

WHAT SIGNAL ARE YOU SENDING? HOW WEBSITE QUALITY INFLUENCES PERCEPTIONS OF PRODUCT QUALITY AND PURCHASE INTENTIONS¹

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An electronic commerce marketing channel is fully mediated by information technology, stripping away much of a product's physical informational cues, and creating information asymmetries (i.e., limited information). These asymmetries may impede consumers' ability to effectively assess certain types of products, thus creating challenges for online sellers. Signaling theory provides a framework for understanding how extrinsic cues—signals—can be used by sellers to convey product quality information to consumers, reducing uncertainty and facilitating a purchase or exchange. This research proposes a model to investigate website quality as a potential signal of product quality and consider the moderating effects of product information asymmetries and signal credibility. Three experiments are reported that examine the efficacy of signaling theory as a basis for predicting online consumer behavior with an experience good. The results indicate that website quality influences consumers' perceptions of product quality, which subsequently affects online purchase intentions. Additionally, website quality was found to have a greater influence on perceived product quality when consumers had higher information asymmetries. Likewise, signal credibility was found to strengthen the relationship between website quality and product quality perceptions for a high quality website. Implications for future research and website design are examined.

Keywords: Signaling theory, signals, cues, website quality, eCommerce, perceived quality, credibility, information asymmetries

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1 Introduction

2
3 The emergence of eCommerce has provided a wide range of
4 retailers with a powerful marketing channel (Grandon and
5 Pearson 2004; Jarvenpaa et al. 2000) that can reach con-
6 sumers throughout the world. With an eCommerce marketing
7 channel, all interactions are technology-mediated, and thus
8 consumers are less able to directly assess a product—to feel,
9 touch, inspect, and sample—resulting in a diminished capa-
10 city to judge product quality prior to purchase (Jiang and
11 Benbasat 2004-2005). These channel limitations are accen-
12 tuated by the nature of the product, *search* versus *experience*,
13 and thus eCommerce may be a more or less effective channel
14 depending upon the type of product (Gupta et al. 2004; Klein
15 1998). A search product (e.g., book) is characterized as
16 having its quality readily apparent prior to purchase, while the
17 quality of an experience product (e.g., clothing) is typically
18 more difficult to evaluate prior to purchase, yet readily ap-
19 parent after use (Nelson 1970). Recent eCommerce research
20 has confirmed that consumers are more comfortable buying
21 search products online (e.g., books, airline tickets) as com-
22 pared to experience products (e.g., wine, stereo equipment)
23 due to the challenges of evaluating experience product attri-
24 butes indirectly (Gupta et al. 2004).

25
26 Online sales continue to increase (Zhang 2006) and are often
27 the fastest growing business segment for traditional retailers,
28 with an increasing number of retailers launching initiatives to
29 sell more complex, high-end products on their websites
30 (Ethier et al. 2006). In particular, the online market for
31 experience products provides a substantial and largely un-
32 tapped revenue source (Gupta et al. 2004), but represents a
33 challenge for online sellers, as the technology-mediated
34 environment makes it more difficult to convey the experiential
35 attributes associated with such products (e.g., taste, sound,
36 fit). While some researchers are investigating how a virtual
37 product experience (VPE) provided through a Web interface
38 can better convey visual product attributes (Coyle and
39 Thorson 2001; Jiang and Benbasat 2004-2005, 2007; Li et al.
40 2002), the eCommerce channel remains limited in conveying
41 experiential attributes as compared to a physical store. Thus,
42 eCommerce research and practice may be informed by
43 drawing on consumer behavior applications of signaling
44 theory (Kirmani and Rao 2000; Rao et al. 1999) to explore
45 how cues such as website quality can be used to signal pro-
46 duct quality when key product attributes cannot be readily
47 discerned.

48
49 Signaling theory has been used to identify and understand the
50 cues (i.e., signals) consumers use to make accurate assess-
51 ments of quality when faced with limited information about
52 a product (Kirmani and Rao 2000). Common signals used in

traditional, offline commerce include brand (Erdem and Swait
1998), retailer reputation (Chu and Chu 1994), price (Dawar
and Parker 1994), and store environment (Baker et al. 1994).
Among these commonly accepted signals, it has been sug-
gested that store environment possesses a strong parallel to an
eCommerce website (Watson et al. 2000), and thus an oppor-
tunity exists to extend product quality signaling to an online
domain. Given the multitude of online retailers, many of
which are unknown to consumers (King et al. 2004), and the
challenges of conveying product attributes in a technology-
mediated environment, a potentially powerful signal for
assessing product quality may be the website itself. This
research poses the following question: *Does website quality
manifest as an effective signal of product quality within an
eCommerce marketing channel?* Based on the qualifying
conditions of signaling theory, we further consider: *How do
information asymmetries and signal credibility influence the
potential relationship between website quality and product
quality?*

Signaling theory has been applied in an eCommerce context
to investigate how traditional signals (e.g., reputation, war-
ranties, and advertising expense) influence trust and perceived
risk with an online retailer (Aiken and Boush 2006; Biswas
and Biswas 2004; Wang et al. 2004; Yen 2006). The results
suggest that such signals may be more important in an online
marketing channel than in an offline one (Biswas and Biswas
2004), given the information asymmetries that can accompany
a technology-mediated channel. Website quality, however,
has not been theoretically framed and investigated as a signal
of *product quality*. Information Systems research has
reported the influence of website quality on trust with an
online retailer and purchase intentions (Everard and Galletta
2005; Gregg and Walczak 2008; McKnight et al. 2002), and
some research has considered how website quality influences
brand-related perceptions (e.g., Gwee et al. 2002; Lowry et al.
2008). An examination of website quality as a signal of pro-
duct quality can contribute to our theoretical understanding of
how website quality influences the online shopping experi-
ence, as well as inform website design.

This paper reports on a series of experimental studies that
examine the efficacy of signaling theory for predicting how
website quality, asymmetries of information, and signal
credibility influence perceptions of product quality and, sub-
sequently, online purchase intentions. We first present and
synthesize the signaling theory literature, and then frame
website quality as a signal of product quality within a research
model that depicts the moderating effects of asymmetries of
information and signal credibility. The research design and
analysis for three experimental studies are described, and the
paper concludes with a discussion of implications for theory,
practice, and future research.

1 Signaling Theory

2
3 Signaling theory has been studied extensively in disciplines
4 such as finance (Benartzi et al. 1997; Robbins and Schatzberg
5 1986), management (Certo 2003; Turban and Greening 1997),
6 and marketing (Boulding and Kirmani 1993; Kirmani 1997;
7 Kirmani and Rao 2000; Rao et al. 1999) as a framework for
8 understanding how two parties (e.g., buyer and seller) address
9 limited or hidden information in precontractual (prepurchase)
10 contexts. From a consumer perspective, signaling theory has
11 been applied to understand how consumers assess product
12 quality when faced with information asymmetries (Kirmani
13 and Rao 2000). A *signal* is a cue that a seller can use “to
14 convey information credibly about unobservable product
15 quality to the buyer” (Rao et al. 1999, p. 259). Signaling
16 theory has been applied in such contexts because it focuses on
17 precontractual information problems and specifies the condi-
18 tions under which the theory is applicable (i.e., information
19 asymmetries before and after purchase, signal credibility).
20 Broader theories such as agency theory address both pre- and
21 post-contractual information problems (Bergen et al. 1992)
22 and are less specific about qualifying conditions, while more
23 narrow theories such as source credibility (Grewal et al. 1994;
24 Hovland and Weiss 1951) do not address the nature of signals
25 or information asymmetries.

26 Signals

27
28 A review of the signaling and cue utilization literature high-
29 lights why signals are generally *extrinsic to the product* and
30 are more confidently assessed by consumers (i.e., *higher*
31 *confidence value*). Extrinsic cues are product-related attri-
32 butes that are not inherent to the product being evaluated,
33 such that changes to these attributes do not alter the funda-
34 mental nature of the product (Richardson et al. 1994).
35 Intrinsic cues are product attributes that, if altered, change the
36 fundamental nature of the product (Richardson et al. 1994).
37 Using a personal computer (PC) as an example, price would
38 be an extrinsic cue, and the internal components used in the
39 PC would be intrinsic cues. While consumers use both
40 intrinsic and extrinsic cues to assess product quality, extrinsic
41 cues may be more influential in certain contexts, such as
42 when extrinsic cues are more readily available or more easily
43 understood than intrinsic cues (Dawar and Parker 1994;
44 Zeithaml 1988). Consumers with limited time (Zeithaml
45 1988) or who have a lower need for cognition (i.e., indi-
46 viduals who are cognitive misers and less apt to engage in
47 elaborative thinking) (Chatterjee et al. 2002), are also more
48 likely to rely on extrinsic cues. As stated earlier, common
49 extrinsic attributes used as signals include brand (Erdem and
50 Swait 1998), retailer reputation (Chu and Chu 1994), price
51 (Dawar and Parker 1994), warranties (Boulding and Kirmani

1993), and store environment (Baker et al. 1994; Bloom and
Reve 1990).

Information cues provide utility for consumers based on the
predictive value and the confidence value of the cue (Cox
1967). *Predictive value* is defined as “the degree to which
consumers associate a given cue with product quality” while
confidence value is defined as the degree to which consumers
have confidence in their ability to use and judge a cue
accurately” (Richardson et al. 1994, p. 29). The internal com-
ponents of a PC (intrinsic attributes) may be highly predictive
of PC quality, but a consumer with less knowledge of PC
hardware will be less confident about assessing such attributes
accurately. The confidence value assigned to extrinsic attri-
butes, such as price and brand, is generally higher than the
confidence value assigned to intrinsic attributes because
extrinsic attributes are more easily recognized and processed
(Richardson et al. 1994; Zeithaml 1988). Empirical studies
have shown that consumers with low product familiarity rely
more on extrinsic cues because of their inability to use and
judge intrinsic product cues (Rao and Monroe 1988). In sum-
mary, when intrinsic product attributes are not readily avail-
able or when consumers are not confident in their ability to
assess these attributes, consumers will rely more on extrinsic
product attributes.

Asymmetries of Information

Asymmetries of information can be further described by *pre-*
purchase information scarcity and *post-purchase information*
clarity (Kirmani and Rao 2000). Prepurchase information
scarcity occurs when a consumer cannot access or interpret a
product’s quality attributes prior to making a purchase. Post-
purchase information clarity occurs when a consumer can
readily assess the quality of a product immediately after pur-
chase or use. For example, the online purchase of a clothing
item can have a high level of prepurchase information
scarcity, as the consumer cannot physically inspect or try on
the clothing prior to purchase. After receiving and wearing
the item, however, the consumer can have high post-purchase
information clarity because the fit and durability of the pro-
duct are now readily apparent. This information scarcity and
clarity can vary depending upon the nature of the product and
the experience of the consumer.

Drawing from the information economics literature, three
categories of goods help to distinguish levels of information
asymmetry: search, experience, and credence (Darby and
Karni 1973; Nelson 1970). A product is said to be a *search*
good when it possesses high degrees of both prepurchase and
post-purchase information *clarity* and typically does not
require physical examination prior to purchase (e.g., a book).

1 Conversely, *experience* goods possess a high degree of pre-
 2 purchase information *scarcity* and often require direct
 3 experience or use to ascertain quality (Nelson 1970). The
 4 experience gained through product use brings post-purchase
 5 *clarity* enabling consumers to immediately assess whether or
 6 not they purchased a high-quality product. *Credence* goods
 7 possess quality attributes that are cost prohibitive to ascertain
 8 and therefore cannot be easily assessed either before or after
 9 a purchase (e.g., automobile repair) (Darby and Karni 1973).
 10 The availability of product information can change based on
 11 consumer experience and the marketing channel, making it
 12 possible for products to change categories (Klein 1998). For
 13 example, in a repeat online purchase of a clothing item, a
 14 consumer has direct product experience based on the prior
 15 purchase, and the clothing item is now a search good for that
 16 consumer. Similarly, a clothing item categorized as a search
 17 good in a traditional store environment, may be better cate-
 18 gorized as an experience good in an online marketing channel
 19 where repurchase trial is not available.
 20
 21 Prepurchase information scarcity and post-purchase informa-
 22 tion clarity are qualifying conditions for signaling theory, as
 23 the unavailability of intrinsic product attributes creates the
 24 need for extrinsic signals, and post-purchase clarity enables
 25 consumers to determine whether or not these signals accu-
 26 rately conveyed product quality. Signaling theory is thus
 27 highly applicable to experience goods, which are often char-
 28 acterized by the combination of high prepurchase information
 29 scarcity and high post-purchase information clarity.

30 **Signal Credibility**

31
 32 A signal is said to be credible when some wealth, investment,
 33 or reputation will be forfeited by the seller if they send a false
 34 signal and sell a low-quality product (Boulding and Kirmani
 35 1993; Ippolito 1990). A warranty is one example of a cred-
 36 ible signal. If a seller provides a low-quality product with a
 37 warranty, the seller will incur repair or replacement expenses
 38 when buyers make warranty claims. A seller of high-quality
 39 products will not incur these same warranty costs. The wealth
 40 or asset that will be forfeited from sending a false signal is
 41 often referred to as a bond, or form of insurance to the buyer
 42 that the seller will provide a high-quality product. Signal
 43 credibility, also referred to as bond credibility, is a key theo-
 44 retical condition for a signal to be an effective mechanism for
 45 conveying high product quality. High signal or bond cred-
 46 ibility occurs when consumers believe that the seller made a
 47 significant investment by sending a signal and the investment
 48 is at risk if a false signal is sent. A false signal is thus prohi-
 49 bitively expensive for a seller of low-quality products.
 50 Information economists refer to such a distinction as a *separa-*
 51 *ting equilibrium*, as only sellers with high-quality products

can afford to send a high credibility signal, enabling buyers to
 distinguish between sellers of high and low quality products
 (Boulding and Kirmani 1993). Conversely, a *pooling equi-*
librium occurs when the benefits from sending a false signal
 outweigh the signal costs (Bergen et al. 1992).

In order for a separating equilibrium to occur, the consumer
 must recognize the investment or potential loss associated
 with signals such as reputation, advertising expense, warranty
 repairs or replacements, product price, and the cost of a high-
 end store environment. They must also believe that this
 investment (i.e., bond) is at risk if the signal is false. For
 example, a restaurant may charge a high price to signal
 hamburger quality, but the signal will only be credible if the
 restaurant is subject to loss (e.g., loss of repeat business and
 bad word of mouth) for selling a low quality hamburger. A
 restaurant in a busy, downtown area may be penalized for
 poor hamburger quality because the business relies on repeat
 visitors and referrals, but a roadside restaurant on a highway
 may be less affected by repeat visitors and referrals, making
 the reputational investment less vulnerable. When faced with
 low signal credibility, an individual can no longer assume that
 the signal is indicative of quality (Boulding and Kirmani
 1993). Thus signaling theory is most applicable when the
 consumer perceives that the seller has made a substantial
 investment in sending a high quality signal and that this
 investment is at risk if the signal is false.

Signaling Outcomes

Signaling theory has been applied across various disciplines
 to understand how one party can signal quality to another,
 less-informed party, providing the necessary information for
 a transaction or exchange to be completed. The desired out-
 come in a signaling framework is for the signal to reduce the
 information gap, assuring the less-informed party (e.g., buyer)
 that they are selecting a good-quality product or service
 (Bloom and Reve 1990). The ultimate goal of signaling is to
 positively influence desired outcomes such as perceived
 quality (e.g., of the product, service, job applicant, stock, etc.)
 and behavior (e.g., purchase intentions, hiring intentions,
 etc.). In a consumer context, a review of the empirical
 research on signaling theory shows that the vast majority of
 studies focus on product or service quality as a key outcome
 with some studies also addressing uncertainty reduction,
 brand or organization quality, and purchase intentions.²

A summary of the qualifying conditions and attributes of the
 key constructs in signaling theory along with examples is pro-

²See Kirmani and Rao (2000) for a review of prior empirical research related
 to signaling theory from the marketing discipline.

Table 1. Signaling Theory Constructs

| | Signal | Asymmetries of Information | Signal Credibility | Signal Outcome |
|-------------|--|--|---|---|
| Description | <ul style="list-style-type: none"> • Informational cues • Extrinsic to entity of interest • High confidence value | <ul style="list-style-type: none"> • Asymmetries exist • Prepurchase information scarcity • Post-purchase information clarity | <ul style="list-style-type: none"> • Signal involves some investment (bond) • Investment (bond) must be vulnerable • Subjective | <ul style="list-style-type: none"> • Improved quality perceptions • Reduced asymmetries • Completed exchange or transaction |
| Examples | <ul style="list-style-type: none"> • Price • Advertising • Warranty • Brand • Store environment | <ul style="list-style-type: none"> • Experience products and services (e.g., clothing, food, automobile) | <ul style="list-style-type: none"> • High investment or cost with future revenue dependent on repeat purchases and referrals • High cost of repairs or replacement under warranty | <ul style="list-style-type: none"> • Product/service quality • Brand quality • Reduced uncertainty • Trust • Purchase or transaction intention |

vided in Table 1. In the next section, we apply signaling theory to the eCommerce marketing channel by considering website quality as a potential signal of product quality and address how asymmetries of information and signal credibility are manifested in this technology-mediated channel.

Applying Signaling Theory to B2C eCommerce

The IT-mediated nature of eCommerce offers organizations numerous advantages (e.g., access to more consumers, increased availability, information accessibility) but it also comes with some inherent challenges. Current technological capabilities of eCommerce limit sellers' ability to convey intrinsic product attributes (e.g., taste, smell, touch, fit, etc.) (Grewal et al. 2004). Prepurchase product trial and direct product experience are a means for presenting consumers with intrinsic cues of product quality in a traditional offline environment (Smith and Swinyard 1983), but these in-store experiences are not as readily available in an online environment (Grewal et al. 2004). Consumers also encounter more unknown retailers in an online environment (Cook and Luo 2003; Delgado-Ballester and Hernandez-Espallardo 2008; Grewal et al. 2003), creating a greater need for these sellers to differentiate themselves and to address consumers' increased perceptions of risk. Consequently, sellers using an eCommerce marketing channel must leverage informational cues or *signals* that facilitate a consumer's ability to make accurate quality assessments about its products (Pavlou et al. 2007), particularly with products that have more experiential attributes being offered by unknown retailers.

Given the asymmetries of information present in the eCommerce marketing channel, we propose a research model of website quality as a signal of product quality as shown in

Figure 1. A review of the relevant IS literature suggests two streams of research that are applicable to our study— applications of signaling theory in an IS context and studies of website quality—which we now summarize.

Signaling theory has been successfully applied in IS and eCommerce marketing research, supporting the applicability of this theory to an IS context. A summary of these studies is provided in Table 2 and reveals gaps in the literature for understanding (1) how website quality functions as a signal, and (2) how this signal influences perceptions of product quality. As shown in Table 2, most marketing signaling studies in an eCommerce context have investigated how traditional signals (e.g., reputation, warranties, advertising expense, etc.) influence trust, risk, and purchase intentions with an online vendor (Aiken and Boush 2006; Biswas and Biswas 2004; Wang et al. 2004; Yen 2006). In a few studies, website quality is described as a signal (Gregg and Walczak 2008; Kim et al. 2004) or included as a relevant factor (Gwee et al. 2002; Pavlou et al. 2007), but the qualifying conditions of asymmetries of information and signal credibility have not been investigated.

The omission of perceived product quality as a signaling outcome is also revealed in Table 2. Referring back to the seminal signaling research in marketing, the primary focus was to understand how signals affect a consumer's perception of the product that was being evaluated. A key theoretical distinction in framing website quality as a signal is to describe how signal credibility and asymmetries of information influence the relationship between a signal and perceived product quality. While some eCommerce signaling research has focused on the quality of an online service (Gwee et al. 2002), product quality has been largely overlooked.

Many eCommerce studies have focused on website quality as a determinant of trust, usability, and online behavioral inten-

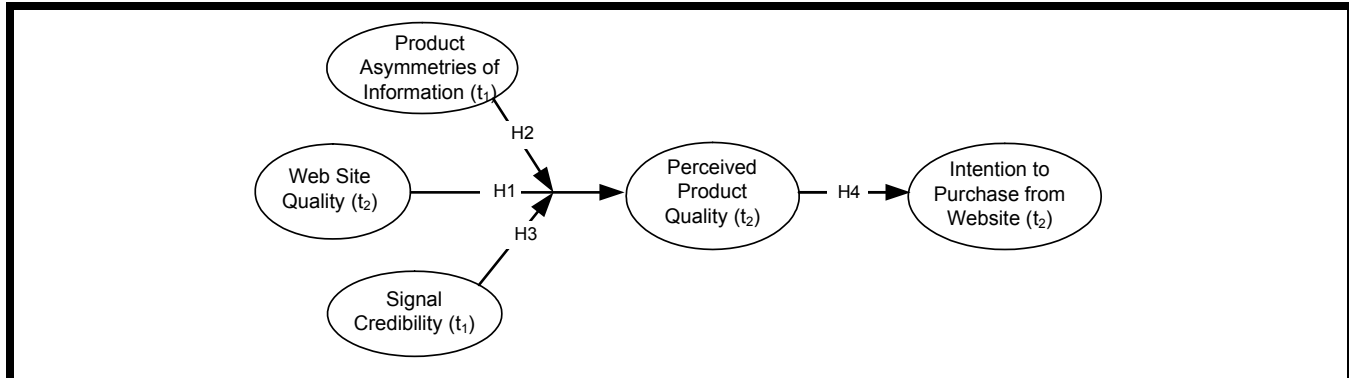


Figure 1. Research Model

tions without applying signaling theory (e.g., Collier and Bienstock 2006; Everard and Galletta 2005; Fang and Holsapple 2007; Lee and Kozar 2006; Loiacono et al. 2007; Lowry et al. 2008). Most of these studies have not addressed perceived product quality and do not differentiate between the extrinsic cues provided by the website and the intrinsic attributes of the product or vendor conveyed on the website. Measures of website quality often assess the product information conveyed on a website (e.g., information quality, accuracy, etc.), in addition to non-product-related website attributes (e.g., ease of use, entertainment, visual appeal, etc.) (Kim and Niehm 2009). While some research has considered how website quality influences brand image and awareness (e.g., Lowry et al. 2008), the website quality research stream has similarly not emphasized the influence on product quality. Signaling theory can provide new insight for eCommerce research as website quality can be conceptualized as an extrinsic cue and considered separately from the intrinsic product information conveyed on the website. Given the unique challenges associated with an eCommerce marketing channel, we argue that signaling theory is an appropriate theoretical lens for understanding how and why website quality influences perceptions of product quality. The following sections present our research hypotheses.

Website Quality as a Signal of Product Quality

A website can serve as a signal of product quality similar to how a store environment (e.g., Baker et al. 1994) serves as a signal of product quality. When consumers have incomplete information about product quality (i.e., a lack of intrinsic cues), they make inferences about product quality based on extrinsic cues that are readily available and easily evaluated (Zeithaml 1988). We now theoretically frame website quality as a signal of product quality by describing how it (1) is extrinsic to the product and (2) has a high confidence value

with consumers, making it a good heuristic for assessing product quality.

Websites can convey intrinsic product attributes (such as written product features, pictures, and virtual product experiences) as well as extrinsic product-related attributes (such as price, brand, and website quality attributes). Just as stores have fine furnishings and décor, websites have attributes (e.g., visual appeal, navigability, security, response time, etc.) that can influence perceptions of product quality. These website quality attributes can function as a signal, influencing consumers independent of the intrinsic product attributes conveyed on the website. Website quality is extrinsic to the products sold on the web site, as a low quality website does not change the inherent attributes of a product being offered online, (e.g., a low quality website can offer high-quality products). Varying levels of website quality have been shown to influence online purchase intentions while conveying the same intrinsic product information (Everard and Galletta 2005), suggesting that website quality does independently influence consumer perceptions.

The confidence value of a signal reflects the consumers' ability to assess an informational cue with certainty and accuracy (Cox 1967). Consumers are generally more confident in their ability to assess extrinsic product-related attributes than intrinsic product attributes because extrinsic cues can be evaluated without any expertise or knowledge of the product (Richardson et al. 1994). Past research has demonstrated that consumers can readily assess website quality, as evidenced by measurement instruments such as WebQual (Loiacono et al. 2007) and SiteQual (Yoo and Donthu 2001). In fact, consumers have demonstrated a high degree of confidence in assessing certain aspects of website quality, with one study demonstrating that the visual appeal of a website is often assessed in less than one second (Lindgaard et al. 2006). These findings provide support for the assertion that con-

Table 2. Review of Empirical eCommerce/Information Systems Signaling Research

| Authors | Signal | Other Factors | Dependent Measure(s) |
|---------------------------|---|--|---|
| Aiken and Boush (2006) | <ul style="list-style-type: none"> Trustmarks Objective-source ratings Advertising investments | <ul style="list-style-type: none"> Internet experience Undermines | <ul style="list-style-type: none"> Trust (affective, behavioral, and cognitive) |
| Biswas and Biswas (2004) | <ul style="list-style-type: none"> Retailer reputation Advertising expense Warranties | <ul style="list-style-type: none"> Product type (offline versus online) | <ul style="list-style-type: none"> Perceived risk (performance, financial, and transaction) |
| Bolton et al. (2008) | | <ul style="list-style-type: none"> Competition Network (strangers, partners) | <ul style="list-style-type: none"> Online trust Trustworthiness Market efficiency |
| Chu et al. (2005) | <ul style="list-style-type: none"> Infomediary reputation Manufacturer, retailer brand | | <ul style="list-style-type: none"> Online purchase intention |
| Durcikova and Gray (2009) | <ul style="list-style-type: none"> Knowledge validation process | <ul style="list-style-type: none"> Gender, experience Knowledge sourcing | <ul style="list-style-type: none"> Knowledge quality knowledge contributions |
| Gregg and Scott (2006) | <ul style="list-style-type: none"> Online reputation systems (feedback ratings) | | <ul style="list-style-type: none"> Fraud prediction/reduction |
| Gregg and Walczak (2008) | <ul style="list-style-type: none"> E-image (business name, auction website attributes, e.g., product descriptions) | <ul style="list-style-type: none"> Product type (used versus new) | <ul style="list-style-type: none"> Willingness to transact online Price premium |
| Gwee et al. (2002) | <ul style="list-style-type: none"> Advertising intensity | <ul style="list-style-type: none"> Value-added features Innovation Website quality | <ul style="list-style-type: none"> Service quality of search engine and e-mail providers Brand knowledge, equity |
| Hoxmeier (2000) | <ul style="list-style-type: none"> Software preannouncements (delivery date credibility, software reliability/features) | | <ul style="list-style-type: none"> Vendor reputation, credibility Vendor dependence Software investment |
| Kim et al. (2004) | <ul style="list-style-type: none"> Reputation Website quality (information quality and system quality) | <ul style="list-style-type: none"> Structural assurance Service quality | <ul style="list-style-type: none"> Trust in online store Customer satisfaction |
| Kimery and McCord (2006) | <ul style="list-style-type: none"> Third party assurance seals | | <ul style="list-style-type: none"> Seal familiarity |
| Pavlou et al (2007) | | <ul style="list-style-type: none"> Trust, social presence Website informativeness Product diagnosticity Purchase involvement | <ul style="list-style-type: none"> Information asymmetry Fears of seller opportunism Privacy, security concerns Actual purchases and intentions |
| Song and Zahedi (2007) | <ul style="list-style-type: none"> Trust signs (third party seals) Health infomediary reputation | <ul style="list-style-type: none"> Propensity to trust Positive experiences Structural assurance Information quality System quality | <ul style="list-style-type: none"> Trusting beliefs Risk beliefs Integrity of health infomediary Intention to use health infomediary |
| Su (2007) | <ul style="list-style-type: none"> Price Retailer reputation (rating) Correlation with brand credibility | <ul style="list-style-type: none"> Objective product information | <ul style="list-style-type: none"> eRetailer choice strategy (expected value, brand seeking, price aversion) |
| Venkatesan et al. (2006) | <ul style="list-style-type: none"> Retailer service quality | <ul style="list-style-type: none"> Market competition | <ul style="list-style-type: none"> Online product pricing strategy |
| Wang et al. (2004) | <ul style="list-style-type: none"> Seal of approval Return policy, awards Security/privacy disclosures | | <ul style="list-style-type: none"> Trust Willingness to provide information Book-marking intentions |
| Yen (2006) | <ul style="list-style-type: none"> Third-party endorsements Presence of physical store Clarity of warranty | | <ul style="list-style-type: none"> Perceived risk Online purchase intention |

sumers exhibit high levels of confidence in assessing website quality, and thus are more likely to use it when assessing product quality.

Consumers turn to signals such as store environment because they actively search for information processing “shortcuts” or heuristics that may help them assess product quality when faced with incomplete product information (Baker et al. 1994). Extrinsic cues are more important to consumers when evaluating experience goods because extrinsic cues are more readily available and easier to evaluate than intrinsic cues (Zeithaml 1988). In an online environment, website quality is said to be a critical element for online vendors due to the additional information asymmetries that are often inherent to an IT-mediated environment (Pitt et al. 1999). When the consumer has limited information about the product, website quality should influence perceived product quality because website quality is observable throughout the online shopping experience and easily evaluated, making it the most available heuristic for consumers to assess. Given that extrinsic attributes often serve as surrogates for intrinsic product attributes (Zeithaml 1988), we expect website quality, as an extrinsic attribute with high consumer confidence value, to influence consumer perceptions of product quality. Thus, we offer the following hypothesis:

H1: Perceptions of website quality positively affect a consumer’s perception of product quality.

Product Asymmetries of Information in an eCommerce Context

Asymmetries of information are a qualifying condition for the application of signaling theory to an eCommerce context. Most buyer and seller exchanges are characterized by the seller having more product information than the buyer (Bergen et al. 1992), and this imbalance can be accentuated in a technology-mediated environment (Jiang and Benbasat 2004-2005). Signaling is most effective when product asymmetries of information consist of a combination of *prepurchase information scarcity* and *post-purchase information clarity* (Kirmani and Rao 2000), which aligns with the asymmetries associated with an experience good. In an online environment, a product may be perceived as more of an experience good than a search good due to the technology mediation. Thus, the eCommerce marketing channel meets the requirement of having asymmetries of information.

Given the existence of some degree of product information asymmetries, consumers will rely on a combination of product information (i.e., intrinsic attributes) and signals (i.e., extrinsic attributes) (Richardson et al. 1994) when evaluating the

quality of an online product. The interplay between product information and signals is dependent on the availability of intrinsic product attributes (Zeithaml 1988). Narrow or low product information asymmetries (i.e., more product information is available) imply that a consumer has reliable knowledge of product quality, thus signals will have a lesser impact on perceptions of product quality. Broad or high product information asymmetries (i.e., less product information is available) imply that a consumer is uncertain of product quality, thus signals will have a greater impact on perceptions of product quality (Biswas and Biswas 2004). When product information asymmetries are high, consumers will place more emphasis on extrinsic product-related attributes (signals) to compensate for the lack of product information. Thus, the following hypothesis is proposed:

H2: Product asymmetries of information moderate the influence of website quality on a consumer’s perception of product quality; that is, the quality of a website will have a greater, positive effect on consumer perceptions of product quality when asymmetries of information are higher as compared to when asymmetries are lower.

Signal Credibility and Website Quality

Signal credibility is another qualifying condition of signaling theory in that a signal must be perceived by a consumer as being credible in order to have a positive effect on product quality. The credibility of a signal is determined by whether or not the consumer perceives that the seller stands to lose something should the signal prove to be false (i.e., bond vulnerability). With website quality as a signal, credibility would be determined by whether or not consumers perceive that the development and maintenance of a *high quality website* requires significant expense and that future/repeat sales are at risk if product quality is poor. As a credible signal, website quality should create a separating equilibrium (i.e., separating the high-quality sellers from low-quality ones).

Similar to signals such as advertising and brand name,³ a seller makes an upfront investment in a website and this expense is incurred regardless of whether or not a sale occurs. The seller hopes to recoup this investment through future sales. As previously discussed, consumers can readily assess

³Signals such as advertising and brand name are considered sale-independent, default-independent signals because the seller has incurred these expenses upfront regardless of whether any products are sold (Kirmani and Rao 2000). Other signals such as coupons, price, and warranties differ (i.e., sale-contingent, default-contingent) in that expenses are incurred (or revenues are at risk) only during the transaction or in the future.

1 the quality of a website (Loiacono et al. 2007; Yoo and
 2 Donthu 2001) and thus can infer the relative investment
 3 necessary to develop a high quality commercial website. The
 4 costs of developing and maintaining a high quality com-
 5 mercial website are not trivial (Simpson 2005), and low
 6 quality websites are still commonplace on the Internet
 7 (Flanders 2009). As a result, a separating equilibrium for
 8 website signal credibility is likely to occur because consumers
 9 can easily discern between commercial websites of high and
 10 low quality, similar to how consumers can discern the dif-
 11 ferences between high and low quality store environments.
 12 Recognition of the seller's investment in the website does not
 13 require any complex calculations or knowledge of the seller's
 14 margin or market share; instead, consumers can observe that
 15 a website is of high quality and infer that the seller needs
 16 future sales to recoup this investment.⁴ Electronic word of
 17 mouth helps to insure that online sellers are penalized for
 18 sending false signals, as online consumers readily share their
 19 opinions with others through e-mail, online referrals, and
 20 blogs, and impact future sales (Reichheld and Scheffer 2000).

21
 22 Signaling research suggests a moderating effect of signal
 23 credibility such that a more credible signal should have a
 24 stronger effect on perceived product quality than a less
 25 credible signal (Boulding and Kirmani 1993). Signals with no
 26 credibility should have little effect or possibly a negative
 27 effect on perceived quality, as consumers realize that the
 28 signal is meaningless and may see the seller as being dis-
 29 honest (Boulding and Kirmani 1993). Given website quality
 30 as a signal, if consumers believe that a high quality website is
 31 expensive and requires significant expertise, then a high
 32 quality web site should strongly influence perceived product
 33 quality, as only high quality sellers could afford (through
 34 future sales) to make such an investment. If consumers were
 35 informed, however, that a good quality website is only
 36 modestly expensive, the signaling influence on perceived
 37 product quality would be reduced as the signal's ability to
 38 differentiate among sellers has been reduced. In summary,
 39 the strength of the relationship between website quality and
 40 perceived product quality increases with the perceived
 41 credibility of the website quality signal. Thus, we offer the
 42 following hypothesis:

H3: Signal credibility moderates the influence of website quality on a consumer's perception of product quality; that is, the quality of a website will have a greater, positive effect on consumer perceptions of product quality when signal credibility is higher as compared to when signal credibility is lower.

Perceived Product Quality and Purchase Intentions

While the IS literature has focused on constructs such as trust, usefulness, enjoyment, and website quality as determinants of online purchase intention (Gefen et al. 2003; Koufaris 2002; McKnight et al. 2002; Palmer 2002; Van der Heijden et al. 2003), there is both theoretical and empirical support that document the influence of perceived product quality on purchase intentions. The theory of reasoned action includes *attitude* as a key determinant of behavior or behavioral intention, with the behavior specified in terms of a behavioral action (e.g., purchase or buy) involving a target object (e.g., product) in a certain context and time frame (e.g., eCommerce marketing channel, sometime in the future) (Ajzen and Fishbein 1980). An attitudinal measure of the target object (e.g., perceived product quality) is thus likely to influence behavioral intentions with that target object. This theoretical relationship has been supported in empirical marketing research in which the attitudinal factor of perceived product quality is found to have a strong relationship with purchase intentions (Boulding and Kirmani 1993; Dodds et al. 1991; Rao et al. 1999). An opportunity exists to investigate the causal link between perceived product quality and behavioral intention in an online environment, and to better understand how website quality signaling can ultimately influence online purchase intentions. Thus, we offer our final hypothesis:

H4: The perceived quality of a product will positively affect a consumer's intention to use a website to purchase the product.

Next, the research method used to test these hypothesized relationships is discussed.

Research Method and Analysis

Three experimental studies were conducted to test the proposed research model as summarized in Table 3. Study 1 was a preliminary study designed to examine the viability of website quality as a signal of product quality and to report on

⁴Signaling theory has been criticized for requiring consumers and businesses to have knowledge of the sellers' margins, market share, and market size in order to evaluate the investment made by a seller (Kirmani and Rao 2000). Consequently, some signals, such as coupons, price, and warranties, may require consumers to have a more advanced understanding of the sellers' business. However, upfront expenditures such as websites, advertising, and brand, are more easily evaluated in general, and can be evaluated relative to other sellers.

Table 3. Summary of Experimental Studies

| | Study 1 | Study 2 | Study 3 |
|-----------------------|---|---|--|
| Design | 6 × 1 lab experiment | 2 × 2 lab experiment | 2 × 2 lab experiment |
| Focus | <ul style="list-style-type: none"> Instrumentation validity Website quality as signal | <ul style="list-style-type: none"> Product information asymmetries | <ul style="list-style-type: none"> Signal credibility |
| Variables Manipulated | WSQ | WSQ PAI | WSQ SC |
| Variables Measured | WSQ PPQ PAI BI SC | PPQ BI | PPQ BI |
| Analysis Method | PLS* | ANOVA/Regression | ANOVA/Regression |
| Hypotheses Tested** | H1, H4 (all were supported) | H1, H2, H4 (all were supported) | H1, H3, H4 (all were supported) |

WSQ: Website quality; PAI: Product asymmetries of information; SC: Signal credibility; PPQ: Perceived product quality, BI: Website purchase Intentions

*PLS was used in Study 1 in order to validate the survey measures of all constructs and the second order formative representation of WSQ. ANOVA was used in Studies 2 and 3 to assess the effect of experimental treatments on PPQ, and regression as used to assess the mediating effect of PPQ.

**An alpha protection level (i.e., probability of a Type 1 error) of 05 was used for hypotheses testing in all studies.

measurement model validity.⁵ Study 2 focused on the effect of product asymmetries of information when manipulating website quality as a signal of product quality. Study 3 focused on the effects of signal credibility. First we describe the experimental domain and measures and then present the three studies.

Experimental Domain

The same experimental domain, a hypothetical tote bag retailer named *totebags.com*, was used for all studies. Website treatments were created to support a realistic set of consumer tasks, namely searching, selecting, and purchasing products. Tote bags and the related accessories (e.g., straps, cell phone and iPod holders) were selected for these studies as they are experiential products and considered to be more conducive to signaling as compared to search and credence products (Kirmani and Rao 2000; Zeithaml 1988). Tote bags are a moderate form of experiential product, as more complex products with a greater number and variety of intrinsic product attributes would be more difficult to evaluate prior to purchase. In addition, tote bags were a very relevant product for the primary subject pool as the majority of the subjects use

tote bags of some form. Product information from an actual tote bag retailer, Timbuk2, was used to populate the website. To control for any effects that could be attributed to the brand, any subjects who were familiar with Timbuk2 were excluded from the studies. In addition, any subjects that reported being familiar with the hypothetical online retailer (*totebags.com*) were excluded. All interface treatments included the exact same product information, such as product images and descriptive information such as size, color, and so on, to control for any potential confounds associated with intrinsic product information cues.

Measures

All measures were adapted from existing, validated scales whenever possible and are provided along with the scale anchors and sources in Appendix A. Website quality was conceptualized as a second-order formative construct formed by the four, first-order dimensions of security, download delay, navigability, and visual appeal. Overall website quality (WSQ) was measured by three reflective items, and the four website quality dimensions were each measured with three reflective items with all items adapted from existing scales.⁶ While there are many known determinants/dimensions of website quality (e.g., Loiacono et al. 2007), we selected

⁵Given that all three studies were controlled experiments with homogenous subject pools (i.e., student subjects), Study 1 was also replicated with a heterogeneous subject pool to increase generalizability and to address any concerns with common method bias. Additional details are provided with Study 1 and in Appendix F.

⁶Further discussion of the conceptualization and measurement of website quality is provided in Appendix C.

1 security (Koufaris and Hampton-Sosa 2004; Zhang et al.
2 2001), download delay (Galletta et al. 2004; Rose and Straub
3 2001), navigability (Palmer 2002), and visual appeal (Trac-
4 tinsky et al. 2000; Van der Heijden and Verhagen 2004), as
5 these dimensions are well-documented in the website quality
6 literature (Kim et al. 2002; Loiacono et al. 2007; Valacich et
7 al. 2007). These dimensions can also be manipulated while
8 providing the same product information, whereas manipula-
9 tions of other website quality characteristics, such as informa-
10 tional fit-to-task, tailored information, and on-line complete-
11 ness (e.g., Loiacono et al. 2007) would inadvertently alter the
12 intrinsic product information provided.

13
14 No existing measures for product asymmetries of information
15 (PAI) or signal credibility (SC) were found in the literature as
16 past research has operationalized these constructs via experi-
17 mental manipulation or controls without accompanying
18 manipulation check measures. Reflective measures for both
19 of these constructs were developed based on signaling theory
20 and the prior literature. PAI was measured to assess an indi-
21 vidual's degree of prepurchase information scarcity related to
22 the product of interest, and thus was operationalized as
23 whether a consumer had any prior information or experience
24 with products offered on *totebag.com*. Prepurchase informa-
25 tion scarcity is a subjective factor that can vary based on an
26 individual's prior product experience (Klein 1998). SC is a
27 *general* assessment of the costs/investment necessary to
28 develop and maintain a high-quality, commercial website and
29 was operationalized as whether high-quality, commercial
30 websites, in general, require significant costs, thus providing
31 a separating equilibrium as described by Bergen et al. (1992).
32 Both PAI and SC were measured prior to any exposure to the
33 experimental website.

34
35 The measures for perceived product quality (PPQ) were
36 adapted from prior signaling research (Boulding and Kirmani
37 1993; Kirmani 1990, 1997; Rao et al. 1999) and framed using
38 specific product quality attributes (e.g., durability) (Garvin
39 1987). Consistent with past research in eCommerce, the
40 behavioral intention (BI) construct was measured using items
41 that assess a subject's likelihood to use a website to purchase
42 a product(s) (Loiacono et al. 2007; Van der Heijden and
43 Verhagen 2004). Measures of computer playfulness and
44 online purchasing experience were also included along with
45 demographic measures for age and sex.

46 Study 1

47
48 Study 1 assesses construct validity and examines the viability
49 of WSQ as a signal of product quality. This section describes
50 the experimental design and data analysis for this preliminary
51 study.

Study 1: Treatments

A total of six different interface treatments were developed to provide variation in WSQ as described in Table 4, while providing the same product information. WSQ was manipulated by varying the four WSQ characteristics of security, download delay, navigability, and visual appeal at two levels, high (fast) and low (slow). The rationale behind using these four characteristics was not to offer an exhaustive list of WSQ characteristics, but to infuse broad variability across the treatments. Two of the treatments (A and F) represented very high and very low quality websites by providing high or low levels of all four characteristics, while the remaining four websites (treatments B through E) provided high levels of one characteristic in combination with low levels of the remaining characteristics.⁷ Screen shots of these interfaces are provided in Appendix B. All six interfaces were used in Study 1, while only the very high and very low quality websites (A and F) were used in Studies 2 and 3.

Security was manipulated via the policy statements on the websites along with the inclusion of both the Truste[®] and Verisign[®] certification seals on the high security site. Download delay was manipulated by introducing a 4-second delay for any action taken by the user on the slow website. The website's navigability was manipulated through the inclusion/omission of certain convenience features such as a shopping cart. Finally, visual appeal was manipulated by varying the use of colors (e.g., backgrounds) and graphics (e.g., color tabs for product selection). Additional details on the manipulations along with the screen shots are provided in Appendix B.

PAI was controlled in this study by using a fictitious organization (i.e., *totebags.com*) and by excluding subjects that had owned or come into contact with a Timbuk2 *totebag* product. SC was not manipulated in this study but was measured as a control variable.

⁷A fractional, factorial design (six treatments) was used instead of a full, factorial design ($2 \times 2 \times 2 \times 2 = 16$ treatments) as the goal of this preliminary study was to validate the measures and conceptualization of the WSQ construct (second-order, formative) rather than to test the interactions of the dimensions. The fractional design represented the main effects of the four WSQ dimensions (high levels of one WSQ dimension with low levels of the remaining dimensions), in addition to the two extreme treatments with very high (low) levels for all four WSQ dimensions. This design resulted in a lower sample size while creating sufficient variance in the four WSQ dimensions to enable us to validate the WSQ construct. The design did not, however, enable us to assess the possible confounding effects of interactions among the dimensions.

Table 4. Study 1: Website Treatments

| Treatment | Security | Download Delay | Navigability | Visual Appeal |
|------------------|----------|----------------|--------------|---------------|
| High Quality – A | High | High | High | High |
| B | High | Low | Low | Low |
| C | Low | High | Low | Low |
| D | Low | Low | High | Low |
| E | Low | Low | Low | High |
| Low Quality – F | Low | Low | Low | Low |

Study 1: Subjects

The subjects for this study were undergraduate students enrolled in an introductory management information systems course at a public university in the United States. A total of 240 subjects (40 for each interface treatment) participated in the experiment, with 50.4 percent being female and an average age of 20.14 (ranging from 18 to 35). Subjects received course credit for participating, and participation was voluntary with alternative options for course credit provided.

Study 1: Experimental Procedures

The study took place in a controlled laboratory setting. Subjects were randomly assigned to one of the six interface treatments. A task sheet was distributed that guided the subjects through the study (see Appendix B). The first step on the task sheet was to complete a pre-survey that measured PAI and SC, and that collected various demographic data such as gender, age, number of online purchases, familiarity with Timbuk2 products, and computer playfulness. The second step provided the subjects with the website address for the experimental treatment and required the subjects to complete a series of exercises designed to fully expose the subjects to the website content and features. Finally, a post-survey was administered that measured WSQ, PQ, and BI.

Study 1: Data Analysis

Descriptive statistics, manipulation checks, and construct validation results are presented in Appendix C, Tables C1 through C5. Manipulation checks were conducted using ANOVA in SPSS 15.0 for the four website quality dimensions and were found to be significant. Overall WSQ was found to significantly differ across the two high quality and low quality website treatments with means of 2.82 and 7.13, respectively, on a nine-point scale.⁸ Data analysis, including

⁸With the other four treatments, where one WSQ dimension was high and the other three dimensions were low, only one treatment (E, high visual appeal) was significantly different than the low quality treatment.

construct validation and hypotheses testing with structural equation modeling (SEM), was conducted using PLS-Graph 3.0. PLS-Graph was selected for data analysis as it is a component-based SEM application that inherently supports the modeling of formative constructs (Gefen et al. 2000).

Construct Validation: Validation of the research model, including analysis of convergent and discriminant validity, is considered a necessary precursor to any hypothesis testing (Gerbing and Anderson 1988). WSQ was modeled as a second-order formative construct formed by the four, first-order reflective constructs of security, download delay, navigability, and visual appeal. The three reflective items measuring overall WSQ enabled us to use a multiple indicator multiple causes (MIMIC) model approach to assess the appropriateness of our WSQ conceptualization (Diamantopoulos and Winklhofer 2001; MacKenzie et al. 2005).

As all constructs and sub-constructs in the model had reflective indicators, we first followed the recommended guidelines for assessing PLS factorial validity with reflective constructs (Gefen and Straub 2005). All constructs showed good reliability with composite reliability scores ranging from .8 to .97, exceeding one recommended threshold of .7 for internal consistency (Nunnally 1967). Convergent validity was assessed by examining item loadings and the average variance extracted (AVE) for each construct. All measurement items loaded significantly on the designated construct (p-values < .001) and each construct had an AVE greater than .6, exceeding the minimum threshold of .5 (Fornell and Larcker 1981). Discriminant validity was assessed by examining the item loadings and crossloadings, and by conducting an AVE analysis. All items loaded strongly on the related construct and were at least an order of magnitude higher than any crossloadings (Gefen and Straub 2005). A more stringent form of AVE analysis was applied with the AVE for each construct (rather than the square root of the AVE) being greater than the correlations with other constructs (Gefen and Straub 2000). These discriminant validity assessments suggest that the model constructs differ. Some of the higher cross-loadings and construct correlations are further discussed in Appendix C.

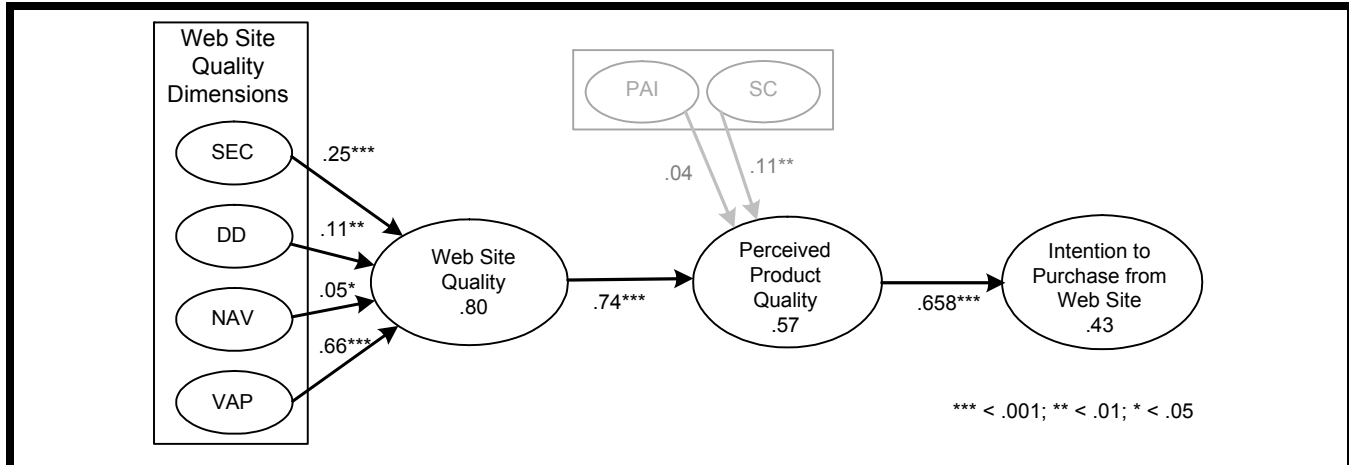


Figure 2. Study 1: Structural Regression Model Results

We assessed the validity of WSQ as a second-order, formative construct based on formative measurement guidelines (Cenfetelli and Bassellier 2009; Petter et al. 2007) by (1) assessing multicollinearity among the first-order constructs, (2) examining the path weights and correlations for the first-order constructs, and (3) conducting a redundancy analysis. The results, described in Appendix C, support our representation of the four dimensions forming overall WSQ. All path weights were significant as shown in Figure 2 and the four, first-order constructs explained 80 percent of the variance in the overall WSQ construct, as measured reflectively by three general, WSQ items. Of the four dimensions, visual appeal had the largest effect on WSQ, followed by security, download delay, and navigability. The results suggest that the three reflective items measuring overall WSQ are “symmetrical and egalitarian” (Campbell 1960, p. 548) to the construct formed by the four WSQ dimensions. As a result, we use the three-item reflective measure as a manipulation check for the high and low website quality treatments in Studies 2 and 3.

Common Method Bias (CMB): An assessment for CMB was conducted for Study 1 given that all of the variables included in the structural regression model were measured through self-reported survey items. Harman’s single factor test was first conducted by running an exploratory factor with all variables included (Podsakoff et al. 2003). A single factor did not emerge from the unrotated solution, suggesting that CMB was not high. Second, a common method factor was included in the structural regression model (Podsakoff et al. 2003) using a PLS approach documented in the literature (Liang et al. 2007; Vance et al. 2008). Additional details and the results are reported in Appendix D. Using this assessment, only 5 of the 30 paths from the common method factor were significant, providing supporting evidence that the study

results were not due to CMB. Further, WSQ, PAI, and SC are experimentally manipulated in Studies 2 and 3, with only PPQ and BI operationalized through self-reported survey responses. All hypotheses are tested in Studies 2 and 3 with only PPQ and BI subject to CMB, providing additional evidence that the study results are not due to CMB.

Hypothesis Testing: The structural regression model shown in Figure 2 was used to test the hypothesized relationships addressed in Study 1 (full results are presented in Appendix E, Table E1). WSQ had a significant effect on PPQ (p-values < .001), supporting H1, and PPQ had a significant effect on BI (p-value < .001), supporting H4. PAI and SC were included in the model to assess construct validity but not for hypotheses testing, as these variables are manipulated and tested for hypothesized interactions in Studies 2 and 3. Signal credibility had a significant effect on PPQ (p-value < .01), with an overall mean of 6.85 on a nine-point scale, supporting our premise that commercial websites are viewed as a significant investment and a credible signal. PAI did not have a significant effect on PPQ with an overall mean of 3.40 on a nine-point scale, supporting the high asymmetries of information present in the study.⁹ None of the control variables (i.e., computer playfulness, sex, age, online purchasing experience) had a significant effect on perceptions of WSQ.

WSQ Dimensions: As shown in Figure 2, visual appeal had the largest effect on overall WSQ, followed by security, download delay, and navigability. Supplementary analysis was conducted to assess the relative influence of the WSQ

⁹PAI was measured on a nine-point scale where a response of 9 represents high familiarity/experience with the product and 1 represents low familiarity/experience with the product.

Table 5. Influence of WSQ Dimensions on WSQ and PPQ, in Order Ranked by Coefficient Size for WSQ

| Perceived (Self-Reported) | WSQ | PPQ |
|---------------------------|-------|-------|
| Visual Appeal | .66** | .46** |
| Security | .25** | .32** |
| Download Delay | .12** | -.02 |
| Navigability | .05* | .17** |
| Adj. R ² | 80% | 60% |

** < .001; * < .05

dimensions on PPQ by running a structural regression model with the WSQ dimensions represented as determinants of PPQ, and omitting the second-order construct of overall WSQ. The results (shown in Table 5) mirrored the relative influence of the dimensions on overall WSQ with one exception: download delay did not have a significant effect on PPQ. Visual appeal had the strongest effect on PPQ, followed by security and navigability. These results are addressed in the discussion section.

Replication of Study 1: Study 1 was replicated with a different subject pool to enhance the generalizability of the results, and with a short version of the post-survey (only measuring PPQ and BI), to provide assurance that CMB did not influence the study results. The description of the study and the results are reported in Appendix F. The website treatments produced a similar pattern of responses for PPQ and BI, and H1 and H4 were similarly supported.

Study 2

A 2 × 2 controlled experiment with two levels of WSQ (high, low) and PAI (high, low) was designed to investigate the influence of PAI within a WSQ signaling context, testing H1, H2, and H4. Measured constructs included PPQ and BI as dependent variables, with WSQ and PAI measured for manipulation check purposes. Drawing from the same population as Study 1, a total of 160 subjects (40 for each treatment) participated in this study, with 38.1 percent being female and an average age of 20.5 (ranging from 18 to 29). Participation in this study was again voluntary, with course credit provided upon completion of the study.

Study 2: Treatments

WSQ was operationalized using the two high/low WSQ treatments assessed in Study 1 (interfaces A and F). PAI was

operationalized by exposing the subjects in the low PAI treatment to an actual Timbuk2 totebag and strap pad accessory. As the subjects entered the lab, they were given a tote bag to examine for several minutes and were asked to explore various features of the tote bag such as the main compartment, strap, zippers, and outer compartments. After inspecting the bag, the subjects were given additional information on the features and quality of the bag and were told that they would be viewing this same bag on the *totebags.com* website. Subjects in the high PAI treatment were not exposed to the bag and were excluded from the study if they reported having any experience with Timbuk2 totebags on the survey.

Study 2: Experimental Procedures

Subjects were randomly assigned to one of the four treatment groups in a controlled laboratory setting. Subjects in the low PAI treatment groups were exposed to the totebag and accessories at the beginning of the experimental sessions. The remaining procedures followed the steps used in Study 1, including a pre-survey, experimental website task, and a post-survey.

Study 2: Data Analysis

Descriptive statistics for the individual scale items, manipulation checks, and construct validation results are presented in Appendix D, Tables D6 through D9. Manipulation checks were conducted using ANOVA in SPSS 15.0 for WSQ (high = 6.7, low = 3.1) and PAI (high = 3.5, low = 5.1) and were significant.¹⁰ Construct reliability and validity were assessed and supported using the same procedures conducted in Study 1 with PLS-Graph for comparability.

¹⁰While the manipulation of PAI was significant, the lower levels of PAI were moderate (5.1 on a nine-point scale) suggesting some asymmetries of information still exist, and thus signaling theory remained applicable at these lower levels of PAI.

Table 6. Study 2: Perceived Product Quality by Treatment

| | Higher PAI (Less product information) | Lower PAI (More product information) |
|----------|--|---|
| Low WSQ | 4.17 | 5.83 |
| High WSQ | 6.63 | 7.03 |

Table 7. Study 2: Perceived Product Quality Hypothesis Testing with ANOVA

| Source | Mean Square | F | p-value | Effect Size (Eta ²) |
|-----------|-------------|-------|---------|---------------------------------|
| WSQ | 135.06 | 64.51 | .000 | .293 |
| PAI | 42.37 | 20.24 | .000 | .115 |
| WSQ × PAI | 15.83 | 7.56 | .007 | .046 |

Adjusted R² = .360

Table 8. Study 2: Regression/Mediation Analysis for B1

| WSQ → BI | | WSQ → PPQ | | WSQ + PPQ → BI | | | | Mediation |
|----------|---------|-----------|---------|----------------|---------|-------|---------|-----------|
| β | p-value | β | p-value | WSQ β | p-value | PPQ β | p-value | |
| .575 | .000 | .51 | .000 | .333 | .000 | .474 | .000 | Partial |

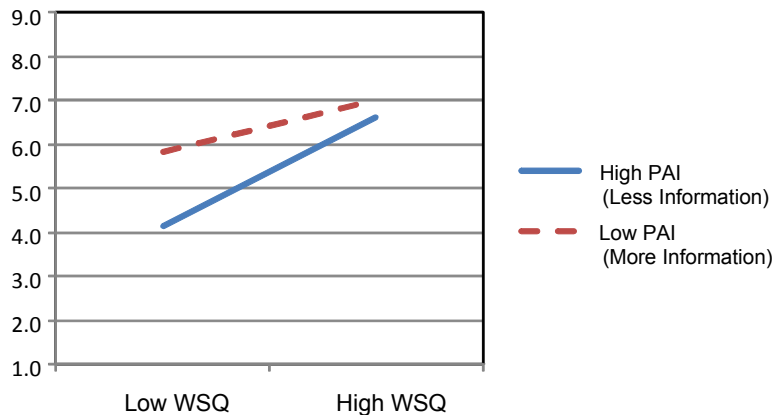


Figure 3. Study 2: Main and Interaction Effects of WSQ and PAI on PPQ

Hypothesis testing was performed in SPSS 15.0 with the results shown in Tables 6, 7, and 8 and in Figure 3. As hypothesized, WSQ had a significant main effect on PPQ, supporting H1, and there was a significant interaction effect with PAI supporting H2. WSQ had a greater effect on PPQ with higher PAI (6.6 – 4.2 = 2.4) than with lower PAI (7.0 – 5.8 = 1.2), and planned comparisons showed that PAI influenced PPQ only when WSQ was low (F = 20.87, p-value < .000). WSQ and PPQ were then regressed on BI to test H4

as shown in Table 8. PPQ significantly influenced BI (.474, p-value < .001) and partially mediated the effect of WSQ on BI, explaining .49 of the variance in BI (adjusted R²).

Study 3

A 2 × 2 controlled experiment with two levels of WSQ (high, low) and SC (high, low) was designed to investigate the

1 impact of SC within a WSQ signaling context, testing H1, H3,
2 and H4. Measured constructs included PPQ and BI as
3 dependent variables, with WSQ and SC measured for manip-
4 ulation check purposes. Drawing from the same population
5 as Studies 1 and 2, there were 160 subjects (40 for each treat-
6 ment) that participated, with 35.0 percent being female and
7 having an average age of 20.8 (ranging from 18 to 35).
8 Participation in this study was again voluntary, with course
9 credit provided upon completion of the study.

10 **Study 3: Treatments**

11
12 WSQ was operationalized using the low and high WSQ treat-
13 ments used in Study 1 (interfaces A and F). Low and high
14 levels of SC were operationalized using two versions of a
15 fictitious *Consumer Report* article (see Appendix B for the
16 articles). One article was intended to decrease the SC of
17 commercial websites by describing the ease and lack of
18 expense required to build and maintain a commercial website,
19 while the other article was designed to increase the SC of
20 websites by reporting the high costs of building and main-
21 taining websites. These articles were adapted from actual
22 *Consumer Reports* articles and were designed to be as
23 realistic as possible.

24 **Study 3: Experimental Procedures**

25
26 Subjects were randomly assigned to one of the four treatment
27 groups in a controlled laboratory setting. At the beginning of
28 the experimental session, subjects in the low SC treatment
29 groups were given the low SC version of the *Consumer*
30 *Reports* article while the high SC treatment groups were given
31 the high SC version. The remaining procedures followed the
32 steps used in Study 1, including a pre-survey, experimental
33 website task, and a post-survey.

34 **Study 3: Data Analysis**

35
36 Descriptive statistics for the individual scale items, manip-
37 ulation checks, and construct validation results are presented
38 in Appendix C, Tables C10 through C13. Manipulation
39 checks were conducted using ANOVA in SPSS 15.0 for WSQ
40 (high = 6.5, low = 2.8) and SC (high = 7.78, low = 4.4) and
41 were significant.¹¹ Construct reliability and validity were

¹¹While the manipulation of SC was significant, the lower levels of SC were moderate (4.4 on a nine-point scale) suggesting that participants still found commercial websites to be a credible signal, and thus signaling theory remained applicable at these levels of SC.

assessed and supported using the same procedures conducted in Study 1 with PLS-Graph for comparability.

Hypothesis testing was performed in SPSS 15.0 with the results shown in Tables 9, 10, and 11, and in Figure 4. As hypothesized, WSQ had a significant effect on PPQ (p-value < .001), supporting H1, and there was a significant interaction effect with SC supporting H3. WSQ had a greater effect on PPQ with higher SC (6.6 – 4.4 = 2.2) than with lower SC (5.7 – 4.5 = 1.2), and planned comparisons showed that SC influenced PPQ only when WSQ was high (F = 10.64, p-value = .002). WSQ and PPQ were then regressed on BI to test H4 as shown in Table 11. PPQ significantly influenced BI (.571, p-value < .001) and partially mediated the effect of WSQ on BI, explaining .57 of the variance in BI.

Discussion

Three experimental studies were conducted to assess website quality as a signal of product quality under varying levels of information asymmetries and signal credibility, with all hypotheses supported. The hypothesized relationship between website quality and perceived product quality was significant in all three studies, as was the relationship between perceived product quality and online purchase intentions.¹² Product asymmetries of information were investigated in Study 2 and were found to moderate the effect of website quality on perceived product quality, with this relationship being stronger when less product information was available (high PAI). In Study 3, signal credibility was found to moderate the relationship between website quality and perceived product quality, with this relationship being stronger when subjects were told that a significant investment was required to build and maintain a commercial website (high SC). A discussion of these results along with the theoretical and practical implications are provided in the following section.

Website Quality as a Signal

In Study 1, overall WSQ was determined by four WSQ dimensions with visual appeal having the strongest effect on WSQ, followed by security, download delay, and navigability. The literature on cue utilization suggests that information cues that are easily observed and that users can confidently assess will be most influential in assessments of qual-

¹²In that all effects were significant at the alpha protection level of .05, statistical power and Type II errors are not issues.

Table 9. Study 3: Perceived Product Quality by Treatment

| | Lower Signal Credibility | Higher Signal Credibility |
|----------|--------------------------|---------------------------|
| Low WSQ | 4.53 | 4.35 |
| High WSQ | 5.73 | 6.64 |

Table 10. Study 3: Perceived Product Quality Hypothesis Testing with ANOVA

| Source | Mean Square | F | p-value | Effect Size – Eta ² |
|----------|-------------|-------|---------|--------------------------------|
| WSQ | 121.92 | 48.54 | .000 | .237 |
| SCI | 5.50 | 2.19 | .141 | .014 |
| WSQ × SC | 11.92 | 4.75 | .031 | .030 |

Adjusted R² = .248

Table 11. Study 3: Regression/Mediation Analysis for B1

| WSQ → BI | | WSQ → PPQ | | WSQ + PPQ → BI | | | | Mediation |
|----------|---------|-----------|---------|----------------|---------|-------|---------|-----------|
| β | p-value | β | p-value | WSQ β | p-value | PPQ β | p-value | |
| .568 | .000 | .479 | .000 | .294 | .000 | .571 | .000 | Partial |

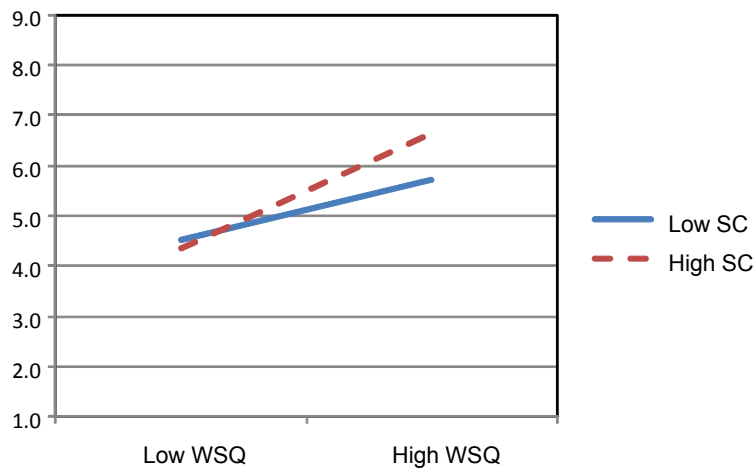


Figure 4. Study 3: Main and Interaction Effects of WSQ and SC on PPQ

ity (Richardson et al. 1994). Studies on user perceptions of websites have shown that the visual appeal of a website can be reliably assessed within 50 milliseconds (Lindgaard et al. 2006), thus it follows that visual appeal has a relatively strong effect on overall WSQ as users can assess visual appeal quickly and with confidence. Visual appeal is also an aesthetic quality of the website, and aesthetics (i.e., representational delight) have been shown to be a dominant com-

ponent of website quality in more experiential contexts (Valacich et al. 2007; Van der Heijden 2004), such as the one reported in this study.

The relative influence of the WSQ dimensions on PPQ was similar with the exception of download delay having no influence in PPQ. This result can be explained by existing research on download delay. While download delay has been

1 shown to influence perceptions of the website (Palmer 2002),
 2 research has found that it did not influence attitude toward the
 3 online retailer (Rose and Straub 2001). Research findings
 4 suggest that if the source of a download delay is not identi-
 5 fied, users may not attribute the delay to the retailer (Rose et
 6 al. 2005), and thus may not consider download delay a signal
 7 of product quality.

8
 9 Further examination of the website quality and product
 10 quality perceptions by the six treatments (shown in Appendix
 11 C, Table C2) demonstrates a halo effect when all dimensions
 12 are of high quality. For example, a comparison of treatments
 13 A and E (A: all dimensions were of high quality; E: visual
 14 appeal is high while the remaining dimensions are of low
 15 quality), provides a striking difference of 1.85 (7.33_A versus
 16 5.48_E) for perceived visual appeal. The manipulation of
 17 visual appeal was the same in both treatments, yet participants
 18 assessed visual appeal as being much higher when all dimen-
 19 sions were of high quality. This pattern of responses is
 20 observed for all of the WSQ dimensions (i.e., security: 6.92_A/
 21 5.22_B, download delay: 7.93_A/6.80_C, navigability: 8.20_A/
 22 7.12_D). Thus, the perceived quality of a WSQ dimension is
 23 influenced by the quality of the other dimensions, with the
 24 best perceptions of WSQ and PPQ resulting when all
 25 dimensions are of high quality.

26 **Product Asymmetries of Information**

27
 28 Study 2 demonstrated that PAI had both a main effect on
 29 PPQ, with higher levels of PAI resulting in lower PPQ, and a
 30 moderating effect such that WSQ has a greater effect on PPQ
 31 when consumers have less information about a product
 32 (higher PAI) as compared to more product information, as
 33 predicted. Even when PAI was moderate (the lower PAI
 34 condition), high WSQ still made a marked improvement in
 35 PPQ (5.83 to 7.03), suggesting that moderate PAI (i.e., not
 36 perfectly symmetrical information) results in a reliance on
 37 both intrinsic and extrinsic cues. Our results also showed that
 38 PAI has a lesser impact on PPQ depending upon WSQ. When
 39 WSQ was high, there was only a marginal difference in PPQ
 40 between higher and lower levels of PAI, 6.63 and 7.03,
 41 respectively, suggesting that a website with high quality
 42 extrinsic cues can largely compensate for a lack of product
 43 information (intrinsic cues).

44 **Signal Credibility**

45
 46 WSQ was supported as a credible signal of PPQ, with
 47 participants in Study 1 reporting that commercial websites
 48 required a significant investment (mean of 6.85 on a nine-
 49 point scale). In Study 3, the *Consumer Report* manipulations
 50 of the investment required for a commercial website increased

the perceived investment to 7.78 for the high SC treatment
 and reduced it to 4.4 for the lower SC treatment, demon-
 strating that moderate perceptions of SC were maintained
 even when subjects were informed that the cost of a high
 quality commercial site was modest by a reputable party.

The results of Study 3 supported the moderating effect of SC,
 with WSQ having a greater effect on PPQ when SC was
 higher, but showed no main effect for SC on PPQ. Upon
 further analysis of the treatment means shown in Table 9, SC
 was found to have an effect on PPQ only when WSQ was
 high. When WSQ was low, there was no significant differ-
 ence in PPQ under high and low SC. These findings support
 the premise that a very poor quality website is not a positive
 signal, and credibility would not necessarily influence PPQ
 under such circumstances (Boulding and Kirmani 1993).

Further interpretation of the results for PAI and SC also
 provide support for the relative importance of these theo-
 retical boundary conditions. In Study 2, PAI had both signi-
 ficant main and interaction effects on PPQ, while in Study 3,
 SC had only a smaller interaction effect with the same WSQ
 treatments. The effect sizes reported in Tables 7 and 10 con-
 firm these results as the effect sizes for PAI main and inter-
 action effects are larger than the SC interaction effect size.
 These findings confirm that information asymmetries are a
 necessary condition, a first step for applying signaling theory.
 If satisfied, this condition enables extrinsic cues to serve as
 signals of product quality when the signal is both credible and
 of high quality. The benefits of signaling should increase in
 conjunction with increases in information asymmetries, signal
 credibility, and the quality of the signal.

Theoretical Contributions

Recent IS research has leveraged the concept of signaling to
 understand how consumer uncertainty can be mitigated in
 online exchanges (Pavlou et al. 2007). Our study applies the
 full theoretical framework of signals to provide a foundation
 for understanding how website quality alleviates the uncer-
 tainty that is often inherent in online product evaluations.
 Based on the empirical evidence offered in this paper, we can
 make the argument that website quality meets the theoretical
 conditions for being a viable signal of product quality. Spe-
 cifically, website quality is an informational cue that can be
 extrinsic to the product and is most effective when two
 theoretical conditions are met: (1) high product asymmetries
 of information and (2) high signal credibility. Website quality
 is particularly salient when the consumer is faced with high
 asymmetries of information, which we assert to be common-
 place in an eCommerce marketing channel, particularly when
 organizations offer experiential products. From an IS per-
 spective, we posit that signaling theory provides a fresh and

1 robust theoretical foundation for explaining how and why
 2 website quality and its associated characteristics affect online
 3 consumer behavior. This research also contributes to the
 4 signaling literature by validating website quality as a signal of
 5 quality that is distinct from other existing signals such as
 6 brand, price, and warranties.

7
 8 The results from these studies have interesting implications
 9 for the virtual product experience literature (Jiang and Ben-
 10 basat 2004-2005; Li et al. 2002). The basic premise of virtual
 11 experience is that if an organization can provide a consumer
 12 with website characteristics that afford a sense of telepresence
 13 (i.e., being there), consumers will be better able to evaluate
 14 the product, resulting in increased intentions to purchase the
 15 product or service (Li et al. 2002). The informational cue
 16 dichotomy (extrinsic versus intrinsic) may draw an important
 17 theoretical distinction between how a consumer perceives a
 18 signal versus a virtual experience. In our studies, intrinsic
 19 product information was controlled and website quality was
 20 isolated as an extrinsic cue and observed to significantly
 21 affect the consumer's perception of product quality. The
 22 results of our studies pose an interesting question: Does a
 23 virtual experience convey intrinsic product cues *or* does it
 24 convey extrinsic cues (i.e., signals) that make consumers more
 25 confident in what they buy and from whom they buy it? The
 26 results from this study point to a need to qualify the theo-
 27 retical nature of the informational cue being presented to the
 28 consumer as well as isolate the impact that these respective
 29 cues have on online consumer behavior.

30 **Pragmatic Contributions**

31
 32 The results from these studies have strategic implications for
 33 most businesses using the eCommerce marketing channel.
 34 First, an intuitive recommendation is that online sellers need
 35 to maintain high quality websites as consumers may rely on
 36 website quality as an extrinsic signal, using it as a surrogate
 37 for perceived product quality in a variety of contexts. These
 38 contexts include the marketing of experience products,
 39 products that are novel to the consumer, nonhomogenous
 40 product assortments (Kamakura and Moon 2009), and when-
 41 ever consumers have limited time (Zeithaml 1988) or certain
 42 personality traits (e.g., low need-for-cognition) (Chatterjee et
 43 al. 2002). Interestingly, even when moderate asymmetries of
 44 information exist, website quality can serve as a powerful
 45 signal, and past research suggests that very low PAI can only
 46 be achieved after repeated exposure to the product of interest
 47 (Goering 1985).

48
 49 Second, our research shows that emphasizing one WSQ
 50 dimension while neglecting other website quality dimensions
 51 may not fully leverage the signaling potential of a website.
 52 An online seller that maximizes the visual appeal of the

website, but does not provide reasonable levels of the other
 website quality dimensions, is missing out on a halo effect as
 shown in our results. For example, the perceived visual
 appeal of a website was reported as higher when the other
 extrinsic website quality dimensions were higher.

Third, while an online seller needs to consider the quality of
 all website dimensions, our research suggests when some
 dimensions may be worth an additional investment. Depend-
 ing upon the nature of the product, online sellers may
 want to focus on specific website quality dimensions. With
 experience products, the aesthetic or emotional elements of a
 website (e.g., visual appeal), have been shown to be the most
 important component of website quality (Pallud 2008;
 Valacich et al. 2007; Van der Heijden 2004).

Online sellers should strive for very high levels of aesthetics
 with experience products and/or hedonic shopping contexts.
 In other product contexts, such as big ticket items, sellers may
 want to consider additional extrinsic signals such as providing
 clear explanations of security features (Koufaris and
 Hampton-Sosa 2004).

Fourth, our results also point to the importance of empha-
 sizing the extrinsic attributes of website quality in general.
 Given the challenges of presenting complex products and
 product packages in an online environment (Kim and Niehm
 2009), extrinsic website quality attributes may be enhanced
 more efficiently than intrinsic website quality attributes, such
 as tailored information and interactivity (e.g., Jiang and
 Benbasat 2004-2005, 2007; Loiacono et al. 2007). While
 these intrinsic website attributes convey relevant product
 information, these features are expensive to implement and
 maintain. Additionally, such investments may still not close
 the information asymmetry gap with complex and experience
 goods. Given finite website design resources, extrinsic web-
 site quality cues could be emphasized over the intrinsic cues,
 and research suggests that extrinsic cues influence perceptions
 of intrinsic website attributes (Kim and Niehm 2009;
 Loiacono et al. 2007). Our study results demonstrated large
 differences in perceived product quality while intrinsic cues
 (e.g., product information content) were kept constant.
 Further, we provided a moderate level of these intrinsic cues,
 without using more expensive, multimedia views of the pro-
 duct (e.g., zoom-in and zoom-out capability, interactivity,
 etc.). Yet, subjects still perceived product quality to be very
 high when provided with high quality levels of extrinsic cues.
 Thus, online sellers should carefully allocate their resources
 between extrinsic and intrinsic web site quality attributes—
 should such prioritization be necessary.

Fifth, website quality, by its nature, is extremely fluid and
 dynamic, which places the onus on the seller to continually
 improve the quality of their site because perceived short-

comings in comparison to a competitor's website could result in lost sales, even if the website is perceived to be of adequate quality. Smaller businesses, with fewer resources to invest in a high quality website, may want to consider marketing their products through online marketplaces with partners such as Amazon and eBay, where they can utilize the high quality of the partner's website and marketplace brand, as signals of product quality. Strategic alliances with established, high-quality marketplaces enable smaller e-businesses to send consumers extrinsic signals, without making the up-front and ongoing investment required of a proprietary commercial website. Creating a high quality website without considering the quality of the product offering may provide a short-term gain, but is ultimately a losing proposition. Product quality is often revealed soon after the purchase, and an online retailer's reputation and sales can quickly suffer through online word-of-mouth when a low quality product is marketed with a high quality signal.

Finally, consumers perceive a commercial website as requiring a significant investment and thus being a credible signal, but these perceptions can be readily manipulated and enhanced. Online sellers can improve consumers' perceptions of product quality by developing a high quality website and by informing website visitors of the upfront costs and continuing effort required to maintain a high quality site. Online sellers can publicize their initial and ongoing efforts to develop a high-quality commercial website through press releases, blogs, and consumer surveys soliciting feedback on the quality of the website. Website awards and recognition can provide external confirmation of website quality and further strengthen the credibility of websites as a signal of product quality.

Limitations and Future Research

As with all research, this series of studies has some limitations. The three studies used a controlled experimental design with student subjects, potentially limiting the external validity of the study. A replication of Study 1, however, was conducted with nonstudent subjects to improve the generalizability of the study's findings. The results from the replication supported the findings of Study 1, and showed a similar pattern of product quality perceptions and behavioral intentions across the different treatments for these more heterogeneous subjects. Prior consumer research has noted that student subjects provide an appropriate sample when the focus is on controlled theory testing (Calder et al. 1981), and when subjects are familiar with the experimental context (i.e., online shopping) (Gordon et al. 1986). eCommerce research has also shown that online consumers are typically younger and more educated, making university business students a

representative sample for this study (Jiang and Benbasat 2004-2005; McKnight et al. 2002). Further research is needed, however, to determine how perceptions of website quality might differ for online consumers of different ages, cultures, and backgrounds.

In our efforts to operationalize website quality as an extrinsic cue, we excluded website quality dimensions that might influence intrinsic product attributes, such as website information quality. This is a limitation of our study, and future research is needed to model both extrinsic and intrinsic website quality dimensions within a signaling context. Also, the same product, totebags, was used in all three studies, thus the applicability of a website quality signal to other product domains needs to be explored. This product was relevant to our subject pool and provided a moderate example of an experience product. Novel products with more experiential attributes should create greater information asymmetries and stronger signaling results. Finally, our study did not test for the potential interaction between PAI and SC, and future research in this area is warranted.

This research provides a theoretical foundation for studying website quality as a signal of quality, creating a new research perspective on website quality that extends existing usability research. We now outline several opportunities for future research on website quality as a signaling phenomenon, including website quality dimensions, signaling effects with virtual experience, and the applicability of eCommerce signaling to online services and search goods.

Future research is needed to more thoroughly explore the dimensions of website quality. Past research has identified numerous website characteristics that may influence perceptions of website quality, and these characteristics may similarly influence perceived product quality. Future studies could manipulate additional characteristics and utilize a full factorial design to investigate the interactions among these characteristics. Such research could better identify the most critical website characteristics from both usability and signaling perspectives.

Also, the core signaling model presented in this paper could be augmented to observe the relative influence of extrinsic website quality cues on perceived product quality when other factors are introduced. One potential extension is to study website quality signaling when other well-accepted signals are manipulated, such as price and brand. Another extension could investigate the relationship between perceptions of intrinsic and extrinsic website quality. Other known determinants of behavioral intentions, such as affective variables (Van der Heijden 2004) and trust (Gefen et al. 2003), could be integrated into the core signaling model as these variables may be influenced by website quality and serve in a mediating role.

1 Additional research is needed on virtual product experience
 2 to understand the mechanism by which this experience
 3 influences perceived product quality and purchase intentions.
 4 Future studies should isolate the effects of the extrinsic
 5 signals provided by the enhanced features of a virtual website
 6 environment from the intrinsic product cues delivered through
 7 this environment. The separate and additive effect of ex-
 8 trinsic and intrinsic cues has yet to be examined with an
 9 online virtual experience.

11 Finally, there are several future research options for applying
 12 signaling in an eCommerce domain. Services are generally
 13 accompanied by fewer tangible information cues than pro-
 14 ducts (Lovelock 1983), and online services would be asso-
 15 ciated with even greater information asymmetries. eCom-
 16 merce signals could be even more effective in such contexts.
 17 Website quality is only one signal that may be effective in
 18 eCommerce. Other signals, such as return policies and ship-
 19 ping charges, should be explored. Also, past consumer
 20 signaling studies have focused on scenarios where asym-
 21 metries of information result from the marketing of
 22 experience goods, but research suggests that time pressure
 23 and individual differences (e.g., low need-for-cognition) can
 24 also create an environment where extrinsic signals are used
 25 despite the availability of intrinsic product information. For
 26 example, product information for a search good may be
 27 readily available, but time pressure and individual differences
 28 may increase the information search costs for some con-
 29 sumers. Research suggests that many consumers shop online
 30 as a way to reduce travel and shopping time (Rohm and
 31 Swaminathan 2004). A signaling framework may be appro-
 32 priate in these contexts as consumers look for an efficient
 33 shopping experience and quick, easily processed cues of
 34 product quality.

35 Conclusion

37 In this research, signaling theory has been applied to website
 38 quality as a potential signal of product quality. The results
 39 from this study found that, indeed, website quality does affect
 40 consumers' perceptions of product quality. Future research
 41 will help identify the key factors that affect how consumers
 42 perceive and interpret website quality as a means for making
 43 product quality assessments when faced with high asym-
 44 metries of information. Signaling theory provides a useful
 45 theoretical foundation for understanding the inherent value of
 46 website characteristics and how they can help organizations
 47 better manage their online consumer interactions. Clearly,
 48 these findings provide a solid foundation for future investiga-
 49 tions and practical insights for designing B2C eCommerce
 50 websites.

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