
The Role of System Trust in Business-to-Consumer Transactions

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ABSTRACT: It has been argued that the buyer's trust of the vendor is a critical precursor to a transactional relationship in an e-commerce environment. This study uses an experimental survey to test a model that includes a number of factors such as trust mechanisms, "system trust," and vendor reputation. The results suggest that one trust mechanism, vendor guarantees, has a direct influence on system trust. Further, within e-commerce situations, system trust plays an important role in the nomological network by directly affecting trust in vendors and indirectly affecting attitudes and intentions to purchase. These results held in the case of both firms with and without an established reputation. The results demonstrate the importance of interventions such as self-reported vendor guarantees that affect system trust in enabling successful e-commerce outcomes.

KEY WORDS AND PHRASES: e-commerce, intention to purchase, reputation in e-commerce, system trust, trust in vendor.

E-COMMERCE OFFERS ENORMOUS OPPORTUNITIES for vendors of any size and origin to conduct their business on the Internet. This opportunity can be particularly appealing to new businesses and local businesses that wish to expand their markets. The relative ease in which vendors can enter this global marketplace has resulted in an abundance of businesses offering their products to consumers who are completely unfamiliar with them. These "unknown" vendors hope to build a reputation online and often seek ways of assuring the consumers that they are indeed legitimate and trustworthy. Vendors are obviously interested in the purchase intentions of potential customers and look for ways to relieve concerns that consumers may have about online transactions. The success of a company's e-commerce depends on consumers who will purchase online.

Recent research on e-commerce has uncovered many facets of why (or why not) a consumer may wish to engage in online purchasing. It appears that one of the top concerns of Web consumers relate to issues of privacy and trust [12, 31]. Factors such as store trustworthiness, perception of risk, reputation, and store size have been shown to influence willingness to purchase [33]. Whereas reputation and size can be an advantage for well-known vendors, what measures must a relatively unknown vendor take in order to compete? This study proposes that unknown vendors may enhance the concept of "system trust" by using trust mechanisms on their Web site. There are many mechanisms available to vendors for the expressed purpose of building trust with consumers. For example, a vendor could use a seal of approval based on an *independent third-party* evaluation, a rating system that gives the Web site a "stars" rating to indicate how their site rates on given criteria *based on customer feedback*, or even a *self-reported statement* on their site as a way of guaranteeing compliance with "established" e-commerce standards [10, 56].

Whereas each of these mechanisms is intended to increase system trust and ultimately the purchase intentions of the consumer, there is limited research to date on how system trust is formed in business-to-consumer transactions. Specifically, what is the role of system trust in relationship to the development of consumer trust in the vendor and confidence in online purchasing? What types of mechanisms are necessary in order to build system trust? Does the reputation of a vendor alleviate the need and importance of these trust mechanisms? This study examines these questions by proposing and testing a model that includes the construct of "system trust" as distinct from the "trust in vendor," "vendor reputation" and three types of mechanisms commonly used by online vendors. The model and its predictive validity in influencing intention to purchase is tested through a survey of over 200 consumers in an experimentally controlled setting. This work is particularly germane to information systems (IS) research since it directly deals with system interventions that can facilitate trust, and the ultimate conduct of commerce in a digital environment.

The Concept of Trust

TRUST HAS BEEN DEFINED IN MANY WAYS throughout the research literature. Most definitions have stemmed from earlier research in psychology or sociology. Accord-

ing to Lindsfold [43], trust can arise from objective credibility. In other words, if it is believed that a person's words are reliable and correspond to his deeds, he or she is considered trustworthy. Lewis and Weigert [41] assert that trust is based on cognitive processes that discriminate among persons and institutions that are trustworthy, distrusted, and unknown. Mayer et al. define it as "the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other party will perform a particular action important to the truster" [47]. These definitions indicate that trust is perceptual and is a subjective interpretation or a belief by one party regarding another.

Three approaches to the study of trust can be identified in the literature [7]. Dispositional theories assume factors within individuals that predispose them to trust. Behavioral decision theories focus on immediate situational factors and posit that trusting is a function of relatively rational decision-making processes. And, finally, institutional frameworks emphasize the causal role of situational factors but are more concerned with the effects of organizational and institutional structures and processes. Rousseau et al. [57] indicate that trust can be relational in nature, when it is derived by repeated interactions between trustor and trustee over time, and institutional when institutional factors provide broad support for trust that sustain further risk-taking and trust behavior. Zucker [63] argues that institutional based trust is a commodity that is "manufactured" by individuals, firms, and industries. The focus of this research is on behavioral and institutional factors in the context of users' interactions in business-to-consumer Internet transactions.

McKnight et al. [51] develop a useful typology of trust, which consists of five constructs: interpersonal trust, trusting beliefs, system trust, dispositional trust, and decision to trust.¹ Interpersonal trust is one party's willingness to depend on the other party with a feeling of security even when negative consequences are possible. Trusting beliefs are based on the person's cognitive beliefs about the other party's characteristics (e.g., competence, integrity). System trust is the belief that proper impersonal structures are in place to enable one to anticipate a successful future endeavor (we base our construct of system trust on this definition that is described in detail later). Dispositional trust is a person's tendency to trust across a broad spectrum of situations and persons. Decision to trust refers to the intention to trust in particular situations. Collectively, these constructs provide a reasonable definition of the construct space for the trust variable. Consistent with this work, Castelfranchi and Falcone [11] regard these perceptions of trust as a belief system of truster regarding the trustee, which could subsequently result in a willingness to depend on the other party in carrying out certain tasks.

Trust in Business Relationships

Marketing research has provided some empirical evidence of the importance of trust perceptions in market relationships. For example, a seller's expected trustworthiness was shown to lead to more cooperation and agreement between parties [58]. Hawes et al. [30] tested "trust-earning" factors of salespeople and found that competence, dependability, and likability were significant factors in a buyer's trust of salespeople.

Trust has also been associated with long-term orientation. Trust plays a key role in determining the long-term orientation of both retail buyers and their vendors [24]. Similarly, Doney and Cannon [22] found that trust influenced a buyer's anticipated future interaction with a seller. In fact, trust also influences relational commitment. Parties are more likely to commit themselves to a relationship characterized by trust [55].

IS research has also examined trust perceptions. Hart and Saunders [28] describe the duality of technology (electronic data interchange [EDI]) as a consequence of trust and an enabler of control. When trust is built, it motivates firms to make investments in electronic exchanges, which in turn also acts to discourage opportunistic behavior. In a later study, they find significant support for a positive relationship between trust and EDI use diversity [29]. McKnight et al. [50] find that trust is a multidimensional construct and that trusting beliefs are related to trusting intentions. Other recent studies have also sought to develop models in an effort to understand the role of trust in an e-commerce environment [4, 9, 14, 36, 37, 49] and participation in electronic markets [14]. The results suggest that Web consumers are most concerned with trust and privacy issues when buying online [31]. Jarvenpaa et al. [33] developed and tested a model of consumer trust in an Internet-based store. They found that store trustworthiness, perception of risk, and willingness to purchase were influenced by reputation and size of the store. The focus of their research was on the perceptions of trust in an Internet store and not the trust in intermediaries or third parties that might mediate between the consumer and the store. Tan and Thoen [62] also describe a model of trust in a Web-based context. They argue that trust in the conduct of a transaction on a Web site will be influenced by the objective and subjective trust in the vendor (i.e., based on its reputation) and trust in the control procedures used. Gefen [25] asserts that trust is very important in information technology (IT) acceptance as it relates to gaining and retaining consumers of online vendors.

The conceptual and empirical literature above allows us to frame the study of trust with respect to a vendor's Web site using the following constructs: system trust, perceived reputation, and perceived trust in vendor, which has an effect on attitudes and purchase intentions. According to behavioral decision-making theories, trust is a function of a rational decision-making process. Trust as the outcome of such a process is a subjective interpretation or belief by one party (customer) regarding another party (vendor). Therefore, all types of trust create "perceptions" of trust in the party (vendor) and should be evaluated as perceived trust. Interpersonal trust and trusting beliefs reflect trust that has been cultivated over time. In the case of a vendor, these aspects of trust are reflected in the "perceived reputation of the vendor," which captures personal experiences, history, and the broad social presence of the vendor and its products and actions. In the case of institutional trust, trust in the party can be established by assuring that the proper impersonal structures are in place to enable a successful transaction. If so, the situation appears "normal" to the transacting party and reinforces system trust. Therefore, system trust, stemming from the broader stream of institutional trust, is the only direct mechanism that can be used to influence perceived trust. This is particularly germane in the e-commerce context where institutional mechanisms can be used to reflect the social indicators that communicate the

trust in control mechanisms used to handle transactions. Furthermore, perceived trust reflects a belief system that leads to attitudes and intentions. In an e-commerce context, attitudes regarding a vendor are formed from the perceptions of trust in the vendor. Attitudes have an effect on purchase intentions and thereby should follow the belief-attitude-intention sequence described in the "theory of reasoned action" (TRA) (as described in the hypotheses section).

The study described below examines system trust within its nomological network of constructs, including specific trust mechanisms that can affect system trust. The model is tested under various conditions of reputation in order to demonstrate its robustness.

System Trust and Trust Mechanisms

We define system trust as a *belief that the proper impersonal structures have been put into place* enabling one party to anticipate successful transactions with another party [41, 44, 51, 59]. System trust can be described in two ways: (1) structural assurances—which include safeguards, such as regulations, laws, guarantees, and contracts, that make the party feel safe depending on the other party, hence enabling trust, and (2) situational normality—which makes the situation appear normal and reduces uncertainty in the transaction. In an e-commerce situation, if a vendor's Web site appears normal (i.e., appropriate for doing business) and their role and the vendor's role appear appropriate and conducive to success, then a consumer perceives situational normality. A well designed Web site that reflects competence, integrity, and reliability would enhance this aspect of system trust [53].

Three types of trust mechanisms can be identified as ways of encouraging system trust in Internet transactions and therefore trust in Internet vendors [45]. These are seals, ratings, and guarantees, each of which is a distinct facilitator of system trust. *Seals of approval* placed on a vendor's Web site are all intended to make a consumer more at ease with online transactions by virtue of being an independent third party in whom the consumer can trust. Often, seals are designed to provide membership into privileged programs that monitor complaints and reassure the customer that security has been established [13]. Nooteburg [56] found evidence to support a positive effect of the presence of a seal on likelihood to purchase. *Rating* systems give Web sites varying amounts of "stars" to indicate how the site rates on given criteria. Rating systems based on customer feedback are an indication of vendor performance. Vendors use ratings to increase the buyer's confidence in their site [34, 35]. Finally, vendors could also use self-reported statements on their site as a way of *guaranteeing* compliance with "established" e-commerce standards [10, 56]. A vendor statement typically includes information about vendor policies regarding returns, privacy, and security. However, this provides no unbiased third-party evaluation of the online vendor. In summary, whereas each mechanism is designed to enhance trust in the site and reduce risk, they do so in different ways. Seals use independent verification through third parties, ratings use customer feedback, and guarantees are the vendor's self-reported statements about their policies and procedures.

Model and Hypotheses

THE RESEARCH MODEL IS ILLUSTRATED in Figure 1 and captures the basic tenets of the literature reviewed above. Trust is assessed as a perceptual construct and "trust in vendor" is hypothesized to be influenced by system trust (institutional) and perceived vendor reputation (interpersonal and trusting beliefs). System trust, in turn, could be influenced by trust mechanisms. The nomological validity of the model is tested in the TRA context. Below, we briefly describe the proposed hypotheses based on the model.

First, we hypothesize that system trust can lead to trust in a vendor in an e-commerce situation. System trust reflects the belief that the requisite institutional controls are in place to trust the vendor for a successful transaction. In other words, what is the belief that the proper technology and information exists for a successful transaction? Prior research posits that system trust can be effective in initial trust formation between unknown parties [51] and thus is a prerequisite of perceived trust in this situation. Thus, we believe that system trust and perceived trust are separate, but related, constructs. This leads to the first hypothesis:

Hypothesis 1. System trust is positively related to perceived trust in an Internet vendor.

It has been proposed that the presence of mechanisms is necessary in situations of shallow dependence. The customer-vendor relationship can be categorized as shallow dependence because of the lack of familiarity of the parties and the reliance of the customer on the vendor to complete the transaction in a reliable and discrete manner [60]. It follows that trust mechanisms would be antecedents to trust. In the case of e-commerce transactions, these mechanisms are developed to assure the consumers that the transactions are safe and the vendor is legitimate. Recent research suggests that adding features such as third-party certifications, guarantees, and former customer testimonials may be the most important improvements to make on a Web site because such mechanisms engender trust in the site [45]. These three mechanisms are representative of current practices and provide distinct endorsements (from various perspectives) of the site. Therefore, we hypothesize that these three trust mechanisms are antecedents to system trust. Formally stated:

Hypothesis 2a. Seals of approval are positively related to system trust.

Hypothesis 2b. Guarantees are positively related to system trust.

Hypothesis 2c. Ratings are positively related to system trust.

Perceived trust in the vendor is defined as one party's willingness to depend on another party with a feeling of relative security even though negative consequences are possible. The consumer must believe that the vendor has both the ability and the motivation to reliably deliver goods and services of the expected quality. Trust is built in the eyes of the consumer when the vendor invests in dedicated resources for the relationship [22, 33, 48]. On a Web site, with the ability to rapidly click and

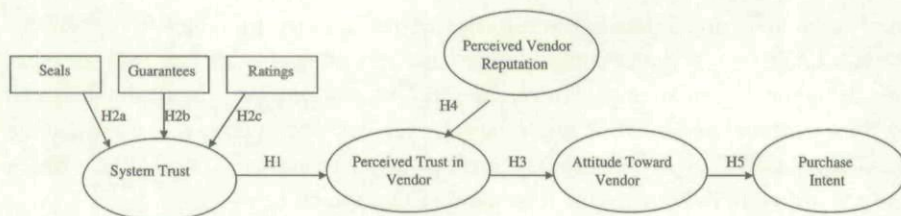


Figure 1. Research Model

search, this trust might be predicated on interpersonal trust (prior experience) or trusting beliefs (social recognition) with the vendor. Perceived reputation of the vendor captures personal experiences, history, and the broad social presence of the vendor and its products and actions. A vendor's reputation is the extent to which customers believe a vendor is honest and concerned about its customers. A favorable reputation enhances credibility of the vendor. Perceived reputation captures the essence of interpersonal trust and trusting beliefs. Other studies have also supported a positive relationship between reputation and level of trust in vendor [22, 24, 33].

Hypothesis 3. Perceived vendor reputation is positively related to perceived trust in vendor.

According to the TRA [1, 23], "a person's performance of a specified behavior is determined by his or her behavioral intention (BI) to perform the behavior, and BI is jointly determined by the person's attitude and subjective norm concerning the behavior in question" [19]. Attitude is determined by the summation of the individual's salient beliefs about consequences of performing the behavior. The TRA is a general model that does not specify the beliefs that might be operative for particular behaviors. In the context of consumer behavior, the TRA model is very useful in describing attitudes and intentions. For example, company trust has been shown to have a direct effect on both attitudes toward product and loyalty intentions [15]. In the case of e-commerce, attitude toward a vendor is formed from trust in the vendor (a belief) [27]. Therefore, we hypothesize that perceived trust is related to attitude. Formally stated:

Hypothesis 4. Perceived trust in a vendor is positively related to attitude toward the vendor.

Research has shown that attitudes and behaviors are favorably affected when high levels of trust are present [3, 58]. Purchase intention is the behavioral intent of the buyer that precedes the act of purchasing. Purchase intention is measured as the strength of one's intention to commit to an act [19]. The established work on the TRA is proposed in the form of Hypothesis 5 for testing the relationship between attitude and intention in an e-commerce setting as follows:

Hypothesis 5. Attitude toward the vendor is positively related to purchase intentions.

In addition to the hypotheses, it was also proposed to explore the interesting question of whether the model differed under extreme conditions of vendors with a "strong"

reputation and "no" reputation. Reputation and system trust might reflect the well-known duality of trust and control, where one substitutes for another [61]. In other words, in the case of an unknown vendor ("no" reputation), the relationship between system trust and vendor trust might be stronger than vice versa. In contrast, some have suggested a supplementary relationship between trust and control [18] in which case no differences between the reputation groups would be observed.

Control Variables

It has been shown throughout the consumer behavior literature that brand-related variables affect purchase intentions. These variables include the brand reputation, price, and perceived quality [21, 39]. The foundation for the perception of quality is based on other mentioned variables along with the amount and frequency of price discounts. It has also been found that wide variations in price negatively affect perceived quality and, in turn, the intent to purchase. Purchase intent is greatest when price falls within a range of acceptable prices to the consumer [21]. For the purpose of this study, we controlled for the brand name (reputation) and price by using a recognized brand at an average price level. We also provided a consistent level of situational normality for the Web design.

Method

AN EXPERIMENTAL SURVEY APPROACH WAS USED in assessing the research model presented in Figure 1. The research instrument was on a Web site that subjects visited and the data was collected by means of a questionnaire that subjects filled out and then submitted. The population for the study consisted of potential online shoppers. Numerous consumer-focused listservs were identified as targets for sample selection. Listservs appropriate for the study were selected based on descriptions giving some indication that the members were average Internet users. We avoided listservs whose members were likely to be IS professionals. Members of the listservs were recruited by an e-mail that offered a chance to win free office supplies in return for participation at the Web site designated in the e-mail. Respondents consisted of 266 Internet users with the following demographics: 92 males and 170 females, average age was 42 years old, 241 of 266 go online at least once a day, 255 of 266 have at least purchased items over the Internet with a value of \$50 or less (200 of them have spent at least \$100 or more), and 186 of them frequently gather product information online. They also self-report an average level of computer expertise of 5.6 on a seven-point scale (anchored at 1 = low expertise to 7 = high expertise).

Task

Subjects were instructed in the e-mail to point their browser to a carefully designed Web site and follow the instructions on the screen. Subjects were to assume the role

of an Internet shopper in search of a DVD player. They were instructed to view the vendor site that followed and told to click on any symbols for further information about the Web site. After viewing the Web site, they were then asked to fill out a questionnaire involving their opinion of the Web site and submit it in order to be eligible for the chance to win. After submitting, they filled out a page of personal information so they could be identified if they won. Care was taken to separate personal information from responses to maintain the anonymity of the process.

Instrument

The instrument consisted of 16 different vendor Web sites created for the experiment. The instrument followed a $2 \times 2 \times 2 \times 2$ design with two levels each of three different trust mechanisms: seals of approval, ratings, and vendor statement guarantees. Several features were designed into the trust mechanisms for the purpose of increasing system trust. Common features included in all three trust mechanisms were risk reduction, service quality, and trust. Additional features included an independent third party for the seal and rating and privacy for the rating and vendor statement. Individual features of each trust mechanism included independent verification for the seal and customer feedback for the rating. The vendor statement differed in that it included self-report statements of a money-back guarantee (risk insurance) and security. Figure 2 provides a summary of the features of each mechanism. In each case, a generic version of a seal and a rating mechanism was used. This is because the focus of the study is on system trust and not on the effectiveness of specific mechanisms. We modeled our seal and rating mechanisms in the experiment based on those that are most widely recognized as identified in a white paper by Cheskin Research [13].² The actual page layout is shown in Appendix A. The levels were either the presence, or absence, of the mechanism. Vendor reputation was also manipulated at two levels, reputation (i.e., site described in a *Wall Street Journal* article) or no reputation. When subjects entered the site, they were randomly assigned to one of the 16 conditions by the computer program. Each mechanism on the site provided a hyperlink to a page containing a description of that mechanism. As previously mentioned, subjects were encouraged to click on all links available. When they were finished viewing the site, they clicked to continue with the survey. Subjects were able to go back to the vendor's Web site while filling out the survey questions.

Measures

In order to develop the multi-item measures of the constructs, a careful review of the literature was undertaken. When possible, existing measures were adapted [17]. In particular, the perceived trust in vendor was adapted from Doney and Cannon [22] and Jarvenpaa et al. [33]; perceived vendor reputation came from Ganesan [24]; attitude from Taylor and Todd [63], Jarvenpaa et al. [33], and Mathieson [46]; and intention to purchase was adapted from Jarvenpaa et al. [33] and Mathieson [46]. System trust measures were developed by reviewing the relevant literature [48, 49].

Key concepts reflected in mechanism	Seal	Rating	Guarantee
Risk reduction	✓	✓	✓
Service quality	✓	✓	✓
Trust	✓	✓	✓
Third party	✓	✓	
Independent verification	✓		
Customer feedback		✓	
Privacy		✓	✓
Guarantee (risk insurance)			✓
Security			✓
Self-reported			✓

Figure 2. Features of Trust Mechanisms

The instrument was pilot tested in two steps. First, using verbal protocols with Ph.D. business students, students were asked to review the instrument and make verbal comments about any items that seemed ambiguous or incomplete. The next step was to test the instrument online with a group of 170 undergraduate students. This test was for the purpose of validating the instrument. The test revealed that two of the questions related to system trust needed a minor word change to improve clarity. The instrument was then tested again on a smaller group of 80 students. The results indicated that the change for clarity was effective. A reliability analysis was conducted on each of the individual constructs, which resulted in coefficient alphas of greater than 0.80 per construct (0.80 and above is generally considered acceptable). Confirmatory factor analysis was also used to verify that each scale uniquely measured its associated factor. Preliminary results suggested that each item developed for each measure met the criteria for convergent and discriminant validity. Therefore, all the items were used in the final instrument (see Appendix B for item listing).

Results

Measurement Model—Convergent Validity and Unidimensionality

THE DATA WAS ANALYZED USING A TWO-STEP structural equation modeling (SEM) approach. First, the measurement model was assessed using confirmatory factor analysis. The measurement model specifies how the constructs of interest are measured by the observed variables (the items in the questionnaire). In order to assess the efficacy of the measurement model, previous research indicates that model fit indices, such as χ^2 , can provide evidence for convergent validity and unidimensionality [26]. In addi-

tion, factor loadings that are high and significant are an indication that the measured variables or factors represent the underlying constructs [8].

The measurement properties for the final model of system trust, perceived trust in vendor, vendor reputation, attitude, and purchase intent are shown in Table 1. All the items in each scale were measured on a seven-point Likert scale.

System trust was measured by a scale of four items. The parameter estimates, fit indices, and observed residuals provide evidence of a good fit for the observed correlations among the items. Generally, the goodness of fit index (GFI) and adjusted goodness of fit index (AGFI) should be equal to or above 0.90 and 0.80, respectively, and the root mean square residual (RMSR) equal to or below 0.08 [32]. The GFI is 0.88, the AGFI is 0.42, the RMSR is 0.07, and the reliability coefficient alpha is 0.88, which, taken together, suggest a good fit. In addition, all indicator reliabilities are sufficiently high and statistically different from zero.

A scale of five items measured perceived trust in vendor. Both the GFI and AGFI are above the suggested 0.90 criteria. The RMSR is a low 0.02, the coefficient alpha is 0.94, and all the indicator reliabilities are high and significantly different than zero, leading to the conclusion of a good fit of the hypothesized model. A scale of five items also measured vendor reputation. Again, the indices overall suggest a good fit for the hypothesized model (GFI = 0.89, AGFI = 0.67, RMSR = 0.04, coefficient alpha = 0.94, with all indicator reliabilities high and significantly different than zero).

A scale of seven items measured the attitude construct. As the fit indices shown in Table 1 indicate, the construct has sufficient indicator reliability that is high and significant, a sufficient RMSR (0.03) and alpha (0.97). A scale of five items measured purchase intention. The RMSR was very low at 0.01 and the alpha was a high 0.98 with high and significant indicator reliabilities.

In sum, whereas the GFIs and the AGFIs did not always meet the criteria, all the other indicators were indicative of a good fit (RMSR, coefficient alpha, strong and significant path coefficients).

Discriminant Validity

To assess the discriminant validity of the scales, 20 maximum likelihood estimation (MLE) models were estimated and 10 χ^2 difference tests. According to Churchill [16], discriminant validity is demonstrated when the measures of each construct converge on their respective true scores, which are unique from the scores of the other constructs. Empirical evidence for discriminant validity can be obtained by comparing an unconstrained model that estimates the correlation between a pair of constructs to a constrained model in which the correlations are set at one. Then, if the difference in χ^2 between the two models is significant, the indication is that the unconstrained model is a better fit for the data [2, 5, 6, 26, 64].

Table 2 presents the results of the 20 MLE estimations along with the χ^2 difference tests. All of the differences in χ^2 are significant providing support for the unidimensional characteristics of the measures. The discriminant validity of each construct is supported in that each scale seems to be capturing a construct that is unique.

Table 1. Construct Validity Using Confirmatory Factor Analysis (CFA)

Item	ML estimate ()	t-value
System trust		
x1	0.72	13.06
x2	0.69	12.33
x3	0.88	17.47
x4	0.90	18.03
Measures of model fit		
Chi-square	70.65 df = 2	
Goodness of fit	0.8838	
Adjusted goodness of fit	0.4188	
Root mean square residual	0.0749	
Coefficient alpha	0.88	
Trust in vendor		
x5	0.89	18.17
x6	0.87	17.73
x7	0.88	17.91
x8	0.92	19.32
x9	0.85	16.85
Measures of model fit		
Chi-square	18.35 df = 5	
Goodness of fit	0.9716	
Adjusted goodness of fit	0.9149	
Root mean square residual	0.0154	
Factor reliability	0.94	
Vendor reputation		
x10	0.92	19.24
x11	0.93	19.68
x12	0.93	19.90
x13	0.82	16.01
x14	0.78	14.79
Measures of model fit		
Chi-square	79.05 df = 5	
Goodness of fit	0.8889	
Adjusted goodness of fit	0.6668	
Root mean square residual	0.0438	
Factor reliability	0.94	
Attitude		
x15	0.93	19.91
x16	0.92	19.66
x17	0.92	19.72
x18	0.86	17.40
x19	0.88	18.27
x20	0.93	20.11
x21	0.95	20.83
Measures of model fit		
Chi-square	309.28 df = 14	
Goodness of fit	0.7282	
Adjusted goodness of fit	0.4564	
Root mean square residual	0.0330	
Factor reliability	0.97	

(continues)

Item	ML estimate ()	t-value
Purchase intention		
x29	0.95	20.75
x30	0.95	20.74
x31	0.97	21.49
x32	0.94	20.19
x33	0.97	21.39
Measures of model fit		
Chi-square	83.99 df = 5	
Goodness of fit	0.8850	
Adjusted goodness of fit	0.6651	
Root mean square residual	0.0133	
Factor reliability	0.98	

Overall Fit

A confirmatory factor analysis was also performed on the full model as specified that allowed the factors to correlate. The factor loadings of all the indicators are provided in Table 3. The model provided a good fit for the data as follows: RMSR = 0.04, RMSEA = 0.10, CFI = 0.92, TLI = 0.91, Bollen Delta2 = 0.92. The χ^2 was 1,110.73 with 290 degrees of freedom. As previously mentioned, fit indices for the RMSR of < 0.08 and RMSEA of < 0.06, with the remaining indices > 0.90 indicate a good fit. The residual correlation matrix was scanned for any high residuals (over 0.20). High residuals can cause a lack of fit. Only one residual was in this category, between question 1 and question 2 of the system trust constructs (0.2166). The data were also screened for univariate and multivariate outliers.³

Structural Model

The structural model of Figure 1 was tested using the maximum likelihood technique in Mplus. Mplus allows for the analysis of categorical independent variables in its two-step method.⁴ The structural portion of the model estimates the assumed causal relationships among the exogenous and endogenous constructs. The final model with path coefficients is presented in Figure 3. As shown, all the paths were significant except for two. These paths are seals to system trust (Hypothesis 2a) and ratings to system trust (Hypothesis 2c). Therefore, the model does not support these hypotheses. However, all the remaining paths are significant at the $p < 0.01$ level, thereby providing support for Hypotheses 1, 2b, 3, 4, and 5.

It should be noted that although the measurement models had strong fit indices, the overall fit of the structural model was marginal. The ratio of the χ^2 to the degrees of freedom was 1,546.20/399 or 3.88 (three is considered appropriate). Other indices include the RMSEA = 0.10, the TLI = 0.88, and the CFI = 0.89.

Notwithstanding, the size and significance of the path from system trust to perceived trust in vendor and the significant path from vendor guarantees to system trust provide support for two important hypotheses in this study. First, this is further evi-

Table 2. Discriminant Validity Using Constrained and Unconstrained Models

Test	ML estimate	<i>t</i> -value	Constrained model chi-square	Unconstrained model chi-square	Chi-square difference
System trust with					
Trust in vendor	0.945	71.93	168.14 (27)	139.74 (26)	28.39
Vendor reputation	0.751	23.26	429.33 (27)	193.28 (26)	236.05
Attitude	0.885	48.75	519.44 (44)	409.40 (43)	110.04
Purchase intention	0.854	40.76	337.03 (27)	185.94 (26)	151.09
Trust in vendor with					
Vendor reputation	0.831	36.15	436.61 (35)	158.82 (34)	277.79
Attitude	0.912	67.71	576.89 (54)	405.81 (53)	171.09
Purchase intention	0.858	45.37	467.29 (35)	138.73 (34)	328.57
Vendor rep with					
Attitude	0.806	32.78	878.54 (54)	479.72 (53)	398.83
Purchase intention	0.758	26.10	762.88 (35)	218.57 (34)	544.31
Attitude with					
Purchase intention	0.905	70.48	982.56 (54)	519.87 (53)	462.69

Table 3. Factor Loadings—Full Model

	Factor loading	<i>t</i> -value
System trust		
x1	0.73	13.44
x2	0.70	12.71
x3	0.87	17.79
x4	0.90	18.63
Trust in vendor		
x5	0.91	19.05
x6	0.86	17.37
x7	0.87	17.74
x8	0.88	20.16
x9	0.88	20.16
Vendor reputation		
x10	0.91	19.12
x11	0.92	19.37
x12	0.93	19.63
x13	0.84	16.86
x14	0.79	15.26
Attitude		
x15	0.93	20.20
x16	0.92	19.80
x17	0.93	19.92
x18	0.86	17.54
x19	0.88	18.08
x20	0.93	19.89
x21	0.94	20.49
Purchase intention		
x29	0.96	21.05
x30	0.95	20.94
x31	0.97	21.70
x32	0.93	20.16
x33	0.95	20.97
Measures of model fit		
RMSR	0.04	
RMSEA	0.10	
CFI	0.92	
TFI	0.91	
Bollen Delta2	0.92	

dence for the appropriateness of the system trust construct in a model of e-commerce purchase intent. Also, the relationship between guarantees and system trust indicates that guarantees are an effective way to increase system trust. In summary, all hypotheses are supported with the exception of Hypotheses 2a and 2c.

An additional analysis was conducted on vendor reputation. Vendor reputation was manipulated in order to determine if reputation alone would have an effect on model fit and, in particular, the relationship between system trust and perceived trust in

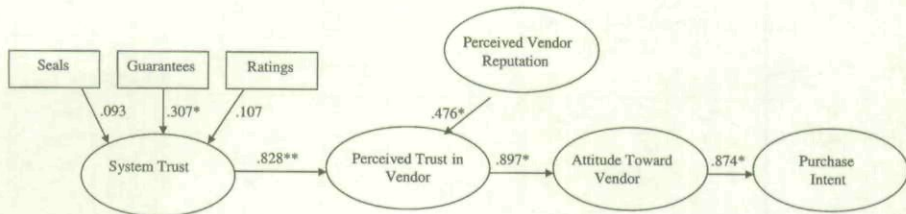


Figure 3. Model Loadings

vendor. Previous research indicates that reputation does have a positive effect on perceived trust in vendor [33]. In order to test this in our study, reputation was manipulated at two levels: "no" reputation and "yes" reputation, and then a multigroup analysis was conducted on two groups.⁵ As a manipulation check, an analysis of variance (ANOVA) was also conducted on the mean of the perceived vendor reputation indicators to ensure that the subjects in the two groups differed on perception of reputation. Results indicate a main effect of group ($F = 12.71$, $p < 0.001$), therefore, we conclude that the vendor reputation manipulation was effective.

The two groups were compared to one another using two different models. The first model held all paths equal across groups except for the path from system trust to perceived trust in vendor; this path was allowed to estimate freely. The path was highly significant and large in both cases ("no" group coefficient = 0.782, $t = 10.448$; "yes" group coefficient = 0.831, $t = 10.773$), which indicates that the strength of the relationship was present in both groups. Next, a fully constrained model (all paths held equal) was also compared to the previous model and no significant change in χ^2 was present, which indicates that constraining the paths to be equal does not affect the fit of the model. Therefore, it was concluded that the groups did not differ with respect to the reputation group to which they were randomly assigned.

Discussion

THIS STUDY INTRODUCED THE CONSTRUCT of "system trust" to a model of e-commerce purchase intention. Whereas "perceived trust" is a good predictor of attitudes and intention, theory suggests that trust is a more complex concept [50]. Prior research has often discussed the idea of system trust, which has its basis in institutional trust, yet we know of no research that tests this construct in an e-commerce purchase intention model. This study measured and validated this construct and then tested it within a larger theoretical framework of trust. The overall model was tested using a two-step structural equation modeling approach. The measurement model provided a good fit for the data, furthering the support for the constructs. The structural model included three antecedents to system trust: seals, guarantees, and ratings. Overall, the structural model had moderate fit. All hypothesized relationships (with the exception of two trust mechanisms), including the relationship between system trust and perceived trust in vendor, were highly significant.

These results provide a number of implications for research and practice. First, they provide evidence of system trust as a "controllable" construct that can be used to directly influence perceived trust. Since the ultimate goal of this stream of work is an effective prediction of purchase behavior, introducing system trust as a variable is significant, since it can be directly influenced through intervention. Successful intervention can create high system trust, which in turn can lead to perceived trust in vendor and ultimately desirable attitude and behavior. Therefore, system trust plays an important role in the belief system by directly affecting trust in vendor and indirectly affecting attitudes and intentions. These results are consistent with the findings of previous research that have tested the relationships between belief, attitude, and intent constructs, such as the TRA [27, 33], the theory of planned behavior [42], and others that show attitudes and behaviors are favorably affected when trust is present [3, 58].

Second, perceived reputation was also a significant antecedent to perceived trust in vendor. On a Web site, with the ability to rapidly click and search, perceived reputation reflects trust predicated on interpersonal trust (prior experience) or trusting beliefs (social recognition) with the vendor. However, more importantly, both system trust and reputation concurrently exhibited a significant relationship with perceived trust in vendor in the structural model. This suggests that system trust is an important predictor of perceived trust in vendor for both unknown and known firms. Further exploration of this point, conducted through experimental manipulation of reputation, affirmed this. Subjects were either viewing the Web site of an unknown but reputable vendor (by reading a *Wall Street Journal* article) or an unknown vendor without a reputation. The results show that the experimental manipulation was effective and the model was robust in both groups, indicating that reputation did not change the relationship between system trust and perceived trust in vendor. On the practical side, this indicates that firms should cultivate a perceived trust in vendor. Whereas reputable firms have an advantage in this regard, system trust is an intervention that can help in all firms. Indeed, according to de Figueiredo [20], as part of an e-commerce strategy, there is a need for branding Web sites (rather than product brands), which has the effect of signaling many trust elements. Our results indicate that cultivating system trust could be helpful in this regard.

The only mechanism in this study that influenced system trust was the use of self-reported guarantees. Interestingly, a self-reported statement (which is relatively inexpensive) can influence system trust and thereby indirectly influence purchase intentions. In assessing this result, it is useful to examine the distinction between the mechanisms as illustrated in Figure 2. Whereas all three vouch for product and service quality, seals and ratings are third-party mechanisms, and guarantees are self-reported statements. These statements, however, provide broader coverage of security and privacy issues as well as risk insurance through money-back guarantees. While it is not possible to untangle the separate effects of the security and money-back guarantee features on system trust, the relationship does seem to reflect that "situational normality" was achieved through the mechanism. In other words, the subjects believed that the proper impersonal structures were put into place to enable a successful transaction, which is consistent with Zucker, who mentions trust as "reflecting the security one

feels about a situation because of guarantees" [65]. What is surprising is the fact that these self-reported statements are potentially biased (endorsed by the vendor), which does not preclude their strong relationship with system trust. This may be due in part to the fact that vendor statements (in general) are usually focused at the heart of system trust issues (such as making statements that everything at the site is secure and working properly), thereby reducing uncertainty about the transaction, hence providing "situational normality." In fact, recent research supports this view by suggesting company policies for privacy and consumer protection should be displayed up front on a company's Internet storefront as a way of conveying trust [40].

The distinguishing features of the seals and ratings included third party information regarding the vendor, independent verification, and customer feedback. We suspect that these mechanisms may be more directly related to other issues involved in the actual purchase. We would hasten to add that even though fairly typical operationalizations of these mechanisms were used, caution should be exerted in extending the lack of significance to other seals. At most, we found positive effects for comprehensive self-proclaimed statements. These results are consistent with prior research that has found a positive relationship between such privacy and security related statements and consumers' online purchase intentions [54].

It should be noted that system trust can be effective in initial trust formation between unknown parties [51]. Accordingly, it is consistent with the concept of "swift trust," which refers to a unique form of trust that is formed in temporary situations when the parties involved are relatively unknown to one another [52]. Swift trust has not been cultivated over time, so it is a form of initial trust. In this regard, system trust has a connection with swift trust in that both involve impersonal actions and initial trust formation. Whereas the primary intent of this work was to study system trust within its nomological network rather than to focus on the efficacy of specific trust mechanisms, there is opportunity for future research to refine and study specific trust interventions and their effectiveness.

A broader model could examine risk as an antecedent to actual purchase behavior. Those relationships were not hypothesized nor tested in the present analysis. Further research should consider these relationships along with risk. In addition, further research should consider other situational factors that influence belief/attitudes/intents. For example, design quality of the Web site and ease of access to information may be additional factors influencing the model.

While many recent studies in the IS literature have proposed models of trust focused on e-commerce transactions [4, 12, 25, 27, 33, 37, 40, 42, 48, 62], our model is one of the first to examine the underlying theoretical construct of system trust within a model of e-commerce purchase intent. Our results are consistent with McKnight et al. [50], who suggest that trust engendered by institutional structures would be tightly related to trust in vendor. Furthermore, we have provided evidence that IS can be used to cultivate system trust within an e-commerce environment. In this regard, our research has important implications for IS designers.

Limitations to this study are mainly those related to external validity. Since it was not an actual vendor or actual purchase, it is not possible to say for certain if these

relationships would hold exactly in the "real world." However, care was taken to ensure that the Web site and the images were as realistic as possible and real Internet users were recruited as subjects.⁶ Further, the multi-sample validation of the constructs and strength of the nomological validity gives us additional confidence in the findings. Further work using more granular measures of trust [50] might further refine the implications of this study, particularly those pertaining to the invariant impact of reputation.

Conclusion

WHILE PERCEIVED TRUST IN VENDOR has been shown to be an important predictor of purchase behavior, practical guidelines on interventions to enhance consumer perceptions is limited. This study takes an important step in doing this by (1) testing the concept of system trust, (2) studying antecedent mechanisms that could influence system trust, (3) examining the substitutability of reputation for system trust, and (4) testing predictive validity of the constructs in the widely accepted TRA framework. Through a carefully designed experimental setting, the study extends prior work in this area. The results indicate that system trust is important to consumers and can be influenced directly by the vendor through provision of guarantees. This low-cost method could pay off through its indirect influence on trust in vendor, attitude, and intentions. Further, the study found that, regardless of reputation, firms should enhance system trust.

With the recent dot-com woes, it is important to engage in work that enhances our understanding of e-commerce success, and provides practical guidelines for managerial intervention. This study illustrates the importance of one such intervention. Future research can build on this work in testing purchase behavior over a wide variety of price/product settings (that were controlled in this study), and further examining the effectiveness of specific trust mechanisms.

NOTES

1. The terms we use to describe the constructs are consistent with earlier versions of McKnight et al. [51].

2. The choice of trust mechanisms was made to closely parallel the actual mechanisms prominent on today's Web sites. In fact, a close correspondence between the BBB online seal and BizRate rating can be noted. We did this (1) to add a degree of external validity to the study and (2) to capture representative mechanisms that could play a role in system trust. Each of these mechanisms might constitute different sub-dimensions (risk, security, privacy, guarantees, etc.), but can each be argued to have an influence on perceptions of "system trust"—our core construct. In other words, each mechanism has the potential to influence a consumer's trust as perceived by observing the Web site and its institutional elements.

3. Five subjects were identified as multivariate outliers based on Mahalanobis Distance. The five observations were removed from the analysis, however, there was no noticeable change in model fit.

4. Variables analyzed in SEM are usually continuous, however, it is possible to analyze categorical variables that are experimental (i.e., part of the experimental design). The categorical variables are represented as exogenous variables that affect other variables in the model and

all are tested within a single sample [38]. In the present case, seals, guarantees, and ratings represent such categorical exogenous variables.

5. While perceived reputation was measured in the model, manipulation of reputation in the experiment allows for the testing of the model at the two ends of the reputation spectrum.

6. Most subjects requested summary results of the study, which indicates that they were interested and took the task seriously.

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Appendix A. Layout of Online Experiment Web Pages

THE WEB PAGES IN FIGURES A1, A2, AND A3 (pages 1, 2, and 3) are the first introductory pages seen by the visitor. These pages give basic information required to proceed through the experiment.

Between the second and third pages exists a randomizer. This function generates a random number and then uses this number to select one of the 16 possible treatments. This step is transparent to the user.

The 16 treatments are comprised by the vendor having either no reputation (seen in page 5) or a strong reputation confirmed by a *Wall Street Journal* article (page 6). Each treatment within these two groups has some combination of presence or absence of a seal, rating, and/or guarantee. The case of all three present is shown in page 4 (Figure A4). Page 7 is the case of none present.

One sentence of page 3 differs slightly for treatment to avoid confusion in having the user searching for features not present in a particular treatment. This sentence directs the user to click for information on the vendor, seals, ratings, and guarantees.

From the base vendor page (4), the user will click on either the vendor logo or the hyperlink to view the reputation page (either page 5 or 6). Clicking on any seal, rating, or guarantee will present the user with associated information. The "Continue with the Survey" hyperlink opens the survey instrument in a new window. The vendor pages remain available to the user at all times.

Page 5 (Figure A5) represents the "high reputation" page as established by a *Wall Street Journal* article presenting a brief history of the vendor and basic financial information.

Page 6 (Figure A6) is the "no reputation" page as established by a statement from the vendor.

Clicking the BizRatings ribbon (Figure A7) will display a page presenting information about the BizRatings program and a sample BizRatings profile.

Clicking the Better Business Blue Ribbon logo (Figure A8) will present the Better Business certification for this vendor and information regarding the standards that must be met by a vendor to receive a certification.

Clicking the Vendor Guarantee button (Figure A9) presents the user with a statement from the vendor concerning the policies regarding security and privacy as well as a satisfaction guarantee.

Page 7 (Figure A10) is an example of a treatment that does not contain either a seal, rating, or guarantee. Notice, however, that the reputation link is present on all pages.

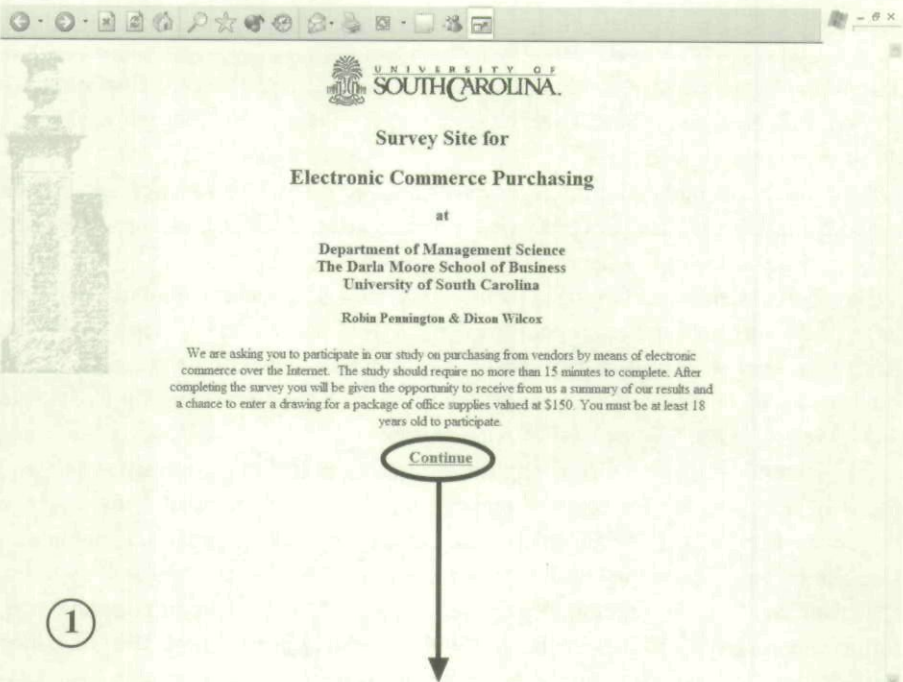


Figure A1. Page 1

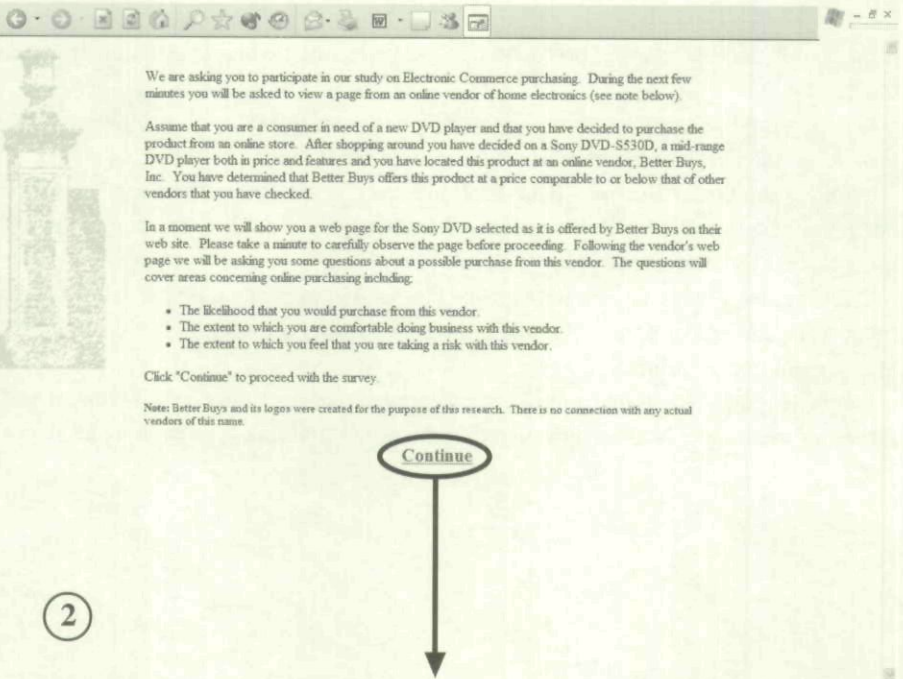


Figure A2. Page 2

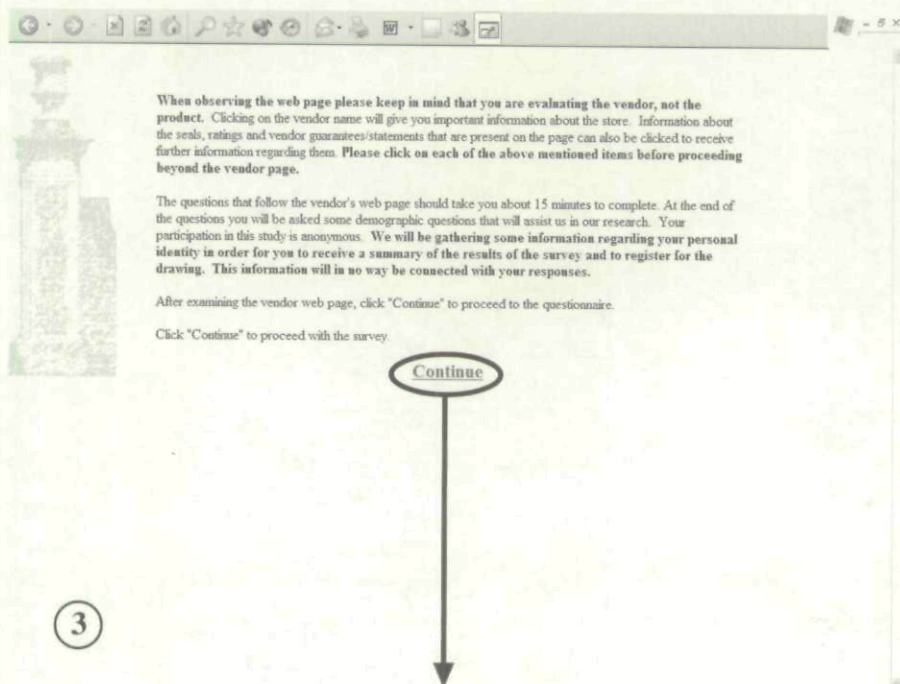


Figure A3. Page 3

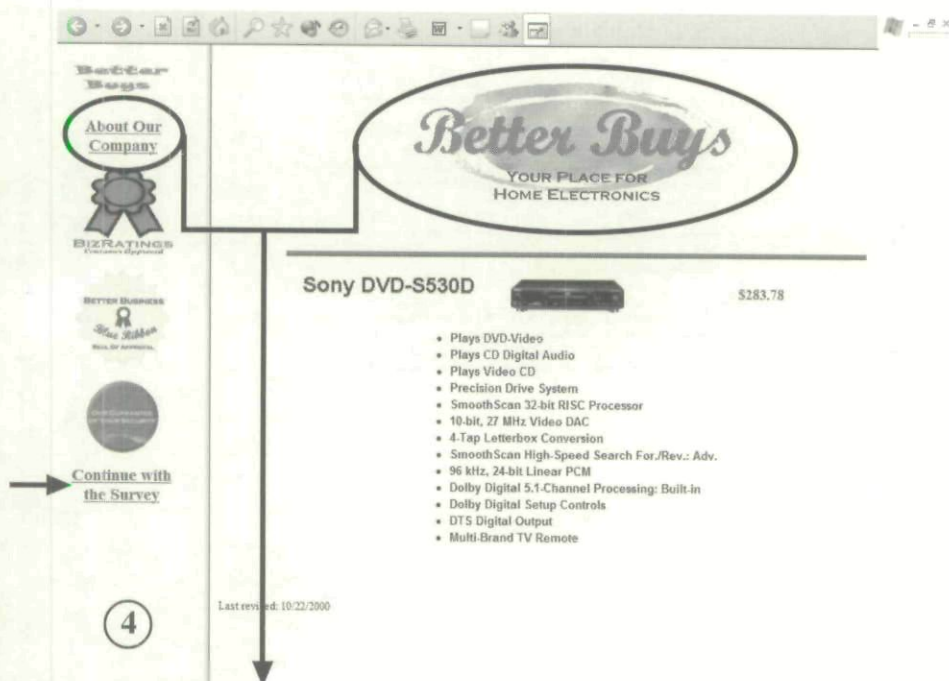


Figure A4. Page 4

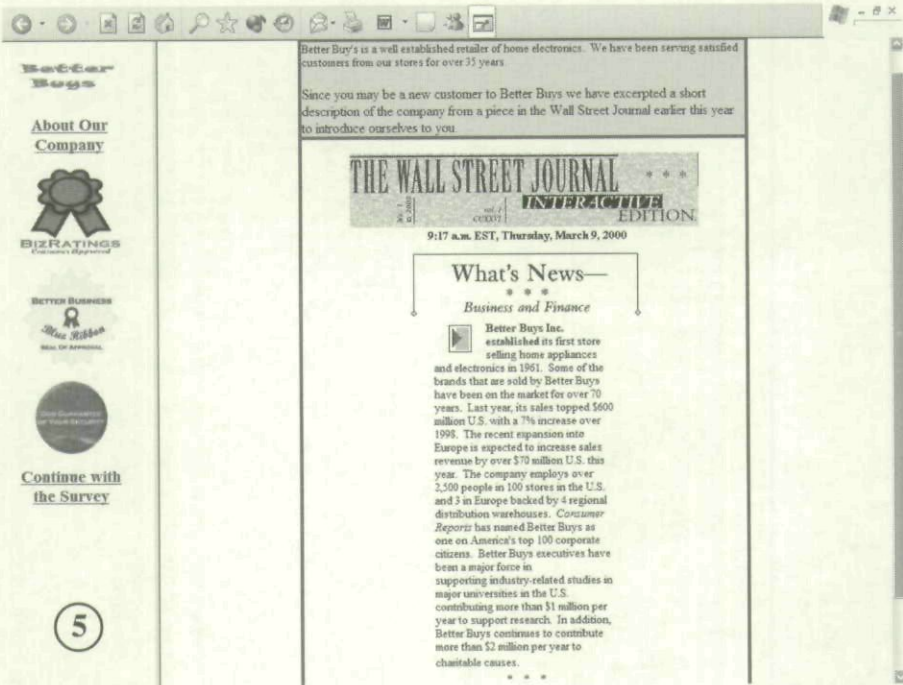


Figure A5. Page 5

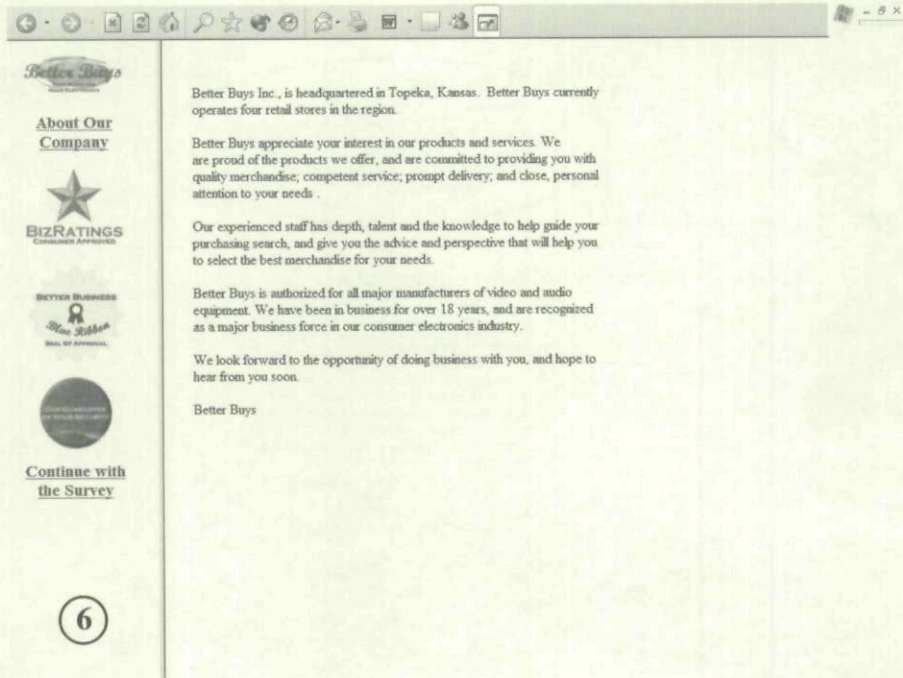


Figure A6. Page 6

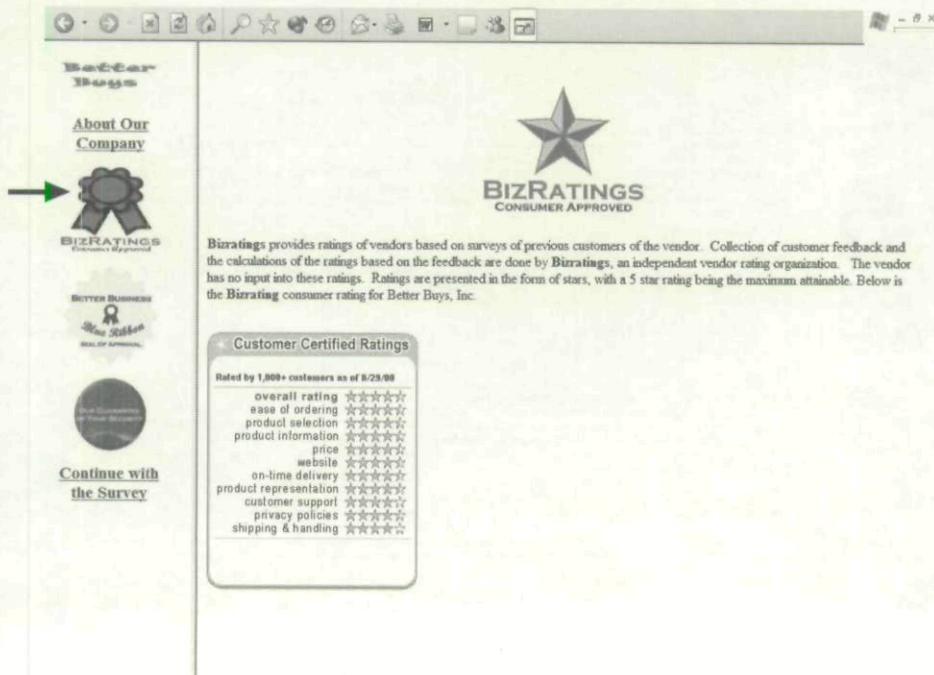


Figure A7. BizRatings

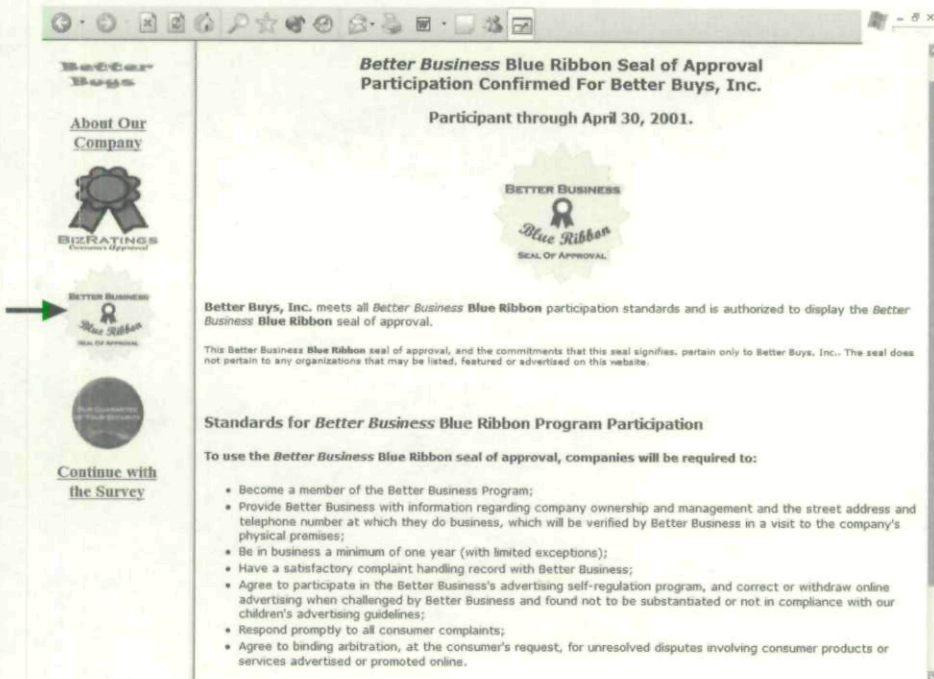


Figure A8. Better Business Blue Ribbon

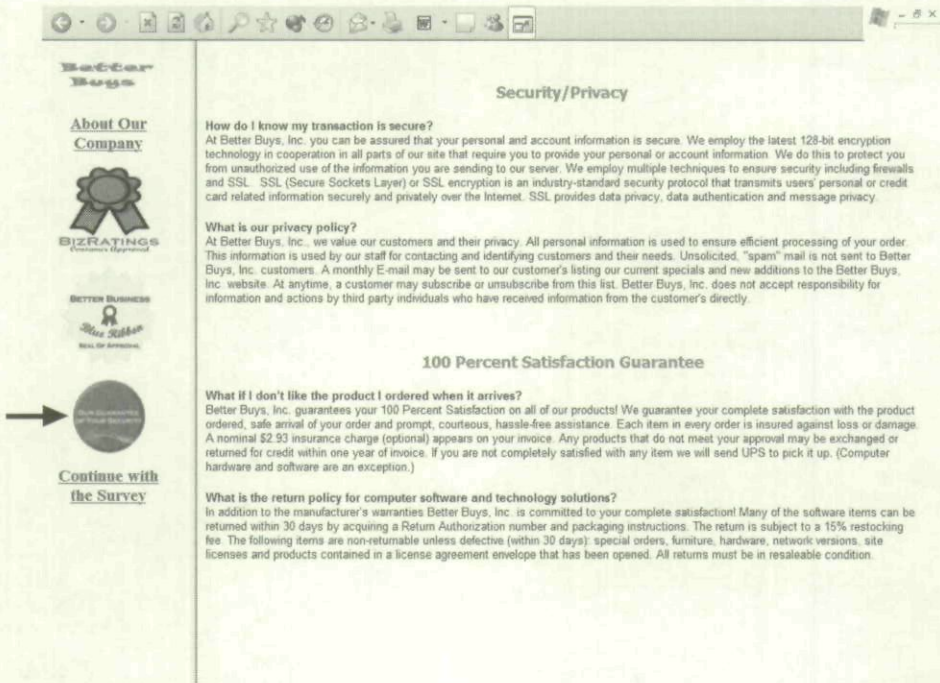


Figure A9. Vendor Guarantee



Figure A10. Page 7

Appendix B. Questionnaire

Items x1-x21 and x29-x33 per Table 1

1. On this Web site, I believe the proper technology has been put into place that would assure me of an error-free transaction (this Web site is functional).
2. On this Web site, I believe the appropriate safeguards (technologies such as encryption and privacy protection measures) have been put into place that would ensure me of a successful transaction.
3. There is enough information on this Web site to assure me that this vendor is legitimate.
4. Based on the appearance of this Web site, I believe this is a legitimate vendor.
5. This vendor appears to be one who would keep promises and commitments (would deliver goods as expected).
6. I believe the information that this vendor provides me.
7. I would trust this vendor to keep my best interests in mind (not distribute my private information).
8. This vendor is trustworthy.
9. I do not find any reasons to be cautious with this vendor.
10. This vendor has a reputation for being honest.

Not sure	1	2	3	4	5	6	7	Definitely
Not sure	1	2	3	4	5	6	7	Definitely
Strongly disagree	1	2	3	4	5	6	7	Strongly agree
Not sure	1	2	3	4	5	6	7	Definitely
Not sure	1	2	3	4	5	6	7	Definitely
Strongly disagree	1	2	3	4	5	6	7	Strongly agree
Strongly disagree	1	2	3	4	5	6	7	Strongly agree
Strongly disagree	1	2	3	4	5	6	7	Strongly agree
Not sure	1	2	3	4	5	6	7	Strongly agree

11. This vendor has a reputation for being concerned about their customers.

Not sure 1 2 3 4 5 6 7 Strongly agree

12. This vendor has good reputation in the market.

Not sure 1 2 3 4 5 6 7 Strongly agree

13. Most customers would like to deal with this vendor.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

14. This vendor is well known.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

15. Using this vendor is a _____ idea.

Bad idea 1 2 3 4 5 6 7 Good idea

16. Using this vendor is a _____ idea.

Foolish idea 1 2 3 4 5 6 7 Wise idea

17. I _____ the idea of using this vendor.

Dislike 1 2 3 4 5 6 7 Like

18. Using this vendor would be _____.

Unpleasant 1 2 3 4 5 6 7 Pleasant

19. The idea of using the Internet to shop from this vendor is appealing.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

20. I like the idea of using the Internet to shop from this store.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

21. Using the Internet to shop from this vendor is a good idea.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

29. The likelihood that I would purchase from this vendor is:

Very low 1 2 3 4 5 6 7 Very high

30. The probability that I would consider buying from this vendor is:

Very low 1 2 3 4 5 6 7 Very high

31. My willingness to buy from this vendor is:

Very low 1 2 3 4 5 6 7 Very high

32. For this particular purchase, I would use this vendor.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

33. My intention would be to purchase from this vendor.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

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