase legibility of text, etc. (Coyne & Hurst, 2001; Stern, 2000). Today, most Website designers agree that having a lot of information on a site may be of little value unless visitors to the Website find the arrangement of information logical and easy to understand. This is particularly relevant for B2B sites that rely on much written text to convey information (Leong, Ewing, & Pitt, 2002). We view organization as the ability of a Website to arrange content, information, images, graphics, etc., in a manner that increases clarity of information and makes it easy for a visitor to find the needed information. Consequently, a well-organized Website will be perceived as being less complex, more user friendly, and will increase the quality of a visitor’s experience at the site. This in turn will increase the effectiveness of the Website.

An exploratory study revealed ease of use as one of the concerns of Website users. Specifically, maximizing ease of user interface, making access easy, and simplifying finding a desired product were mentioned as main objectives (Keeney, 1999). Clearly, an efficiently executed Website design that enhances ease of use is an important factor in determining Website effectiveness (Eighmey, 1997). On the other hand, factors such as web page complexity that lower ease of use also lower attitude toward the site (Stevenson, Bruner, & Kumar, 2000). Similarly, in a study based on B2B sites, navigability was found to improve commitment toward the site but not satisfaction (Bauer et al., 2002). Finally, Chen and Wells (1999) found organization to
be one of the significant factors in explaining the variance in visitors’ attitudes toward a Website. Therefore, we propose the following hypothesis:

- H5: The higher the level of perceived organization in a Website, the higher is the Website's effectiveness.

Privacy and Security. The Pew Internet and American Life Project, in a large-scale study, documented that American Internet users have great concerns over how Websites are collecting, using, and sharing personally identifiable information (www.pewinternet.org). Consumers feel a growing lack of control over how their personal information is used by companies and find it unacceptable for marketers to sell information about them. In general, privacy concerns are a result of lack of control, especially over secondary use of information (Phelps et al., 2001; Sheehan & Hoy, 2000), lack of trust in the Website (Milne & Boza, 1999; Sheehan & Hoy, 2000), and knowledge of information practices by companies (Milne & Boza, 1999; Phelps et al., 2001). Gender and age-based differences also exist with women being more concerned about privacy than men and older people being more concerned than younger people (Milne & Boza, 1999; Sheehan, 1999). Consequences of such concerns may vary from not purchasing at the Website (Phelps, D’Souza, & Nowak, 2001), requesting to be taken off the mailing list, spreading negative word of the company, complaining to a third party such as an Internet Service Provider, to providing incomplete personal information when registering at the Website (Sheehan & Hoy, 1999).

In view of the negative impact of privacy concerns not only on sales but also on overall image, Websites are interested in alleviating privacy concerns. Steps that may be taken in this direction include gaining consumer trust (Hoffman, Novak, & Peralta, 1999; Luo, 2002; Yoon, 2002), providing compensation in exchange for information (Sheehan & Hoy, 1999, 2000), posting online disclosure statements (Miyazaki & Fernandez, 2000), providing a statement of how the information would be used (Hoffman et al., 1999), or use of third-party assurance seals such as Truste. Among these solutions, the focus of much research has been on developing a good relationship with consumers and thereby enhancing feelings of trust in the Website (Luo, 2002; Yoon, 2002). To summarize, privacy concerns are associated with purchasing behavior (Korgaonkar & Wolin, 1999; Phelps et al., 2001) and satisfaction with the Website (Yoon, 2002), therefore we expect that reduction of these concerns will improve Website effectiveness.

Security issues are centered on transmission and storage of transactional information by a Website. As in the case of privacy, consumers experience a lack of control over the payment information provided to a Website. Such concerns over security issues grow with increases in online proficiency, probably from greater exposure to stories of security lapses on Websites (Hoffman, Novak, & Peralta, 1999).

Security issues raised by environmental control are shared by the Websites and consumers. In contrast, the secondary use of information is a source of conflict between commercial Websites and consumers (Hoffman et al., 1999). This has led many Websites to resolve the technical issues related to security. In spite of these measures, visitors may still perceive the Website to be unsafe. Other steps taken to lower perceptions of security concerns include online retailer disclosure statements, providing online credit card security guarantees (Miyazaki & Fernandez, 2000), and use of third-party assurance seals such as Verisign or BBBOnline (Lala, Arnold, Sutton, & Guan, 2001). Reduction in perceptions of security concerns affects web usage (Korgaonkar & Wolin, 1999) and also enhances satisfaction with the Website (Yoon, 2002).

Based on the above review, we propose the following hypothesis:

H6: The greater the perceived privacy and security of a Website, the higher is the Website effectiveness.

Accessibility. Accessibility refers to the ease with which a visitor can reach a Website. Poor download speeds due to access lags, transmis-
sion lags, or server lags can be a source of irritation to users (Hanson, 2000). Long waiting time for a Website to download has been shown to negatively affect evaluations of the Website (Dellaert & Kahn, 1999; Weinberg, 2000). Accessibility of a site in general has a positive effect on trust that customers have in a Website (Bauer et al., 2002). Popular media have also publicized many incidents where long waiting times to load a Web page (due to congestion on the net) or inability to access a Website temporarily (due to server breakdown or server capacity constraints) resulted in user frustration, lost sales, and negative publicity. Therefore, we hypothesize the following:

**H7:** The greater the perceived accessibility of a Website, the higher is the Website’s effectiveness.

**Entertainment.** Many researchers have suggested that the effectiveness of a Website depends on whether visitors to a Website feel that it is able to engage their attention by being fun, exciting, pleasurable, enjoyable, or entertaining (Bruner & Kumar, 2000; Chen & Wells, 1999; Eighmey, 1997). The basic idea is that if visitors perceive their experience with a Website as entertaining, they are more likely to credit the Website with positive attributes and are also more likely to conduct business with such sites. A Website may score high on entertainment by being funny. Amusing animations, jokes, satires, and humorous remarks are often used to make a Website funny. A Website does not, however, have to be laughter-provoking to be entertaining; in fact, most entertaining Websites are not. Use of interesting themes, flashy graphics, or appealing site design may contribute to a Website experience being perceived as entertaining.

As mentioned earlier, Eighmey (1997) found that effective Websites demonstrate the productive intersection of information and entertainment. Chen and Wells (1999) factor analyzed a number of adjectives used to describe Website experiences and found that the entertainment dimension explained a third of the variance in the attitude toward the Website. Bruner and Kumar (2000) found that animation and graphics make a Web page more interesting, which in turn influences attitude toward the site. Although all three studies reported above used primarily B2C Websites, marketing practitioners have suggested that entertainment value may be important even for B2B Websites (Peppers & Rogers, 2001). On the basis of this review, we propose the following hypothesis:

**H8:** The higher the level of perceived entertainment in a Website, the higher is the Website effectiveness.

**Website Effectiveness**

Both behavioral (such as hit rate or number of unique visitors) and perceptual metrics have been proposed to measure the effectiveness of Websites. Many of the commonly used behavioral measures (such as hit rate or unique visitors) suffer from problems due to the widespread availability and use of online robots, non-uniqueness of IP addresses, and caching of Web pages by Internet browsers (Dreze & Zufryden, 1998). Thus in this research we decided in favor of a perception-based measure of effectiveness of a Website as developed by Chen and Wells (1999). They developed a valid and reliable rating scale to measure overall effectiveness of B2C Websites. We adopted this measure (with appropriate modifications for B2B Websites).

**METHOD**

**Study Context and Sample Selection**

Data for the main study were obtained from companies in the construction industry. This industry was selected for three reasons. First, one of the authors has a lot of domain expertise in this industry and knows the characteristics of the main Websites in this industry very well. Second, most companies in this industry interact directly with other businesses and not consumers. Third, a large power tool company in the Midwest sponsored this study and allowed us to sample from its customer base for data collection. A sample of 3,000 companies was randomly selected from this power tool compa-
ny’s opt-in customer e-mail list. These customers were sent an e-mail asking them to participate in a Web-based survey. As an incentive, the respondents were offered a chance to win a high-end cordless drill/driver (retail price about $300) manufactured by the power tool company.

Of the 3,000 e-mails sent, 101 were returned as undeliverable. A total of 609 responses were obtained during the two weeks (in March 2001) the survey was hosted on the Website of a market research company. However, 52 responses had to be dropped because of problems (abandonment by respondents, server crash, etc.) during data collection. Thus, we were left with 557 completed surveys and an effective response rate of approximately 19.2%. The characteristics of the final sample follow.

About 24% of the respondents belonged to companies that had fewer than 10 employees, 32% belonged to companies that had between 10 and 100 employees, and the remaining 37% belonged to companies that had more than 100 employees (7% of the respondents didn’t answer this question). These percentages compare favorably with known characteristics of the customers for the power tool company. Of the respondents’ job functions, 35% were engineers, 11% were managers, 10% were owners, 7% were purchasing agents, and the remaining 37% performed other functions. It was also found that the Internet was most often used by sample respondents to identify, compare, purchase, and specify products. The use of the Internet by sample members for managing and bidding for construction projects was less frequent.

Scale Development Procedure

We developed scales for each of the nine constructs in Figure 1 by using a four-phase iterative procedure (Churchill, 1979). In developing our measures, we used items from published scales (with appropriate modifications) wherever possible for measuring constructs used in this study. However, as pointed out in the literature review, most published studies used B2C sites and consumers as their sample. Thus, many of the construct operationalizations in the published studies had to be modified substantially because of the differences between B2B sites and B2C sites.

In the first phase, based on the literature review, we defined the constructs (see Table 2). Then items from all available measures of similar constructs in published studies were collated to generate a large pool of items. This was supplemented by additional items developed independently by the authors. Care was taken to tap the domain of each construct as closely as possible.

In the second phase, the items generated in the first phase were subjected to a face validity test by academicians in the fields of Internet marketing and electronic commerce as well as managers from the power tool company. They were asked to critically evaluate the items from the standpoint of domain representativeness, item specificity, clarity, uniqueness, and applicability in the context of the construction industry. Based on the feedback received, some items were dropped and others were modified to improve specificity and precision. In the third phase, two focus groups were conducted by the power tool company with a small sample (12 respondents in each focus group) of its customers. In addition, 20 in-depth interviews were conducted with the customers of this power tool company. Again, based on the feedback received, suggestions from the focus groups, and in-depth interviews, some items were eliminated and others revised to improve their specificity and precision. The final phase involved testing the measures, and this is described in detail in the results section. A brief description of the items corresponding to each measure remaining at the end of the third phase is described next. All the eight antecedents were measured using a 7-point scale ranging from “not at all applies” to “very much applies.”

Measures and Items

Personalization. We could not find any published scale for this construct. Thus, the items for this construct were chosen based primarily on input from focus group participants and domain experts. At the end of the third phase
of construct development, we had a four-item scale for this construct. It contained items such as “Website recognizes return visitors” and “Website allows customization of content.” These items are identified in Table 2 as P1–P4.

Interactivity. Interactivity as conceptualized by Ghose and Dou (1998) is a very broad construct. We conceptualized two dimensions of interactivity that might impact Website effectiveness. Transaction-related interactivity was operationalized using four items (identified as TRI1–TRI4 in Table 2). A representative item is “ability to make purchases.” The nontransaction-related interactivity is operationalized with seven items (identified as NTRI1–NTRI7 in Table 2). A representative item is “Website allows comparisons with competitor’s product features.”

Informativeness. Chen and Wells (1999) used the adjectives “informative,” “intelligent,” “knowledgeable,” “resourceful,” “useful,” and “helpful” for operationalizing informativeness of a B2C Website. Respondents in our focus groups and in-depth interviews questioned the suitability of these adjectives in describing B2B Websites. Based on the feedback from these interviews, we developed four items for different types of information typically offered by a company in a B2B Website. These items are identified as I1–I4 in Table 2. A representative item is “detailed technical information about products.”

Organization. Chen and Wells (1999) found the adjectives “not messy,” “not cumbersome,” “not confusing,” and “not irritating” to be associated with organization. Focus group respondents and domain experts questioned the appropriateness of all negatively worded adjectives in describing B2B sites. Based on their feedback, we developed a three-item measure for the organization including items such as “Website is well organized.” These items are identified as O1–O3 in Table 2.

Privacy and Security. Although it seems the popular press is awash with this issue, we could not find a published scale for measuring consumers’ perceptions about this construct in a Website context. Consequently, we had to develop our own measures (based on common usage of these terms as well as feedback from focus groups and domain experts) for this construct. Three items were used to tap into privacy- and security-related issues. These items are identified as PS1–PS3 in Table 2. A representative item is “Website has a posted privacy policy.”

Accessibility. Similar to the privacy/security issues, there was no published scale for measuring accessibility. Therefore, we developed a two-item measure to tap into the domain of this construct that spans Website loading quickly and functioning continuously. These items are AC1 and AC2 in Table 2.

Entertainment. Chen and Wells (1999) found six adjectives to describe the entertainment factor that came out of the factor analyses of all the adjectives in their study. However, feedback from domain experts and customer interviews indicated that the adjectives “cool” and “flashy” used by Chen and Wells are less likely to be used by a mature audience and even less likely to be used to describe B2B sites. Similarly, “imaginative” was another adjective thought to be more appropriate for a B2C site by our focus group respondents. These three items were therefore dropped. We incorporated the other three adjectives from the Chen and Wells study to develop a three-item measure for entertainment. These items are identified as E1–E3 in Table 2. A sample item is “Website is fun.”

Website Effectiveness. We used a five-item measure to tap into the domains of this construct. These items were adapted from Chen and Wells (1999). Focus group respondents considered one of the items from the Chen and Wells scale, “I feel comfortable in surfing this site,” inappropriate for B2B sites. This item was dropped. The final scale has five items. Four of these items were measured using a 7-point Likert scale with end anchors as “strongly disagree” and “strongly agree.” A representative item is “I am satisfied with the service provided by this
<table>
<thead>
<tr>
<th>Construct</th>
<th>Definitions and Items*</th>
<th>Estimation Sample</th>
<th>Holdout Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Std. Loading</td>
<td>Composite Reliability</td>
</tr>
<tr>
<td>Personalization (P)</td>
<td>Ability of a Website to treat each visitor as an individual and to serve up information based on his/her explicit or implicit preferences</td>
<td>0.83 0.72</td>
<td>0.85 0.74</td>
</tr>
<tr>
<td></td>
<td>• The site encourages registration (P1)</td>
<td>0.73</td>
<td>0.80</td>
</tr>
<tr>
<td></td>
<td>• The site recognizes return visitors (P2)</td>
<td>0.95</td>
<td>0.90</td>
</tr>
<tr>
<td>Transaction-Related (TRI)</td>
<td>Ability of a Website to engage in two-way communication with a visitor for the sole purpose of conducting a transaction</td>
<td>0.87 0.62</td>
<td>0.92 0.74</td>
</tr>
<tr>
<td>Interactivity</td>
<td>• The site allows you to make purchases (TRI1)</td>
<td>0.68</td>
<td>0.80</td>
</tr>
<tr>
<td></td>
<td>• The site allows you to make payments (TRI2)</td>
<td>0.64</td>
<td>0.78</td>
</tr>
<tr>
<td></td>
<td>• The site allows you to check order/shipment status (TRI3)</td>
<td>0.90</td>
<td>0.95</td>
</tr>
<tr>
<td></td>
<td>• The site allows you to see in-stock availability of items (TRI4)</td>
<td>0.92</td>
<td>0.91</td>
</tr>
<tr>
<td>Non-transaction-Related (NTRI)</td>
<td>Ability of a Website to engage in two-way communication with a visitor for purposes such as offering recommendations and product comparisons, which may not lead to a transaction</td>
<td>0.86 0.61</td>
<td>0.91 0.71</td>
</tr>
<tr>
<td>Interactivity</td>
<td>• The site allows customization of content (P3)</td>
<td>0.75</td>
<td>0.80</td>
</tr>
<tr>
<td></td>
<td>• The site allows you to configure product/pricing options (P4)</td>
<td>0.82</td>
<td>0.79</td>
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<tr>
<td></td>
<td>• The site makes recommendations using customer’s input and preferences (NTRI3)</td>
<td>0.80</td>
<td>0.91</td>
</tr>
<tr>
<td></td>
<td>• The site allows online exchange of information with other users (NTRI5)</td>
<td>0.78</td>
<td>0.82</td>
</tr>
<tr>
<td></td>
<td>• The site allows comparison with competitor’s product features (NTRI6)</td>
<td>0.76</td>
<td>0.84</td>
</tr>
<tr>
<td></td>
<td>• The site allows comparison with competitor’s product prices (NTRI7)</td>
<td>0.79</td>
<td>0.81</td>
</tr>
<tr>
<td>Informativeness (I)</td>
<td>Ability of a Website to provide a visitor with information of value</td>
<td>0.79 0.51</td>
<td>0.82 0.55</td>
</tr>
<tr>
<td></td>
<td>• The site provides detailed technical information about products (I1)</td>
<td>0.84</td>
<td>0.82</td>
</tr>
<tr>
<td></td>
<td>• The site provides application or trade specific usage information (I2)</td>
<td>0.88</td>
<td>0.88</td>
</tr>
<tr>
<td></td>
<td>• The site provides general information about the company (I3)</td>
<td>0.48</td>
<td>0.46</td>
</tr>
<tr>
<td></td>
<td>• The site provides industry-related news/information (I4)</td>
<td>0.54</td>
<td>0.73</td>
</tr>
<tr>
<td>Construct</td>
<td>Definitions and Items*</td>
<td>Estimation Sample</td>
<td>Holdout Sample</td>
</tr>
<tr>
<td>--------------------</td>
<td>----------------------------------------------------------------------------------------</td>
<td>-------------------</td>
<td>----------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Std. Loading</td>
<td>Composite Reliability</td>
</tr>
<tr>
<td>Organization (O)</td>
<td>Ability of a Website to arrange content, information, hyperlinks, images, and graphics in a manner that increases clarity of information and makes it easy to find needed information</td>
<td>0.86</td>
<td>0.67</td>
</tr>
<tr>
<td></td>
<td>● The site is well organized (O1)</td>
<td>0.92</td>
<td>0.96</td>
</tr>
<tr>
<td></td>
<td>● The site is not cumbersome to navigate (O2)</td>
<td>0.88</td>
<td>0.91</td>
</tr>
<tr>
<td></td>
<td>● The site looks appealing (O3)</td>
<td>0.66</td>
<td>0.74</td>
</tr>
<tr>
<td>Privacy/Security (PS)</td>
<td>Ability of a site to protect personal, financial, and transaction-related information of a visitor</td>
<td>0.93</td>
<td>0.82</td>
</tr>
<tr>
<td></td>
<td>● The site has posted a privacy policy (PS1)</td>
<td>0.86</td>
<td>0.80</td>
</tr>
<tr>
<td></td>
<td>● The site has third-party privacy/security seal (PS2)</td>
<td>0.93</td>
<td>0.91</td>
</tr>
<tr>
<td></td>
<td>● The site emphasizes security of data (PS3)</td>
<td>0.91</td>
<td>0.97</td>
</tr>
<tr>
<td>Accessibility (AC)</td>
<td>Ease with which a visitor can reach the site</td>
<td>0.76</td>
<td>0.61</td>
</tr>
<tr>
<td></td>
<td>● The site loads quickly (Activity)</td>
<td>0.80</td>
<td>0.76</td>
</tr>
<tr>
<td></td>
<td>● The site functions continuously (24/7)</td>
<td>0.76</td>
<td>0.74</td>
</tr>
<tr>
<td>Entertainment (E)</td>
<td>Ability of a Website to engage attention of a visitor by being fun, exciting, pleasurable, and enjoyable</td>
<td>0.98</td>
<td>0.93</td>
</tr>
<tr>
<td></td>
<td>● The site is fun (E1)</td>
<td>0.96</td>
<td>0.97</td>
</tr>
<tr>
<td></td>
<td>● The site is exciting (E2)</td>
<td>0.99</td>
<td>0.99</td>
</tr>
<tr>
<td></td>
<td>● The site is entertaining (E3)</td>
<td>0.95</td>
<td>0.96</td>
</tr>
<tr>
<td>Website (WSE) effectiveness</td>
<td>Overall evaluation of the goodness or badness of a Website</td>
<td>0.87</td>
<td>0.59</td>
</tr>
<tr>
<td></td>
<td>● Compared to other Websites in the construction industry, I rate this Website as (WSE1)</td>
<td>0.50</td>
<td>0.58</td>
</tr>
<tr>
<td></td>
<td>● The site makes it easy to build a relationship with the company (WSE2)</td>
<td>0.71</td>
<td>0.69</td>
</tr>
<tr>
<td></td>
<td>● I like to visit this site often (WSE3)</td>
<td>0.66</td>
<td>0.71</td>
</tr>
<tr>
<td></td>
<td>● I am satisfied with the service provided by this site (WSE4)</td>
<td>0.89</td>
<td>0.89</td>
</tr>
<tr>
<td></td>
<td>● I feel it is useful to spend my time at this site (WSE5)</td>
<td>0.87</td>
<td>0.86</td>
</tr>
</tbody>
</table>

*Note. This table shows the final assignment of items to constructs based on the scale purification. Our original conceptualization for assignment of each item to constructs can be inferred by the alphanumeric code. For instance, we conceptualized P1–P4 to load on personalization (P). In this table “Std. Loading” is “Standardized Loading” and “AVE” is “Average Variance Extracted.”
site.” A fifth item, “compared to other Websites in the construction industry, I rate this Website as” was measured on a 5-point scale with end-anchors as “one of the worst” and “one of the best.” These items are identified in Table 2 as WSE1–WSE5.

**Survey Instrument**

Respondents were given a drop-down list of ten Websites (the most common sites in the construction industry) and asked to indicate one site with which they were most familiar. (Requesting the respondents to pick the most familiar Website didn’t bias response variation. In other words, the Website selected was equally likely to be good or bad.) They were then asked to indicate their perceptions of the site chosen from the drop-down list on a battery of questions as described in the measures. At the end, they were asked a few questions about their company and their job descriptions.

**RESULTS**

**Analysis Overview**

Although we had 557 completed surveys, two of the ten Websites were chosen by very few respondents, (Website number four was picked by 11, and Website number six was picked by six respondents). Because the sample sizes for these two sites were so small, we decided to drop these observations from the analysis. Thus, our data set was reduced to 540 observations. We followed the commonly accepted procedure of randomly dividing the data set into two subsets, an estimation sample (n = 286) and a validation or holdout sample (n = 254). We then used exploratory factor analysis (EFA), reliability analysis (using Cronbach’s alpha and item-to-total correlation), and confirmatory factor analysis (CFA) to purify our measurement model using only the estimation sample data. The measurement model was then validated using confirmatory factor analysis on the holdout sample data. Finally, we used regression analysis on the entire data set to test our hypotheses about the relationships among the constructs. We note that this procedure closely follows the approach recommended by many researchers (Breckler, 1990; Bullock, Harlow, & Mulaik, 1994).

**Purification of Measurement Model on the Estimation Sample Data**

An index of Kaiser’s measure of sampling adequacy (overall MSA = 0.882) and Bartlett’s test of sphericity ($\chi^2 = 6729.11, p = 0.00$) suggested the data in the estimation sample were suitable for factor analysis (Stewart, 1981). We strongly feel that many of these constructs are correlated conceptually, and therefore we ran a factor analysis with oblique rotation. Data from all 35 questions (tapping the eight independent and the one dependent construct) were analyzed simultaneously by a common factor analysis using Oblimin rotation. Based on the eigenvalue greater than one and scree-plot criteria, we chose an eight-factor model that captured 68.64% of the total variance. Note that our conceptualization indicated a nine-factor solution. We tried a nine-factor model, but the loadings of the eight-factor model presented a cleaner and more interpretable solution than the nine-factor model. The results of the EFA for the eight-factor model are shown in Table 3.

**Purification Based on EFA Results.** All but one of the non-transaction-related interactivity items (NTRI4) in the EFA had maximum factor loadings greater than 0.4. Gorsuch (1983) suggested removal of items that fail to meet this criterion. Churchill (1979) recommended that items that produce a substantial or sudden drop in item-to-total correlations should also be considered for deletion during scale purification. All but two non-transaction-related interactivity items were uniform in the item-to-total correlations. The item “the site helps locate dealers near you” (NTRI4) had a maximum factor loading of 0.29, produced a sudden drop in item-to-total correlation and had a low communality of 0.37. The item “the site provides quick response to e-mail inquiries” (NTRI2) had an item-to-total correlation of 0.40 and produced a sudden drop in the item-to-total correlation for the non-transaction-related interactivity construct. Based on this evidence, these two items were deleted from the construct non transaction-
related interactivity. We also note that in the EFA, two of the personalization items (P3 and P4, capturing customization of content) loaded on the non-transaction-related interactivity construct. Post hoc, this made sense for the following reason. For any explicit customization of content, users typically have to provide detailed information to the Website. That is, users will have to interact with the Website. All of the eight Websites included in this study used pri-
marily the explicit method of customization. This may have produced strong correlations between respondents’ ratings about the customization elements with their ratings about the non-transaction-related interactivity items.

In the exploratory factor analysis, most of the items in Table 3 loaded on separate factors as we conceptualized. However, items belonging to the constructs “organization” and “accessibility” loaded onto the same factor in the exploratory factor analysis. Based on our conceptualization, these two constructs should be theoretically distinct from each other, and we conjecture that their confounding in the exploratory factor analysis is a chance finding. Although we cannot substantiate this, it is possible that there is an ecological correlation between Website organization and accessibility in the eight Websites used in our study. That is, we conjecture that for these eight Websites, those that are well organized are also highly accessible. In any case, we subsequently test the factor-structure (eight versus nine) in the confirmatory factor analysis as described next.

Purification Based on CFA Results. First, we tested an eight-factor model (with item assignment to factors as found in EFA) against a nine-factor model (the only change is that organization and accessibility items were separated into two factors). The results of this test suggest that the nine-factor model outperforms the eight-factor model (improvements in the chi-square difference test was significant at the 5% level). Thus, all subsequent discussion is based on the nine-factor model.

In the CFA, one of the items measuring non-transaction-related interactivity, “the site allows search capability” (NTRI1), was found to have a low squared multiple correlation (0.03) and a low standardized loading (0.17). The modification indices also suggested freeing up cross loadings for this item. Further, dropping this item improved the overall fit of the model. This item was therefore deleted. The overall fit measures of the CFA model suggest a good fit for the data ($\chi^2 = 880.96$ with $418$ df, CFI = 0.92, GFI = 0.81; RMSEA = 0.068), particularly given the attenuation in the fit measures for large models and large sample sizes.

Because many of the measures developed were new, they needed to be tested for construct validity. Measures of the level of internal consistency between items of a single construct, the differences between items of different constructs, and convergent validity were assessed for each of the nine constructs. We examined item reliabilities, tests of composite reliability, and average variance extracted. The composite reliabilities were acceptable and ranged from 0.76 to 0.98 (Fornell & Larcker, 1981). Average variance extracted measures the amount of variance captured by a construct in relation to the variance due to random measurement error. All estimates of average variance extracted exceeded the 0.5 minimum cutoff suggested by Bagozzi and Yi (1988). These values are reported in Table 2. In addition, all the standardized loadings in the measurement model were significant at the 5% level.

The first test of discriminant validity was to assess whether pairs of constructs were sufficiently different from each other or whether they could be collapsed into single factors to yield a more parsimonious model. In order to achieve this, a two-factor confirmatory factor analysis of pairs of constructs was conducted twice, once by constraining the correlation between the latent variables to unity and once by freeing up the parameter. A chi-square difference test was then used to test whether the chi-square value of the unconstrained model was significantly lower, in which case discriminant validity would be upheld (Anderson & Gerbing, 1988). The results from this test indicated that the discriminant validity was upheld in all pairwise tests. The second test of discriminant validity involves comparing the variance extracted estimates of each measure with the square of the parameter estimate between the measures. If the variance extracted estimates exceed the square of the correlation between the two constructs, evidence of discriminant validity exists (Fornell & Larcker, 1981). The variance extracted estimates reported in Table 2 for each of the constructs exceeded the square of the correlations between the constructs (i.e.,
square of the corresponding number in the phi-matrix from the LISREL output). A third and final test was whether the 95% confidence intervals of the phi’s (i.e., the correlations between the constructs) contain the value of unity (Anderson & Gerbing, 1988). This test was also found to be satisfactory for all the constructs. Therefore, the measurement model seems to be acceptable based on the estimation sample data.

**Test of Measurement Model on the Holdout Sample Data**

A more rigorous test of the measurement model is to force the CFA model (developed on the estimation sample data) on the holdout sample data. Achieving a comparable fit would offer evidence of robustness of the measures developed. Accordingly, we ran a maximum likelihood confirmatory factor analysis by forcing the final measurement model developed from the estimation sample data on the data from the holdout sample. The overall fit measures for this forced confirmatory factor analysis ($\chi^2 = 970.82$ with 418 df; CFI = 0.91, GFI = 0.77; RMSEA = 0.079) demonstrate a fairly good fit and help to cross-validate the model. In addition, the composite reliabilities and the average variance extracted in the measurement model are very similar between the estimation sample data and the holdout sample data (as shown in Table 1). Finally, all loadings were statistically significant at the 5% level for the holdout sample. Thus, we feel confident about the measurement model developed in this study.

**Regression Analysis Using the Entire Sample**

Having validated the measurement model, we formed summated rating scales for each construct by averaging the scores on the items belonging to each construct. We tested our hypotheses using a multiple regression model with Website effectiveness as the dependent variable and the eight antecedents in Figure 1 as the independent variables. We ran the regression model by simultaneously forcing all the independent variables in the model. The overall results from the regression using the entire sample data are reported in Table 4. As the numbers in the Table 4 show, the overall regression model is statistically significant ($p$ value for the
ANOVA F statistic is less than 0.001). The independent variables together explained 45% of the variance in Website effectiveness. Based on the t tests of regression coefficients in the model, informativeness, organization, transaction-related interactivity, and personalization had statistically significant and positive effects on Website effectiveness. These findings offer support for hypotheses H1, H2, H4, and H5. While the other hypotheses, H3, H6, H7, and H8, were not supported, they need to be viewed in the context of the full regression model. That is, given the significant independent variables in the model, the other independent variables (accessibility, privacy/security, nontransaction-related interactivity, and entertainment) do not significantly add to the predictive power of the model.

We note that the four nonsignificant independent variables had reasonably large zero-order correlations (as reported in Table 4) with the dependent variable. Additionally, as we conceptualized, these nonsignificant independent variables are also correlated with the significant independent variables. However, the correlations among the independent variables are not so large as to make the regression results susceptible to the problems of multicollinearity. For example, the highest variance inflation factor (VIF) is 2.97, and this value is much lower than the value of 10 commonly used as a cut-off for identifying multicollinearity problems in regression models. Thus, while no direct relationship is found between the non significant independent variables and Website effectiveness given the other significant variables in the model, it is possible that these nonsignificant independent variables have some indirect effects (due to their correlation with the significant independent variables) on the dependent variable.

Recall that each respondent in this study rated one of the eight Websites (the one with which he/she was most familiar) in this study. We were concerned about the potential biasing effects of any single Website in our tests of hypotheses using regression. To explore whether a bias was introduced due to the idiosyncratic feature of any one Website in our sample, we reran the regression model leaving out one Website at a time. The results from this leave-one-site-out analysis are reported in Table 5. All the regressions generated essentially the same pattern of results, including statistical significance of overall model, percent variance explained, statistical significance of the coefficients, and the directionality of the coefficients of the independent variables. Therefore, we conclude that our results are fairly robust and not unduly influenced by any one Website in our data.

**DISCUSSION**

The purpose of this study was to develop and validate measurement scales for factors that influence customers’ perceptions of the effectiveness of B2B Websites and to empirically test the significance of these factors. Based on our review of academic and trade press literature, we identified eight factors that might influence Website effectiveness. Using a four-phase scale development procedure, we developed valid and reliable scales for measuring each of these eight factors for B2B Websites. We then tested (simultaneously) the significance of these factors in explaining B2B Website effectiveness. The relative importance of the significant factors in explaining the variability of Website effectiveness, as captured by the partial correlation coefficients, indicate that in the context of this study informativeness is the most important factor. This is followed by organization, transaction-related interactivity, and personalization. No direct relationship could be found between the other factors (non-transaction-related interactivity, privacy/security, accessibility, and entertainment) and Website effectiveness.

This study represents the first effort in the academic literature to determine the factors that contribute to the effectiveness of B2B Websites. While qualitative arguments have been propagated in the literature, this study takes on a quantitative approach in testing hypotheses relating each factor to Website effectiveness. To the best of our knowledge, no published empirical study has attempted to test the significance of all of these factors simultaneously in a B2B...
setting. Thus, this study contributes to advancing our knowledge about what factors influence B2B Website effectiveness. In addition, the rigorously developed and tested scales generated in this study could be used to advance more research in this area. Before discussing the managerial implications of the results from our study, we first describe its limitations so that readers can interpret the implications within the context of the study limitations.

**Limitations and Further Research**

Our objective in this study was to develop and validate measures and test a simple direct-effects model in the B2B Website context. Owing to this aim, this study has a few limitations. First, this study is based on customer perceptions of Websites in the construction industry. Therefore, the findings from this study need to be interpreted with caution, as they may not generalize to other industries. Replicating these findings in future research using Websites from other industries would be extremely important for increasing the generalizability of these results. Second, as compared to other Web-based surveys, the response rate in our study was on the lower end. While respondents and nonrespondents were found to be similar in terms of demographics, this still leaves open the possibility of a nonresponse bias. Third, the framing of the Website choice question may have biased responses to the higher end of the scale. Specifically, respondents were asked to give their responses for the Website they were most familiar with. It is possible that the most familiar site was also the most preferred Website. Although responses were uniformly spread over the entire scale for the variables measured, in the absence of comparable data regarding average effectiveness scores of Websites, it is not possible to rule out the possibility of an upward bias in responses. Fourth, even though we did not address indirect effects in our model, it is possible that a hierarchical relationship exists among the eight antecedent variables investigated in this research. These types of models need to be investigated in future research. Related to this issue is the possibility of the existence of inter-

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Site 1</th>
<th>Site 2</th>
<th>Site 3</th>
<th>Site 5</th>
<th>Site 7</th>
<th>Site 8</th>
<th>Site 9</th>
<th>Site 10</th>
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</thead>
<tbody>
<tr>
<td>Personalization</td>
<td>0.13*</td>
<td>0.16*</td>
<td>0.13*</td>
<td>0.12*</td>
<td>0.12*</td>
<td>0.13*</td>
<td>0.13*</td>
<td>0.12*</td>
</tr>
<tr>
<td>Transaction-related interactivity</td>
<td>0.15*</td>
<td>0.14*</td>
<td>0.15*</td>
<td>0.12*</td>
<td>0.14*</td>
<td>0.15*</td>
<td>0.16*</td>
<td>0.17*</td>
</tr>
<tr>
<td>Non-transaction-related interactivity</td>
<td>−0.07</td>
<td>−0.03</td>
<td>−0.06</td>
<td>−0.09</td>
<td>−0.06</td>
<td>−0.05</td>
<td>−0.10</td>
<td>−0.07</td>
</tr>
<tr>
<td>Informativeness</td>
<td>0.27*</td>
<td>0.33*</td>
<td>0.27*</td>
<td>0.30*</td>
<td>0.28*</td>
<td>0.28*</td>
<td>0.27*</td>
<td>0.26*</td>
</tr>
<tr>
<td>Organization</td>
<td>0.38*</td>
<td>0.24*</td>
<td>0.38*</td>
<td>0.38*</td>
<td>0.37*</td>
<td>0.38*</td>
<td>0.41*</td>
<td>0.39*</td>
</tr>
<tr>
<td>Privacy/Security</td>
<td>−0.06</td>
<td>−0.11</td>
<td>−0.08</td>
<td>−0.01</td>
<td>−0.05</td>
<td>−0.07</td>
<td>−0.04</td>
<td>−0.07</td>
</tr>
<tr>
<td>Accessibility</td>
<td>0.05</td>
<td>0.10</td>
<td>0.04</td>
<td>0.02</td>
<td>0.06</td>
<td>0.03</td>
<td>0.01</td>
<td>0.04</td>
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<tr>
<td>Entertainment</td>
<td>0.03</td>
<td>0.10</td>
<td>0.04</td>
<td>0.01</td>
<td>0.02</td>
<td>0.01</td>
<td>0.02</td>
<td>0.04</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.44</td>
<td>0.49</td>
<td>0.44</td>
<td>0.45</td>
<td>0.45</td>
<td>0.45</td>
<td>0.46</td>
<td>0.46</td>
</tr>
<tr>
<td>Adj. $R^2$</td>
<td>0.43</td>
<td>0.47</td>
<td>0.43</td>
<td>0.44</td>
<td>0.44</td>
<td>0.44</td>
<td>0.45</td>
<td>0.45</td>
</tr>
<tr>
<td>$F$</td>
<td>47.22*</td>
<td>35.10*</td>
<td>47.06*</td>
<td>43.58*</td>
<td>49.13*</td>
<td>50.78*</td>
<td>43.11*</td>
<td>48.48*</td>
</tr>
</tbody>
</table>

Note. *p value < 0.05.
action effects among the independent variables used in this study. While we did not hypothesize or test for any interaction effect, such effects need to be investigated in future research. Finally, we used only perceptual measures for both independent and dependent variables. While perceptual measures are clearly important for generating insights into how customers perceive and value B2B Websites, the bottom line orientation of direct marketers demands that future research use other constructs such as actual revenue generated by a Website or ROI of a Website for the dependent measure.

**Managerial Implications**

Web managers are often faced by resource allocation questions; and more often than not their decisions are guided by intuition, especially in the area of Website design. Our results offer them some help in deciding on how to allocate funds. Based on the results of this study, managers for B2B sites will be well advised to improve the perceptions of their sites with respect to informativeness, organization, transaction-related interactivity, and personalization. It is interesting to note that although entertainment is often cited as the most important factor in B2C Website effectiveness, this factor was not significant in our study. Thus, it appears that utilitarian aspects of B2B sites are more important to the customers. Also interesting is the nonsignificance of privacy/security and accessibility issues. Again, popular press and B2C research have consistently played up the importance of these factors. But these seem to play relatively smaller roles in evaluation of B2B sites in the construction industry.

Another interesting outcome from this study is the operationalization and significance of the personalization dimension. As we discussed in the scale development, we first thought personalization went beyond just recognizing each visitor individually and should contain more “bells and whistles” such as the Website’s ability to customize content on the fly. It turns out that, in this sample, personalization simply means addressing visitors as individuals and remembering them when they return to the site. This personalization factor was significant in explaining variability in Website effectiveness. The customization items loaded on non-transaction-related interactivity, which turned out to be nonsignificant in the regression model. Therefore, it appears that for this industry, managers trying to influence Website effectiveness through personalization can do so simply by treating each visitor as an individual and recognizing them personally when they come back to the site. Of course, only future research can point out whether this result is specific to the B2B sites in the construction industry or whether it will hold for other B2B sites as well.

In conclusion, it is clear that for B2B Websites some factors (such as informativeness) influence Website effectiveness more than other factors (such as entertainment), and managers would do well to keep these in mind while allocating resources to Website design. The growth of B2B sites on the Web demands that further academic studies should attempt to replicate these findings and explore more complicated (such as hierarchical or mediational) models.

**REFERENCES**


