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A Web assurance services model of trust for B2C e-commerce

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Abstract

This study proposes and tests a model of trust in the context of Web assurance services for business-to-consumer (B2C) electronic commerce (e-commerce). Development of the model is important because many consumers are hesitant to engage in e-commerce transactions due to a lack of trust with businesses. Various providers have offered Web assurance services as a means to help companies address concerns among consumers associated with B2C e-commerce. Implicitly, these services are intended to bolster trust, which in turn, should improve outcomes such as online purchases. The results show that Web assurance services create trust both through the assurances they attest to and their individual provider attributes. The formation of trust is important, as it is shown to influence various outcomes, including consumers' willingness to purchase products. Additionally, both assurances and provider attributes have some residual effect on outcomes beyond that shown through the formation of trust.

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1. Introduction

With the recent widespread popularity of the Internet, business-to-consumer (B2C) e-commerce has quickly become a common medium for businesses to generate revenue. Already, B2C e-commerce has grown to an estimated US\$26 billion in sales for 2000 (U.S. Census Bureau, 2001). However, e-commerce accounts for less than 1% of retail sales (U.S. Census Bureau, 2001). Even if projections of continued growth in e-commerce revenue are accurate, it appears that many consumers have not accepted e-commerce as a purchasing channel. Research has shown that insufficient trust represents a key reason for consumers to avoid purchasing products over the Internet (American Institute of Certified Public Accountants (AICPA), 1997; Hoffman et al., 1999; Urban et al., 2000; Crowell, 2001).

Recently, a number of Web assurance services have been developed. These services are intended to alleviate consumers' trust-based concerns. These services include, among others: (1) BBBOnline Privacy, developed by the Better Business Bureau; (2) TRUSTe, developed by the Electronic Frontier Foundation; and (3) WebTrust, developed through joint efforts of the American Institute of Certified Public Accountants (AICPA) and the Canadian Institute of Chartered Accountants (CICA). Companies purchasing one of these services display a seal on their Web site. An analysis of these seals indicates that the number of companies purchasing a Web assurance service is increasing (Gogan, 1999). Alternatively, instead of relying upon an external group, a company may offer assurances about material contained on their Web site. Several studies have shown (Houston and Taylor, 1999; Noteberg et al., 1999; Arnold et al., 2000; Hunton et al., 2000; Kovar et al., 2000; Mauldin and Arunachalam, 2002; Lala et al., 2002), that in certain instances, displaying the seals positively influences consumer perceptions.

The current study extends prior research by proposing and testing a trust-based model of B2C e-commerce. This model is tested using path analysis with latent variables related to assurance and provider attributes, trust beliefs, and outcomes. The proposed model is used to provide evidence related to three key questions. First, to what extent do the two aspects of Web assurance services, assurances and provider attributes, influence the formation of trust? Second, to what extent does the formation of trust influence consumers' outcome judgments? And third, taking into account the formation of trust, to what extent are the two aspects of Web assurance services, assurance and provider attributes, incrementally associated with outcome judgments? Evidence to address these questions is essential to gain a better understanding of how Web assurance services influence consumers' judgments and how future services can be tailored to meet consumers' needs.

The remainder of the paper is organized as follows. The next section reviews the existing literature and proposes research questions. Section 3 describes the research design and instrument. Section 4 discusses the results. The final section discusses the contributions of the paper, implications of the findings, limitations, and future research.

2. Literature review and research questions

The advent of Internet stores is changing the nature of the relationship between consumers and businesses. In traditional stores, customers have the ability to view and sample actual products, to make inquiries with salespeople, and to take immediate possession upon purchase. In Internet stores, these abilities are typically diminished. Additionally, certain risks to consumers are elevated with Internet stores. For example, risks are greater in terms of the underlying existence of these companies, their trustworthiness, and their potential misuse of users' personal information, including credit card information, conveyed to the company (Gray and Debreceny, 1998).

These elevated risks and concerns have been found to inhibit purchasing decisions (AICPA, 1997; Culnan and Armstrong, 1999; Hoffman et al., 1999; Urban et al., 2000; Crowell, 2001). Presumably, by addressing these concerns, consumers would be more willing to purchase from Web-based companies. As an example of one approach to address these concerns, companies typically establish policies regarding the safety of customers' credit card information and other personal information. However, the establishment of such procedures may be insufficient to overcome concerns by consumers. Consumers may be skeptical that the company will actually comply with established policies. That is, merely establishing privacy and other kinds of policies may not be sufficient to gain customers' trust that these policies will be appropriately implemented.

Trust has been defined as "the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party" (Mayer et al., 1995, p. 712). In e-commerce, trust refers to a consumer's willingness (the trustor) to give Web sites (the trustee) personal and financial information in exchange for goods or services and promises to follow stated policies and procedures. Previous studies by the AICPA (1997) and Hoffman et al. (1999) demonstrate that many consumers do not trust Web providers enough to engage in exchanges with them.

This paper examines one mechanism for enhancing consumer trust, Web assurance services, and proposes a model of how such services bolster trust. As mentioned, a number of services including BBBOnline, TRUSTe, and WebTrust have emerged to enhance trust in an Internet site. Web assurance services represent a form of institutional-based trust (Zucker, 1986; McKnight et al., 1998). Institutional-based trust is formed through societal institutions such as certification by a credible source or governmental regulations (Zucker, 1986). As business transactions on the Internet are relatively unregulated, Web assurance services constitute a way to generate institution-based trust for company's Internet sites. Companies purchasing a Web assurance service display a seal intended to enhance the credibility for their Web sites. Prior research examining the impact of Web assurance services on the formation of trust and consumer behavior is explored below.

2.1. *Prior studies on Web assurance services*

Given the recent emergence of Web assurance services, research examining consumers' reactions to these services is relatively limited. These studies provide evidence with regard to two basic questions. First, does the presence of a Web seal affect consumers' judgment behavior? Second, does the provider of the service influence consumers' judgment and behavior? [Noteberg et al. \(1999\)](#) address both questions by examining the effect of various Web assurance seals (accountant, bank, computer association, consumer union, self-reported, and none) on subjects' likelihood of purchase judgment. Using generic seal types² from the noted sources, they found that the presence of any seal resulted in a greater likelihood of purchase compared to when no seal was present. Additionally, only the consumer union seal resulted in a greater likelihood of purchase than the self-reported seal. When examining the effect of seal type on the likelihood that privacy concerns would prevent purchase, only the accountant, bank, and consumer seals were significantly greater than no seal. While this study does show that the seal provider can influence consumers' intentions, it does not fully develop the differences in Web assurance services such as name recognition and characteristics of the seal providers.

[Lala et al. \(2002\)](#) also performed a study comparing various Web seals to determine the importance of the relative information quality of the seals. To gauge consumers' perceptions of the information quality, they examined two currently available seals, BBB Online (low information quality) and WebTrust (high information quality), along with a control setting of no seal. The results indicate that consumers do prefer high information quality seals to low information quality seals or no seals as indicated by consumers' purchasing intentions. However, the study does note that this preference can potentially be caused by the provider attributes associated with the seal as well as the information provided.

[Houston and Taylor \(1999\)](#) and [Kovar et al. \(2000\)](#) examine the effect of a specific service, WebTrust, on user expectations of and intentions to purchase from Internet sites. Both of these studies find that in comparison to when no seal is present, subjects' willingness/intentions to purchase are stronger when the WebTrust seal is present (or acknowledged). However, the results also indicate that among subjects receiving WebTrust, inferences were made to attributes that extended beyond those covered by WebTrust. For example, even though WebTrust does not include assurances regarding product quality, participants in the WebTrust condition rated the quality of products higher than when similar assurances were made without any association with CPAs. Kovar et al. speculates that this may be due, in part, to the reputations of CPAs on consumer expectations in general. This explanation suggests that the tendency to overgeneralize assurance will not occur with other providers of Web services. Attention to and prior exposure to Web seals also may play a critical role in the usefulness of Web assurance services. In this regard, Kovar et al. found that in the instance of

² The Web seals used in the experiment state the issuing party (i.e. Accountant), but did not state the brand name it was replicating (i.e. WebTrust). Additionally, the assurances provided varied among seals.

WebTrust, measures of expectations³ and intent to purchase both increased as subjects paid more attention to the seal. Prior exposure to the seal was also found to increase subjects' expectations and intent to purchase.

In contrast to previous research that focused on outcome measures (i.e. willingness to purchase and expectations), a recent study by Portz et al. (2001) advanced research by exploring the effect of WebTrust on a company's trustworthiness. They find that the presence of WebTrust does increase the companies overall measure of trustworthiness. To further our understanding of how Web assurance services influence trust, as well as outcomes, Web assurance services are further distinguished based upon assurance measures and Web seal provider attributes.

2.2. Model formation

The proposed relationships among Web assurance services, trust, and outcomes are presented in Fig. 1. This model of trust⁴ is based on those developed by McKnight et al. (1998) and Mayer et al. (1995). Consistent with McKnight et al.'s model, institutional-based trust positively influences both trusting beliefs (or trust) and trusting intentions (or outcomes). In Fig. 1, the seal-type variable represents the source of institutional-based trust, and as shown, is related to both trust and outcomes. As shown, in Fig. 1, seal type is also expected to influence perceptions formed about two attributes: assurances that the seals attest to and provider features. Thus, in Fig. 1, the ability of the seal-type variable to influence trust, is expected, in part, to be a function of perceptions formed about the assurances being attested to and who is performing the attesting. Specifically, the assurance measures capture an individual's beliefs about the policies made by companies supported by Web seals while the Web seal provider attributes measures capture an individual's beliefs about the characteristics of the organization providing the assurance. As shown in Fig. 1, an individual's assurance beliefs and provider beliefs each is expected to influence an individual's overall level of trust. While prior research by Portz et al. (2001) demonstrates an association between WebTrust and overall measures of trust, research has not explored the process of trust development within the context of Web seals. Our model proposes two sources by which Web seals can facilitate the development of trust: assurance beliefs and Web seal provider attribute beliefs.

Building on the work of Mayer et al. (1995), Fig. 1 shows trust influencing outcomes. This study includes three measures in the outcome variable potentially impacted by the formation

³ As a measure of expectations, the study used the average of the following six measures: information protection, business practices, transaction integrity, quality, the company's financial stability, and the scope of services performed in obtaining the seal.

⁴ One element not included in the model is individual factors such as propensity to trust (Mayer et al., 1995) or disposition to trust and cognitive processes (McKnight et al., 1998). While they have been shown to be useful elements in past studies, they have been omitted from the model due to the limited number of variables that can be used in path analysis. Post hoc analysis including these variables indicated that they would not have improved the model fit or altered the relationship among the other variables in the model.

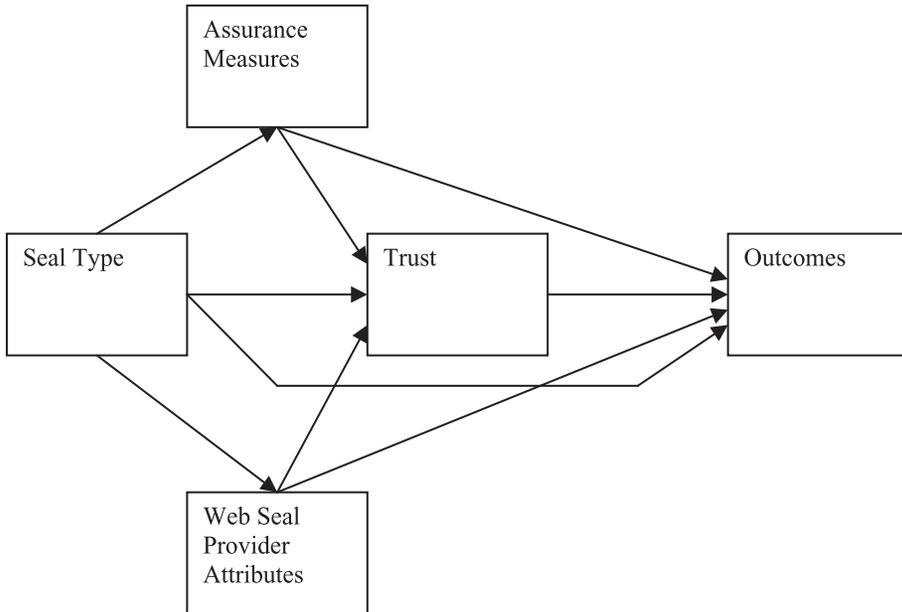


Fig. 1. Model of trust including assurance measures and provider attributes. Seal type: self-reported, BBB Online, Truste, WebTrust, and Big 5; Trust: predictability, dependability, faith, and overall trust; Outcomes: willingness to purchase, and perceived quality of product, and risk; Assurance measures: privacy, business practices and transaction integrity, security, and availability; Web seal provider attributes: confidentiality, objectivity, integrity, experience, expertise, and technical knowledge.

of trust: (1) the willingness to purchase, (2) the perceived risk of engaging in Internet transactions with the company, and (3) the perceived quality of the product. Willingness to purchase is included as an outcome as it measures consumers' intent to purchase products. This is a key measure since Web assurance services are intended to increase sales. As discussed above, previous research by Houston and Taylor (1999), Kovar et al. (2000), Lala et al. (2002), and Noteberg et al. (1999) has employed a similar outcome measure. Risk is included because it has been found to deter consumers from engaging in Internet transactions (AICPA, 1997; Culnan and Armstrong, 1999; Hoffman et al., 1999; Urban et al., 2000; Crowell, 2001). The final outcome is quality. While Web assurance seals do not provide assurances regarding the quality of products, past studies (Houston and Taylor, 1999; Kovar et al., 2000) have found that Web seals are associated with consumers' beliefs about product quality.

Based on the proposed model, three hypotheses are forwarded.⁵ The first hypothesis focuses on the relationship between the perceptions of Web seals attributes and trust formation. As shown in the model, perceptions about both the assurances attested to and

⁵ In transitioning from the model of trust in Fig. 1, no hypotheses are developed about the effects of seals on other measures due to the inadequate number of observations for testing such relationships with structural equation modeling.

the provider attributes have the potential to influence the formation of trust. Thus, the hypothesis is:

H1a: There will be a positive association between assurance perceptions and the formation of trust.

H1b: There will be a positive association between provider attribute perceptions and the formation of trust.

Numerous studies (AICPA, 1997; Hoffman et al., 1999; Urban et al., 2000; Crowell, 2001) have discussed the importance of trust in e-commerce. As shown in Fig. 1, trust is an antecedent to outcomes. The relationship between trust and outcomes is addressed in Hypothesis 2:

H2: There will be a positive association between trust and outcomes.

The final hypothesis considers the extent to which perceptions of assurances and provider attributes are associated with outcome incrementally to trust. The proposed model holds that both perceptions of assurances and provider attributes will influence outcomes beyond that captured through the formation of trust. This discussion leads to the following hypothesis:

H3a: Controlling for trust, there will be a positive association between assurance perceptions and outcomes.

H3b: Controlling for trust, there will be a positive association between provider attribute perceptions and outcomes.

3. Method

An Internet-based experiment was conducted. The case was developed based upon a semifunctional Web site for a fictitious company modeled after an actual Web site for a clothing retailer. A fictitious company was used to ensure that the company would be unknown to consumers. “Unknown” companies, that have not developed their own reputation to potentially overcome consumer concerns, are expected to benefit the most from Web assurance services (Gray and Debreceeny, 1998). The Web site was then manipulated so that subjects viewed one of five Web assurance seals. These seals included a self-seal provided by the fictitious company, the BBBOnline Reliability seal, the TRUSTe seal, the WebTrust seal, and a joint seal displaying both a Big 5 seal and WebTrust (referred to hereafter as the Big 5 seal).⁶ These five seals represent a broad spectrum of the choices

⁶ Similar to actual Web seals, each of the seals contained an active link to a page displaying the actual assurances provided by each seal. Therefore, if subjects were unfamiliar with seal and wished to inquire as to the services provided, they could simply click on the seal to gain this information.

available to companies seeking Web assurance services. Further, these seals generally are sponsored by different groups and offer differing attestations.⁷ Thus, the inclusion of these five seals provides a reasonably strong basis to assess the extent, if any, that perceptions are influenced by the kind of seal, and whether these perceptual differences are associated with organizational outcomes of interest.

All subjects were initially given a series of demographic and background questions. Responses to several of these questions were used as control variables in the analysis.⁸ Subjects were then randomly assigned to one of the five Web site treatments. All treatments were identical with the exception of the seal manipulation. Similar to actual clothing Web sites, the initial page subjects viewed had information on different product categories such as products for men and women, gifts, sales, and so forth. The Web seal was placed on the top right of the page and a link to leave the Web site and finish the questionnaire was placed on the bottom. Each of the categories displayed on the initial page was active so that if a user decided to inquire further, they could do so by clicking on that item. Subsequent pages gave users the option to return to the main page or to complete the remainder of the questionnaire. Upon clicking on the link to complete the questionnaire, subjects were then asked to answer three manipulation check questions. These questions were related to the company, product, and Web seal. If a subject answered any of these three questions incorrectly, the subject was returned to the Web site.⁹ Clearly, this type of manipulation check does not exist with actual Web sites. That is, Web site users do not have to demonstrate that they have attended to or are aware of a company's Web seal. However, by including a manipulation check for the Web seal, we are able to exclude subjects' lack of awareness/attentiveness as a possible explanation for any insignificant results. Further, by placing manipulation check questions at this stage in the questionnaire and by requiring subjects to answer questions correctly, the study was able to maximize subject participation. Had subjects not been required to answer the manipulation question correctly, those that did not answer the manipulation check question correctly presumably would have been excluded from the study because of a lack of "inclusion importance" (Yates, 1990, p. 367). In this regard, Tan and Yates (1995, p. 315) contend that "if a decision maker never even acknowledges the existence of a particular dimension, then the decision maker cannot possibly respond to that dimension." As described below, even though students were used as subjects, the study employed a relatively large number of subjects. Thus, it was important to use subjects efficiently.

After answering these three questions correctly, subjects answered a series of questions pertaining to outcomes, trust, assurances, and provider attributes. These questions are described in more detail below. The questions pertaining to provider attributes were given

⁷ For a more detailed description of the seals and the services they provide, refer to Greenstein (2000) and Greenstein and Vasarhelyi (2001).

⁸ Based on factor analysis, four control variables were retained for use in the study. They were past purchasing experience, Internet experience, propensity to trust, and concerns related to B2C e-commerce. Post hoc analysis including each of these variables both individually and in the aggregate did not strengthen the model nor alter the results. Hence, these variables were not included in the model or the analysis.

⁹ Subject's initial responses to the manipulation check were captured in the experiment. Separate analyses based on the manipulation check are discussed in the Results section.

in a separate section after those for outcomes, trust, and assurances to lessen any demand effects caused by questions related directly to Web seals or providers. In all sections of the experiment, once a subject completed one section of the questionnaire, s/he was not allowed to return to a previous section.

3.1. Subjects

The subjects used in this experiment were 225 students enrolled in undergraduate business courses at a large, southwestern state university. Subjects were entered into a cash lottery, and in most cases, given course credit for participation. As familiarity with the accounting profession could bias a subject's opinion of the WebTrust service as compared to other Web assurance services, subjects were only taken from courses where accounting majors were unlikely. Accordingly, only 9 of the 225 subjects reported accounting as their major. Demographic data collected on the subjects including age, gender, education, degree standing, major, and family income are shown in Table 1. While students only represent a small portion of the general population, past studies (Kovar et al., 2000; Houston and Taylor, 1999; Mauldin and Arunachalam, 2002; Lala et al., 2002) have utilized students as subjects. Data collected on the subjects indicate that these subjects commonly shop online. For example, 64% go online every day, their average self-rated Internet experience was 5.30 on a seven-point scale with 7 being excellent, and 26% had purchased clothing online in the past 6 months.

3.2. Variables

As shown in Table 2, 20 variables were used in the analysis. The first three variables were used to measure the outcomes of willingness to purchase, quality, and risk. Willingness to purchase was included to measure the main objective of Web assurance services, to increase consumers' willingness to purchase from Web sites. The second outcome, quality, is included to measure consumers' false expectation that Web assurance services provide assurances regarding the quality of products. While none of the Web assurance services used in the study provides any assurances with respect to the quality of products, past studies (Houston and Taylor, 1999; Kovar et al., 2000) have found that consumers have a false expectation whereby they believe Web seals provide assurance governing the quality of products. The last outcome variable is risk. Since the various risks of engaging in transactions over the Internet are major deterrents preventing consumers from purchasing products (AICPA, 1997; Culnan and Armstrong, 1999; Hoffman et al., 1999; Urban et al., 2000; Crowell, 2001), risk is included as a factor.

The second group of variables, V4 through V10, measures trust. Seven questions were adapted from Bhattacharjee (2002) to measure various levels of trust including predictability, dependability, faith, and overall trust. As the Web seals may affect different emotional and cognitive levels of trust among consumers, two questions were chosen for each of the levels, and one question was used to measure overall trust.

Variables V11 through V14 were used to measure the various assurances attested to by the Web seals. While the actual assurances provided vary by seal, four assurances of privacy,

Table 1
Demographic data

	<i>n</i>
<i>Age</i>	
<20	33
20–25	159
26–30	21
31–40	6
41–55	5
>55	1
<i>Gender</i>	
Male	137
Female	88
<i>Education</i>	
HS	114
2Y	36
4Y	70
Advanced	1
Other	4
<i>Degree standing</i>	
Freshman	3
Sophomore	49
Junior	101
Senior	69
Other	3
<i>Major^a</i>	
Accounting	9
CIS	35
Finance	75
Management	27
Marketing	23
Other	78
<i>Family income</i>	
<25,000	32
25,000–50,000	46
50,000–75,000	34
75,000–100,000	29
>100,000	39
Other ^b	45

^a The total of this demographic exceeds the total number of subjects ($n=225$) since subjects were allowed to check more than one major.

^b These subjects did not wish to disclose income.

Table 2
Variables

Outcomes:

- V1: How likely would you be to purchase a product from DLeary?
- V2: How would you rate the quality of products from DLeary?
- V3: How would you rate the risk of engaging in Internet transactions with DLeary?

Trust:

- V4: I believe that DLeary will act with high business standards.
- V5: I can count on the people at DLeary to behave with high business standards.
- V6: I think that DLeary can be relied upon to fulfill their obligations to customers like me.
- V7: I feel that DLeary is dependable.
- V8: I feel that DLeary will not take unfair advantage of me, if such a situation arises.
- V9: I do not think that DLeary has ill intentions about any of their customers.
- V10: Overall, I trust DLeary.

Assurances:

- V11: How confident are you that personal information provided to DLeary is used appropriately?
- V12: How confident are you that credit card numbers provided to DLeary are protected from unauthorized users?
- V13: How confident are you that customers' orders are fulfilled as agreed by DLeary?
- V14: How confident are you that you will be able to access your personal information maintained by DLeary?

Provider attributes:

Please rate DLeary (the Better Business Bureau, TRUSTe, Certified Public Accountants, Ernest and Young LLP) with respect to each of the following six attributes.

- V15: Confidentiality
 - V16: Objectivity
 - V17: Integrity
 - V18: Experience in providing assurance services.
 - V19: Expertise in providing assurance services.
 - V20: Technical knowledge related to e-commerce issues.
-

security, business practices and transaction integrity, and availability are used to measure the assurances for all seals as these variables provide a comprehensive set of measures. Also, it should be noted that the variables measure the assurances as perceived by consumers, not actual assurance offered. In a past study focusing on WebTrust, [Portz et al. \(2000\)](#) found that consumers' perceptions of the assurances provided by Web assurance services are not completely accurate. In our model, the critical measure in terms of influencing trust and outcomes is consumers' perceptions of assurances, not the actual assurances.

The final variables, V15 through V20, measure attributes of Web seal providers believed to be sources of value. These measures include confidentiality, objectivity, integrity, experience, and expertise. A sixth measure, technical knowledge, is also included due to its potential importance in providing assurance over Internet-based transactions.

4. Empirical results

The data were analyzed using path analysis with latent variables. This method provides an advantage over other methods of analysis as it examines the causal relationships between

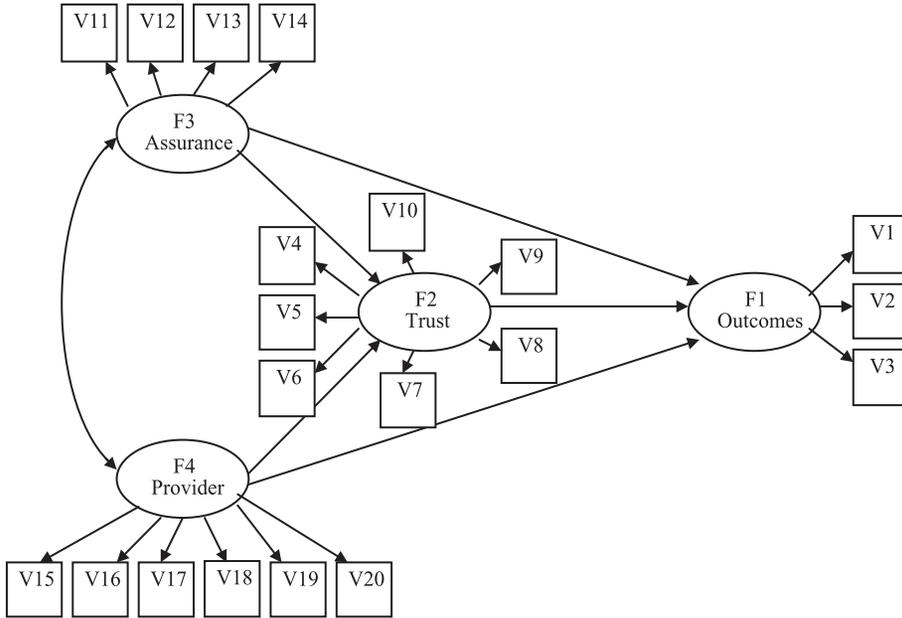


Fig. 2. Path analysis: measurement model.

latent variables in the model. This section consists of developing the measurement model, the path analysis with latent variables, and nonstandard models based on each of the outcomes.

4.1. Measurement model

The measurement model is shown in Fig. 2. This model is based on the model of trust in Fig. 1. Four latent variables are used. The first latent variable, outcomes (F1), consists of three measures: willingness to purchase, quality, and risk. The second latent variable, trust (F2), consists of seven measures: two measures for each of predictability, dependability, and faith, along with one measure of overall trust. The third latent variable, assurance (F3), consists of four measures: privacy, security, business practices and transaction integrity, and availability. And the fourth latent variable, provider (F4), has six measures: confidentiality, objectivity, integrity, experience, expertise, and technical knowledge.

Based on the confirmatory factor analysis, several changes were made to the model. These changes consisted of combining several measures within the latent variables due to multicollinearity.¹⁰ The multiple measures for predictability, dependability, and faith within the trust latent variable were combined resulting in one measure for each factor. Additionally, the overall measure of trust was combined with the dependability measures. Within the provider latent variable, the confidentiality, objectivity, and integrity measures were combined into one

¹⁰ Hatcher (1994) notes that a necessary condition for confirmatory factor analysis and path analysis with latent variables is the absence of multicollinearity.

measure. Also, the experience and expertise measures were combined into one measure. When combining these variables, each variable received equal weighting.

The revised model is shown in Fig. 3. Fit statistics for the model include a chi-square of 107.59 with 59 degrees of freedom (χ^2/df ratio = 1.82; $Pr > \chi^2 = .0001$), Goodness of Fit Index (GFI) = 0.9296, Bentler's Comparative Fit Index (CFI) = 0.9719, and Bentler and Bonett's Non-normed Index (NNFI) = 0.9629. While the chi-square test indicates the model may not be properly fit, this test is considered oversensitive (James et al., 1982; Hatcher, 1994). The abundance of the other measures indicates the model has sufficient fit. Fit statistics are included in Table 3.

4.2. Path analysis with latent variables

The hypotheses were tested using the revised model. Results of the analysis also appear in Fig. 4. As the same model is used as in the confirmatory analysis, there were no changes in the chi-square, degrees of freedom, GFI, CFI, or the NNFI. Additionally, all factor loadings are significant ($P < .05$) and all standard errors are greater than zero for both latent and manifest variables. R^2 values for the endogenous latent variables of outcomes (F1) and trust (F2) are .7472 and .4717, respectively. There are few large residuals based on the distribution of asymptotically standardized residuals. And last, the Parsimony Normed Fit Index (PNFI) is 0.7114. Once again, while the chi-square test indicates the model may not be properly fit, this

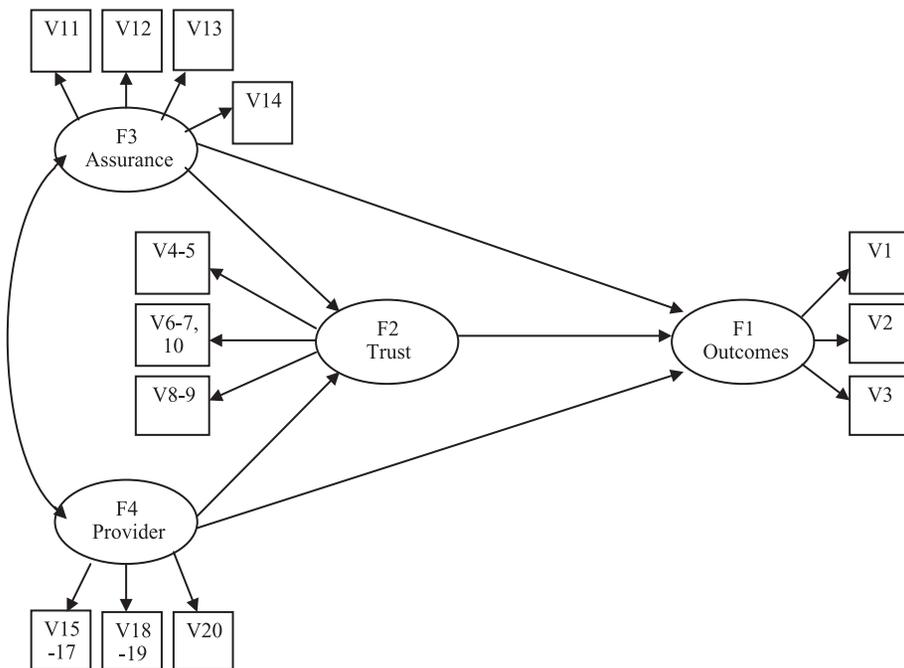


Fig. 3. Path analysis: revised model.

Table 3
Fit statistics

	Confirmatory/ all outcomes	Willingness	Quality	Risk
χ^2	107.59	77.98	78.75	78.55
χ^2/df	59	39	39	39
$Pr > \chi^2$.0001	.0002	.0002	.0002
χ^2/df	1.82	2.00	2.02	2.01
GFI	0.9296	0.9393	0.9375	0.9387
CFI	0.9719	0.9760	0.9760	0.9750
NNFI	0.9629	0.9662	0.9662	0.9648
PNFI	0.7114	0.6762	0.6765	0.6751
RMSR	0.0664	0.0574	0.0553	0.0569
RMSEA	0.0606	0.0668	0.0675	0.0673
ECVI	0.7851	0.6029	0.6063	0.6054

test is considered overly sensitive. The abundance of the other measures indicates the model has sufficient fit.

The model reveals trust is developed through both assurance and provider attributes as both variables have a significant influence on the development of trust. This is shown through the significant paths from assurances (F3) to trust (F2) ($\beta_{f2f3} = 0.607$; $P < .001$) and from provider (F4) to trust (F2) ($\beta_{f2f4} = 0.124$; $P < .05$). While both measures are significant

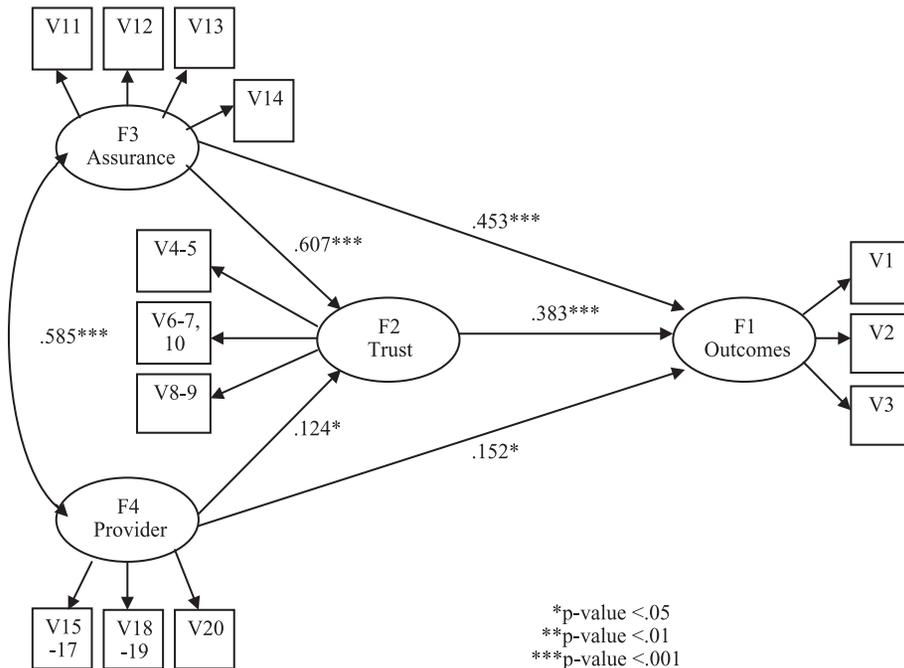


Fig. 4. Path analysis: all outcomes.

indicating both assurances and provider attributes positively influence trust, the magnitude of the paths indicates assurance has a much greater effect on trust than provider attributes. These results support Hypotheses 1a and 1b and indicate that both assurance and provider attributes are important in developing trust.

The second hypothesis predicts a positive association between trust and outcomes. The results indicate that trust has a significant positive association on outcomes as shown in the path between trust (F2) and outcomes (F1) ($\beta_{f2f1} = 0.383$; $P < .001$). This evidence supports Hypothesis 2.

The final hypothesis addresses the incremental effects of assurance and provider attributes on outcomes controlling for trust. For both assurances and provider attributes, there are significant, incremental effects beyond that shown through trust. Consistent with Hypothesis 3a, the path between assurance (F3) and outcomes (F1) is significant ($\beta_{f3f1} = 0.453$; $P < .001$), controlling for trust. Additionally, consistent with Hypothesis 3b, the path between provider (F4) and assurance (F1) is significant ($\beta_{f4f1} = 0.152$; $P < .05$).

As noted earlier, subjects' initial responses to the manipulation checks were captured in the experiment. Two separate analyses were conducted. One for subjects initially answering the Web seal manipulation check correctly ($n = 87$), and one for subjects initially answering the Web seal manipulation incorrectly ($n = 138$). With one exception, the results based on each of the two subgroups were generally qualitatively similar to the overall results discussed above. However, in comparison to the results from the entire sample, the subgroup of subjects

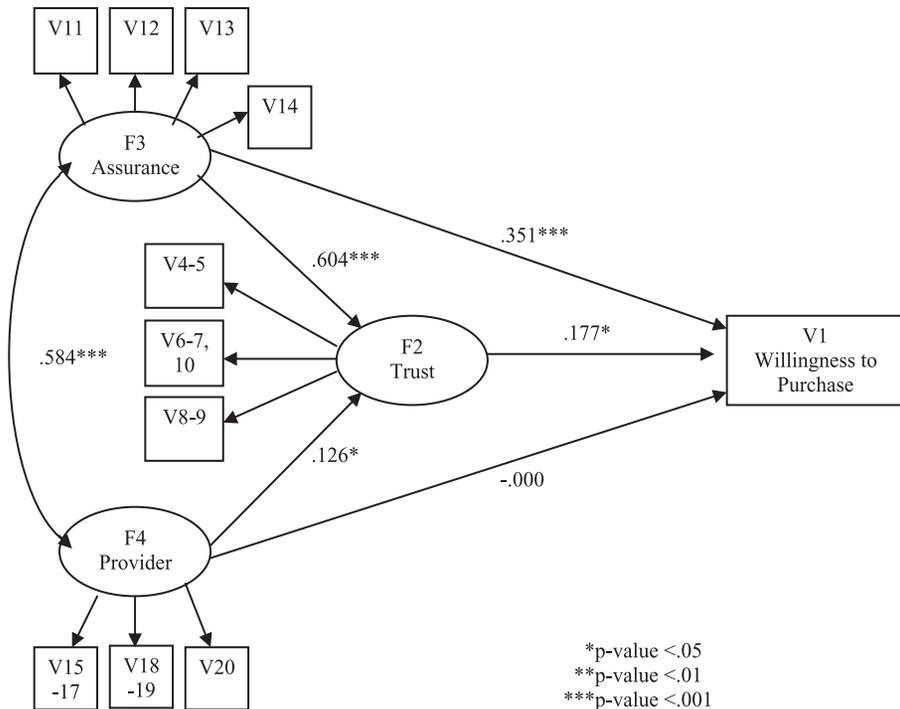


Fig. 5. Path analysis: nonstandard model for willingness to purchase.

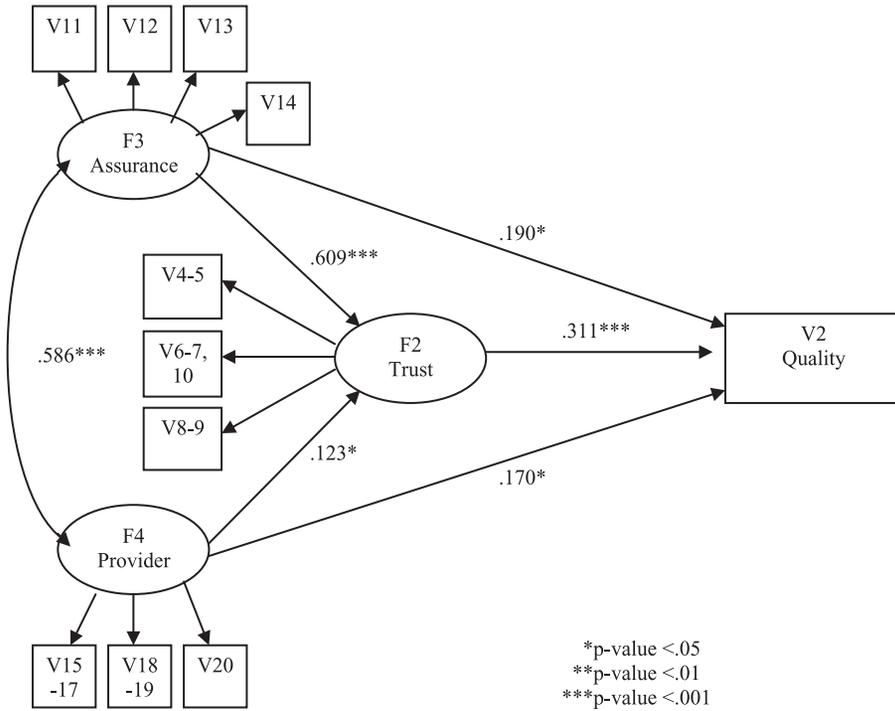


Fig. 6. Path analysis: nonstandard model for quality.

initially answering the manipulation check incorrectly placed more emphasis on the formation of trust ($pf2f3 = 0.685$; $P < .001$ and $pf2f4 = 0.134$; $P < .05$) and the influence of trust on outcomes was stronger ($pf1f2 = 0.445$; $P < .01$). Those initially answering correctly placed more emphasis on the paths linking assurances and provider attributes directly to outcomes ($pf1f3 = 0.510$; $P < .001$ and $pf1f4 = 0.284$; $P < .05$).

4.3. Nonstandard models

While the previous analysis looks at all outcomes as a latent variable, additional analysis examines each of the outcomes individually using nonstandard models. A nonstandard model differs from a traditional (standard) latent-variable model in that at least one of the constructs in the structural portion of the model is represented by a single manifest variable (Hatcher, 1994). In traditional models, the constructs are represented by multiple variables. In this instance, willingness to purchase, quality, and perceived risk are used as single manifest variables to generate three separate nonstandard models rather than combined into one latent variable as in prior analysis.¹¹ Results of this analysis appear in Figs. 5, 6, and 7.

¹¹ While using nonstandard models can result in biased parameter estimates due to measurement error of constructs (Hatcher, 1994), they have been utilized in this instance to provide insight into individual differences among outcomes.

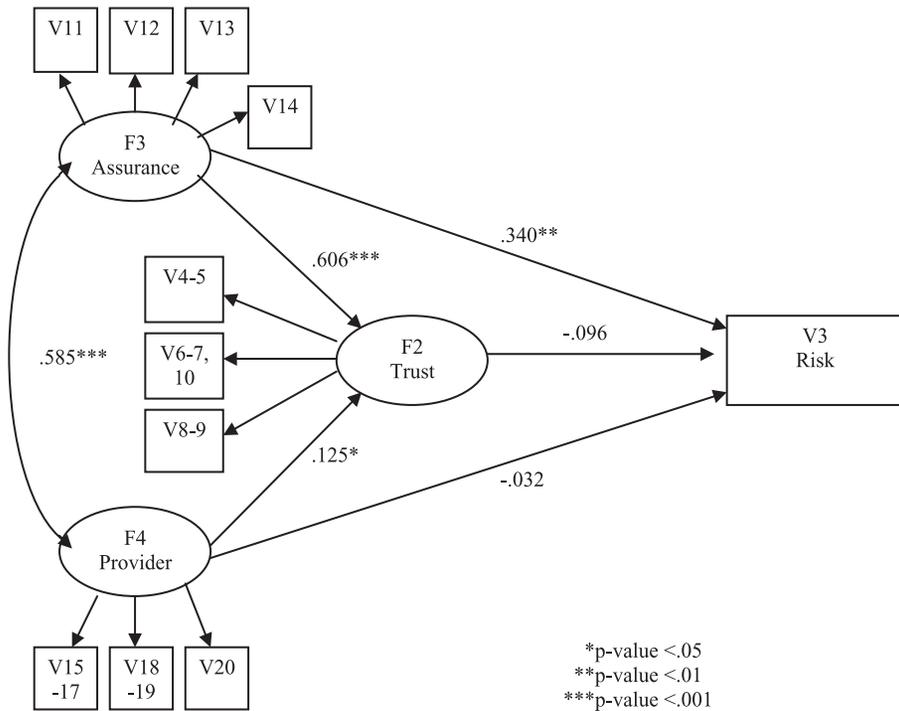


Fig. 7. Path analysis: nonstandard model for risk.

Assurance is significantly associated with each outcome. Among the three outcomes, the greatest path coefficient for assurance was found for willingness to purchase ($pf3v1 = 0.351$; $P < .001$), followed by risk ($pf3v3 = 0.340$; $P < .01$), and then quality ($pf3v2 = 0.190$; $P < .05$). Trust only has a significant influence on outcomes in two of the three models. When viewing the path from trust to outcomes, trust has the greatest effect on quality ($pf2v2 = 0.311$; $P < .001$), then willingness to purchase ($pf2v1 = 0.177$; $P < .05$), and no effect on risk. The only significant path from provider attributes to outcomes is for quality ($pf4v2 = 0.170$; $P < .05$). There is no direct effect of provider attributes on outcomes for either willingness to purchase or risk.

5. Conclusions, limitations, and future research

With the growth of the Internet, B2C e-commerce has become a rapid area of expansion for many businesses. One barrier to success, however, has been a lack of a consumer confidence in Web sites developed by companies. To help overcome this limitation, a number of separate providers have developed Web assurance services to provide these Web sites with institution-based trust. This study proposed and tested a model of the means by which these services establish trust and influence consumers' behavior.

As there have been relatively few papers in the area of Web assurance services, this study serves to make several contributions to the literature. First, it aids in our understanding of how Web assurance services affect trust formation by developing and testing a model of trust in an e-commerce environment. As trust is believed to be a critical factor in the success of Internet stores (Urban et al., 2000), this understanding aids in the effective design and implementation of Web assurance services. Results of the analysis show that both assurances and provider attributes are positively associated with various measures of trust. The formation of trust is important to understanding Web assurance services as trust has been shown through the path analysis to have a significant impact in determining willingness to purchase and perceived quality.

While trust has been shown to be a significant factor in determining outcomes, the path analysis also reveals that the primary factor in determining outcomes is assurance. Assurance has a significant influence on outcomes both as a latent variable, and when examined with manifest variables for willingness to purchase, perceived quality, and risk. Additionally, assurance was found to have an indirect effect on outcomes through its significant influence on trust. Practical implications of this finding are that Web assurance providers should focus more on the assurances that they provide, and less on their personal attributes, as assurance appears to be the key determinant of consumers' behavior.

And last, this study further examines the quality expectation gap reported by Houston and Taylor (1999). The results validate that Web seals are associated with forming improved expectations regarding quality. However, the analysis shows this result applies to all Web assurance seals, not just WebTrust. This presents a potential problem for all Web assurance providers in communicating the coverage of their seals to consumers.

It should be noted that this study only examines consumers' attitudes towards various Web assurance services and intent to purchase products, not actual behavior. While intent has generally been found to be the strongest predictor of behavior, it may not accurately predict actual behavior (Eagly and Chaiken, 1993; Ajzen and Fishbein, 1980). Additionally, the study only looks at the effects of Web assurance services on a specific product, clothing. Consumers' perceptions, behavior, and expectations may vary when presented with other products (e.g. Hunton et al., 2000). Thus, future studies should examine consumers' perceptions across a range of products.

While this study aids in our understanding of Web assurance services, several key questions still need to be addressed by future research. First, what type of assurance do consumers value the most? Is it privacy, security, business practices and transaction integrity, or availability? Or have the current Web assurance services failed to deliver what consumers demand? For Web assurance services to be valued by businesses, they must be able to meet the demands of consumers.

Another question that remains is whether Web assurance services will be valued in the future. As the Internet is still in its infancy, a number of changes can take place that will affect the market for Internet services. Government regulation, increased credit card protection, and the growing expertise of Internet users are just a few of the factors that could alter the benefits derived from Web assurance services.

For Web assurance services to increase in value, consumers must become more educated on what these services do, as well as what they do not do. Future research can examine ways to educate consumers, and how this will affect consumers' perceptions of Web assurance services and the Web sites they represent. Educating consumers should help Web assurance services by decreasing the gap between what the services provide, and what the consumers expect.

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