Trustworthiness in B2C E-Commerce: An Examination of Alternative Models

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Abstract

Advancing research on trust requires clarifying the different conceptualizations of trust and trust-related constructs. The purpose of this study is to advance the theoretical conceptualization of trustworthiness by synthesizing previous research and testing three alternative conceptualizations within the e-commerce context. Data collected from multiple studies involving over 700 participants were used to examine the relative merits of trustworthiness as a one-dimensional construct, a grouping of three first-order constructs, and a second-order construct. Our results indicate that a one-dimensional view may be too simplistic, given the variety of factors that online consumers must weigh. Instead, the study suggests that trustworthiness is multidimensional and that both first- and second-order conceptualizations have a place in e-commerce trust research. Trust researchers should be guided by the research question, hypotheses, and research design in deciding which conceptualization to use.

ACM Categories: H.1.2, K.4.4

Keywords: Trustworthiness, Trust, World Wide Web, Electronic Commerce, Second Order Factors, Ability, Integrity, Benevolence

Introduction

Research into trust has increased dramatically in the last decade, and numerous studies have investigated differing models of trust (Lander et al., 2004; Lewicki & Bunker, 1995; Lewis & Weigert, 1985; Tyler & Degoevy, 1996). Little research, however, has explored the specific nature of trustworthiness, often modeled as a precursor to trust (Mayer et al., 1995; McKnight et al., 2002a). The distinction between trust and trustworthiness is an important one. Trust is often described as a general willingness to depend on another in situations of risk (Mayer et al., 1995; McKnight et al., 2002a). Trustworthiness—referred to as trusting beliefs within the information systems discipline—is the set of beliefs about the other party that precedes that willingness (Mayer et al., 1995). Research that seeks to understand the factors that influence the formation of trust must be clear in how it conceptualizes and analyzes the antecedents of trust.

In information systems research, prior trust studies have proven useful in understanding user interactions in the context of e-commerce (Gefen, 2003b; Pavlou & Gefen, 2004). Consumers' trust—i.e., their willingness to transact with online

Acknowledgement

The authors appreciate and gratefully acknowledge the cooperation of David Gefen of Drexel University, who provided data that increased the quality of our study.

1 David Gefen served as the Senior Editor for this paper.
businesses—is believed to be driven by their assessment of the business’ trustworthiness (McKnight et al., 2002b; Reichheld & Schefter, 2000). Unfortunately, information systems has not consistently conceptualized trust and its antecedents and consequences (Gefen, 2002b; McKnight et al., 2002a). As an example, some recent business-to-consumer (B2C) e-commerce research has blended the conceptualizations of trustworthiness and trust, rather than defining one as a precursor to the other (Bhattacharjee, 2002; Gefen et al., 2003; Pavlou, 2003; Suh & Han, 2002). This inconsistency raises questions about the proper conceptualization of these two important constructs, and also hinders theoretical advances on trust and related constructs.

The purpose of this study is to clarify and advance the theoretical conceptualization of trustworthiness within a B2C context by synthesizing previous research and testing alternative models. We first test a more parsimonious model of trustworthiness to determine if trust theory can be simplified by modeling trustworthiness as a one-dimensional factor. We also extend McKnight et al. (2002a) by providing a theoretical rationale and the theoretical implications for a second-order model of trustworthiness. Finally, we extend both McKnight et al. (2002a) and Gefen (2002b) by testing their respective multidimensional conceptualizations against alternative conceptualizations.

**Literature Review**

**Trustworthiness versus Trust**

While past research has posited that a variety of beliefs make up trustworthiness (see McKnight et al., 2002a for a detailed review), recent research has primarily focused on three specific factors which may parsimoniously capture the concept of trustworthiness—i.e., ability, benevolence, and integrity (Mayer et al., 1995). We refer to these constructs throughout the paper as the “dimensions of trustworthiness.” Ability is the perceived skills, competencies, and characteristics that enable a party to have influence within a specific domain (Mayer et al., 1995). Benevolence is the trustee’s belief that the trustee wants to do good toward the trustor. Integrity is the belief that the trustee adheres to a set of principles that the trustee finds acceptable (Mayer et al., 1995). We define trustworthiness as “a confident trustor perception that the trustee...has attributes that are beneficial to the trustor” (McKnight et al., 2002a, p.337).²

In contrast, trust is defined as a willingness to depend on the trustee (McKnight et al., 2002a). This definition of trust distinguishes it from the beliefs that precede it—e.g., beliefs about a trustee’s ability, benevolence, and integrity. This study examines the distinction between trustworthiness and trust by examining a context consistent with past IS research—i.e. that of trustworthiness and initial trust within a B2C context (McKnight et al., 2002a). Initial trust describes trust in the context of an unfamiliar trustee, in our case consumer trust with unfamiliar online retailers (McKnight et al., 2002a). The distinction between trust and trustworthiness is supported by the connection between trust research with the theory of reasoned action (TRA) (Fishbein & Azjen, 1975; McKnight et al., 2002a). TRA posits that an individual’s beliefs affect one’s attitudes, which affect one’s intention to perform the behavior. Applying TRA to models of trust, trusting beliefs (trustworthiness) would precede and affect trusting attitudes (trust). TRA therefore differentiates the individual’s beliefs about the trustee (trustworthiness) from the individual’s resulting willingness to take an action (trust).

Trustworthiness is therefore not the same as trust, but rather it forms the basis for trust and downstream trust-related actions. While some studies involving trust and trustworthiness clearly differentiate these two concepts (Mayer et al., 1995; McKnight et al., 2002a), other IS studies have not (Bhattacharjee, 2002; Pavlou, 2003; Suh & Han, 2002). As an example, recent IS studies utilize trustworthiness indicators (i.e., ability, benevolence, and integrity), but refer to the construct as “trust.” Bhattacharjee defines trust as a willingness to be vulnerable, but includes indicators that measure Amazon.com’s ability, benevolence, and integrity as part of trust, rather than trustworthiness (Bhattacharjee, 2002). In addition, this same research uses the trust indicator “Overall, Amazon.com is trustworthy” [emphasis added], which has a clear overlap with the conceptually distinct construct of trustworthiness. These survey items, therefore, assess the trustor’s perception that Amazon.com has beneficial characteristics (i.e., is trustworthy), not whether consumer is willing to depend on Amazon.com (i.e., trusts Amazon.com). This approach also diverges from TRA by equating beliefs with attitudes.

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² We use the term “beneficial” in a broad sense, and the term “benevolence” to denote a specific trustworthiness dimension.
In a B2C context, blending trust with trustworthiness may overestimate formed trust, since the practice assumes that if a party (e.g., Amazon.com) is perceived to have beneficial characteristics, it will be trusted. This assumption effectively omits the role of trust within the nomological network, since it is possible that a consumer may perceive that Amazon.com has beneficial characteristics (is trustworthy), but still may not be willing to depend on it for books.3 Trustworthiness may instill trust, which indicates that trustworthiness and trust are distinct but related constructs. Hence, trust's role within the nomological network within these studies may be misrepresented, since it may actually be trustworthiness that was studied. This misrepresentation requires clarification, since perceptions that a party is trustworthy is not the same as the trust that results from those perceptions.

Although prior studies have helped shed some light on the effects of trust (Gefen, 2002b; Kim & Prabhakar, 2004; Suh & Han, 2002; Van Slyke et al., 2004), the different conceptualizations of trust and trustworthiness across studies may also be limiting the IS discipline's ability to advance knowledge in this domain. This study seeks to clarify the theoretical nature of trustworthiness, and as a result more clearly differentiate it from trust. Toward this end, this study explores and compares trustworthiness as a one-dimensional construct, a collection of first-order constructs, and as a second-order construct. Information systems and other disciplines have relied on each of these, but the implications of each of the conceptualizations in a B2C context have not been previously explored. In the next sections, therefore, we discuss each of these views of trustworthiness, along with the implications of each.

**Trustworthiness as a One-Dimensional Construct**

Model 1A in Figure 1 assumes that trustworthiness is a one-dimensional construct that has ability, benevolence, and integrity indicators that all covary. Trustworthiness is viewed as a composite belief that results in a party being more or less trusted (Mayer et al., 1995). Researchers have viewed such one-dimensional models of trustworthiness differently, including belief in a person's composite competence and integrity (Lieberman, 1981), in a person's predictability (Good, 1988), or as the extent that someone is motivated (or not motivated) to lie (Hovland et al., 1953).

A one-dimensional model of trustworthiness favors parsimony over completeness. Existing theory could be simplified, however, if trustworthiness is a simple trait that is or is not possessed. This is similar to the calculative model of trust that posits a trustor weighs the pros and cons of trusting another in a business relationship (Doney & Cannon, 1997). This view of trustworthiness may be sufficient, therefore, in contexts where the trustor can focus on one aspect of the trustee (Gefen, 2002a) in deciding whether or not to take a risk.

Within an online shopping context, however, a one-dimensional view may be too simplistic. Consumers may expect that a vendor will be successful across a number of dimensions before they are willing to make a purchase. An online retailer may be reliable

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3 Possible reasons include distrust of Internet-based transactions, fear of releasing personal information (including credit card information), and low disposition to trust. While these have been commonly included as additional determinants of trust, these constructs also reinforce that the consumer must perceive that different factors (including trustworthiness), are present before trust can occur.
in shipping its products, but fails to keep personal information private. The decision to buy a product from the company, therefore, becomes complex. Is the online retailer trustworthy within this context? Measuring a trustor’s assessments of trustee’s trustworthiness may be problematic under a one-dimensional view of trustworthiness, since it focuses on a limited view of the concept (e.g., the company’s shipping efficiency) that may ignore other important aspects of the trustee (e.g., protecting customer privacy). Moreover, a one-dimensional view assumes that the truster can make aggregate assessments of the trustee’s tendency to act in a beneficial manner across different—and possibly conflicting—dimensions.

**Trustworthiness as a Multidimensional Construct**

Recent research has found that multidimensional constructs are helpful in explaining higher-order concepts that span their component dimensions. Examples have included concern for information privacy (Stewart & Segars, 2002), general mental aptitude (Law & Wong, 1999), and employee job satisfaction (Netemeyer et al., 1990). To explore the possibility that trustworthiness in an online context is multidimensional, we examine two alternative multidimensional models of trustworthiness. The first models trustworthiness as a grouping of first-order constructs. The second models trustworthiness as a second-order construct.

**Trustworthiness As a Grouping of First-Order Constructs**

A three-dimensional, first-order model of trustworthiness has arguably been the predominant conceptualization of trustworthiness (Model 1B in Figure 1) (Mayer et al., 1995). Trustworthiness is proposed to exist as a logical grouping of ability, benevolence, and integrity (Mayer et al., 1995), with each factor independently and distinctly affecting trust. This model may provide more complete conceptualization than the one-dimensional model of trustworthiness. Viewing trustworthiness as a first order model allows the three latent variables to capture the variance that is specific to ability, benevolence, and integrity (Law & Wong, 1999). A first-order model, therefore, allows researchers to draw conclusions about the three constructs’ relative effects on trust across different contexts (Gefen, 2002b; Lee & Turban, 2001). In contrast, the previously discussed one-dimensional model captures the variance common only to all measurement indicators, but treats the variance specific to each dimension as error (Law & Wong, 1999).

Modeling trustworthiness as three first-order constructs suggests a formative view of trustworthiness. A formative model assumes that the three indicators cause an additive trustworthiness perception that then influences the formation of trust. A change in any of the first-order dimensions is assumed to result in a consistent change in trust. The magnitude of the change is represented by the weight of the regression path between the dimension and trust. Within a formative conceptualization, however, trustworthiness’ indicators do not necessarily covary (Chin, 1998). In fact, formative dimensions are often designed to be somewhat mutually exclusive so that they capture different aspects of the latent variable. As an example, Chin (1998) presents the amount of beer, wine, and hard liquor consumed as formative indicators of mental inebriation. All feed mental inebriation, and need not be correlated. In another example, changes in income and education are presented as formative indicators of socio-economic status (SES) (Chin, 1998). Because a change in income does not necessarily reflect a change in education (two SES indicators), each is assumed to contribute independently to SES.

If a researcher chooses to adopt a formative model of trustworthiness, then the research question, hypotheses, and design must be consistent with an additive or cumulative process of trustworthiness and trust formation. The researcher using a first-order conceptualization assumes that ability, benevolence, and integrity combine in an independent manner—that is, that a change in one dimension does not necessarily affect the other two. This conceptualization assumes that when faced with a change in one aspect of trustworthiness, the trustor is a dispassionate thinker who can compartmentalize perceptions of the trustee. Consistent with this view, one of the advantages of a first-order model is that it allows researchers to draw conclusions about each of the first-order constructs’ relative effects on trust, possibly across different contexts—e.g., when levels of risk are different.

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4 Within a first-order conceptualization, trustworthiness is typically not included as a latent variable. Instead, ability, benevolence, and integrity are modeled as directly causing changes in trust perceptions.

5 Most first-order conceptualizations, including the one presented in this paper, include interdependencies between ability, benevolence, and integrity in the form of covariance arrows. These covariances are not meant to model causality or directionality, nor do they attempt to give meaning to these interdependencies. Instead, they control for the significant correlation that is usually present among the factors.
This model also has limitations, however. When ability, benevolence, and integrity data are collected, significant intercorrelations between the constructs are typically found (Bhattacherjee, 2002; McKnight et al., 2002a; Schoorman et al., 1996). These intercorrelations may result in model multicollinearity, which can mask the true effects of the three constructs on trust (Bollen, 1989). In addition, presenting trustworthiness as three distinct beliefs implicitly posits that trustworthiness exists not as a theoretical construct, but as a semantic convenience. Research questions and hypotheses may address only the first-order constructs, not the concept represented by the grouping (Law et al., 1998). The implications of this limitation can be seen in IS studies that utilize this approach. None contains any research questions, hypotheses, or inferences about the effects of trustworthiness itself. Rather, these studies focus on the effects of the individual trustworthiness beliefs—e.g. ability, benevolence, or integrity—on trust (Gefen, 2002b; Lee & Turban, 2001). A considerable limitation of this approach, therefore, is that it cannot provide insights into the role of trustworthiness per se within B2C electronic commerce or other research domains (Law et al., 1998).

Trustworthiness as a Second-Order Construct

While the theoretical justification for the first-order model has been explored extensively (Mayer et al., 1995; Schoorman et al., 1996), little theoretical development has been proposed for a second-order model of trustworthiness. In this section, we explore the justification for and the relative merits of a second-order conceptualization. Model 1C in Figure 1 models trustworthiness as a higher-order factor that explains the common variance across ability, benevolence, and integrity. Ability reflects the belief that an online retailer has the capacity to act in a beneficial manner; benevolence reflects the belief that the online retailer intends to act in a beneficial manner; and integrity reflects the belief that the online retailer will act predictably and in agreement with the customer’s views. A second-order conceptualization posits that a commonality exists across the three dimensions representing the trustee’s composite belief that the trustee will act in a beneficial manner (McKnight et al., 2002a). While McKnight et al., posited such a second-order conceptualization, they did not discuss the underlying theoretical rational, nor the relative advantages and disadvantages versus other conceptualizations.

Modeling trustworthiness as a second-order construct suggests a reflective view of trustworthiness. Each first-order latent construct in a reflective model represents a different manifestation of the second-order factor. A change in any of the first-order factors is assumed to result in a change in the other underlying indicators. Hence, measures (or first-order constructs, in the case of second order factors) must be strongly correlated to support a reflective conceptualization. Studies including trustworthiness commonly find a high degree of intercorrelations among the three trustworthiness dimensions (Bhattacherjee, 2002; Lee & Turban, 2001; McKnight et al., 2002a; Schoorman et al., 1996), which supports the presence of a higher-order factor (Bollen, 1989).

Unlike a first-order conceptualization, a second-order model assumes that individuals maintain consistency in their perceptions of different aspects of the trustee (e.g., online retailers). A variety of cognitive consistency theories (Abelson et al., 1968)—e.g., cognitive dissonance (Festinger, 1957) and balance theory (Heider, 1946)—supports such a viewpoint. Such theories posit that individuals strive to resolve conflicting perceptions. In essence, the mental elements that make up perceptions as a specific example, cognitive dissonance theory predicts that when there is inconsistency between attitudes or behaviors, changes need to occur to eliminate this dissonance. One mechanism for reducing dissonance is through changing the dissonant beliefs so they are no longer inconsistent (Festinger, 1957). Individuals try to confirm existing perceptions about others, even if it means accepting beliefs that lack foundation (Kahnemann et al., 1982; Mynatt et al., 1977), or rejecting conflicting information in favor of confirming evidence.

Using second-order factors to model consistency in individuals’ cognitive processes has been used in other recent IS studies. Stewart and Segars (2002) modeled concern for information privacy (CFIP) as a second order factor representing an individual’s cognitive state or perception about corporate control over personal information. The underlying dimensions (collection of information, unauthorized access to information, errors in information, and secondary use of information) represent the different ways CFIP is perceived. This cognitive process is similar to a second order conceptualization of trustworthiness, which represents an individual’s cognitive state or perception that the trustee will act in a beneficial manner.

From a modeling perspective, second-order models have a number of advantages. Second-order constructs can result in more parsimonious nomological networks by reducing the number of
causal linkages. While multicollinearity can be problematic in first-order models, second-order factors provide a mechanism to explain the common variance across first-order dimensions (Erez & Judge, 2001; Gerbing & Anderson, 1984). In our model, we interpret the second-order construct as the composite belief that another will act in a beneficial manner (McKnight et al., 2002a). Ability, benevolence, and integrity are also represented, allowing a second-order model to capture the variance specific to each first-order dimension. Hence, a second-order model gives meaning to both sources of variance, resulting in a more complete conceptualization. For this reason, second-order factor models are preferred over a first-order model, ceterus paribus (Erez & Judge, 2001; Gerbing & Anderson, 1984).

Many of the advantages of the first-order model reflect the disadvantages of the second-order model of trustworthiness. The differential effects of ability, benevolence, and integrity on trust cannot be modeled under a second-order conceptualization. Changes in the second-order factor are modeled as affecting the first-order dimensions, not vice versa. In addition, the paths from trustworthiness to the underlying dimensions represent factor loadings, and cannot be interpreted as causal paths.

Research Methodology

We used data from three studies to test the efficacy of the three models of trustworthiness. For Studies 1 and 2, we collected data from over 700 students at universities in the midwestern and northwestern United States. For Study 3, we reanalyzed data from a previously published study (Gefen, 2002b).

We used the following procedures across all models. For all first-order constructs, we fixed the latent variance to 1 to set the scale (Kline, 1998). For the second-order constructs, we fixed one factor loading to 1 to establish model identifiability (Kline, 1998). To assess model fit, we relied on the GFI and AGFI fit indices, root mean square error of approximation (RMSEA), chi-square to degrees of freedom ratio, the root mean square residual (RMR). Acceptable levels for GFI and AGFI exceed 0.90 and 0.80, respectively (Segars & Grover, 1993), although 0.90 is sometimes cited for AGFI (Chin & Todd, 1995). For RMSEA, 0.08 has been cited as a reasonable error of approximation (Browne & Cudeck, 1993). Other researchers have recommended the lower 0.06 value as an acceptable level (Hu & Bentler, 1999). A 2:1 ratio has been cited for the chi-square to degrees of freedom ratio (Bentler & Bonett, 1980; Hair et al., 1998), although a more accepting 3:1 is commonly used in MIS studies (Chin & Todd, 1995). A 0.05 standard is considered acceptable for RMR (Gefen et al., 2000). To facilitate comparison across studies, we report only the standardized regression paths and factor loadings.

We followed accepted procedures for assessing unidimensionality and discriminant validity (Anderson & Gerbing, 1988; Gefen, 2003a). To assess the fit for a one-dimensional model of trustworthiness, we tested a CFA model which allowed the one-dimensional view to covary with the latent trust variable. To test the fit for the two multidimensional models of trustworthiness, we included separate constructs for ability, benevolence, integrity, and trust that were also allowed to covary. For models that passed initial levels of fit, the procedure recommends examining modification indices that exceed 5.0. This level indicates the model chi-square level would drop significantly if the path were added. Residual covariance levels exceeding 2.58 were also examined, which reflects a significant degree of shared variance, and a potential threat to unidimensionality. For discriminant validity, we conducted chi-square different tests and examined the modification indices between latent variables and measurement indicators.

Study 1

Data were collected from 289 students attending an introduction to MIS class at a university in the midwestern United States. Students answered questions about Books-a-million (or "BAMM.com"), an online bookseller. The researchers provided an exercise for the participants to complete online, which was designed to familiarize students with BAMM.com's interface and to establish initial trustworthiness and trust perceptions. The exercise included such activities as using the BAMM.com search feature to find a book written by a specific author, a review of the website's return policy, and an examination of BAMM.com's Online Gift Delivery Service. Finally, students simulated the process of buying a book, although the actual purchase was optional. We reviewed the completed exercise forms to ensure that students did actually complete the exercise.

Data were collected immediately after the website exercise, which students completed in less than twenty minutes. We asked if students had previously heard of BAMM.com, visited the BAMM.com website, or even purchased anything from BAMM.com. To focus our results on trustworthiness' effects on initial trust, any student...
who responded “yes” or did not respond to any of the above questions was removed from the dataset. Twenty-one students (7.2%) indicated they had previous experiences with BAMM.com, and forty-two (14.5%) did not answer one of the questions. In total, sixty-three students were removed, resulting in a final sample of 226. Of the remaining students, 1 (<1%) was a freshman, 169 (74%) were sophomores, 42 (19%) were juniors, and 10 (4%) were seniors. One student (<1%) listed his or her status as “Other,” and three (2%) did not answer the question. Student ages ranged from 19 to 23, with the average age being 20. Males comprised 51% (n=115) of the sample.

**Study 1 Measures and Instrument Validation**

We adapted established measures of trustworthiness and trust to our specific context (McKnight et al., 2002a). The measures were originally developed using a second-order conceptualization of trustworthiness. A purpose of Study 1, therefore, was to determine if one-dimensional and first-order views of trustworthiness represented valid alternative models. Table 1 lists the correlations among the study indicators (see Appendix), along with the means and standard deviations. Composite reliabilities are also listed in Table 1, and indicate that the reliability levels for ability (0.93), benevolence (0.89), integrity (0.93), and trust (0.89) all exceed the 0.80 standard (Gefen, 2003a; Nunnally & Bernstein, 1994).

We next assessed model unidimensionality. Testing a one-dimensional model of trustworthiness (Figure 2A), the fit statistics failed to meet accepted standards (GFI=0.81; AGFI=0.74; RMSEA=0.11; chi-square=321.55; df=89). We rejected this model based on the unacceptable levels of fit. We next tested a CFA model that allowed ability, benevolence, integrity, and trust to covary (Figure 2B). All fit indices met or exceeded accepted standards (GFI=0.92; AGFI=0.89; RMSEA=0.060; chi-square/df=1.82; RMR=0.023).

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Cronbach’s alpha levels are listed in the diagonal. All correlations (n=226) are significant (p<0.001)

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Table 1. Study 1 Construct Correlations and Reliabilities
Figure 2A: Study 1 One-Dimensional Measurement Model
All paths are significant p<0.001.

Figure 2B: Study 1 Multidimensional Measurement Model
All paths are significant p<0.001.
Eight of the modification indices between residual variances exceeded 5.0—the highest being 8.78. None of the standardized residual covariances, however, exceeded 1.77, which is well below the recommended 2.58 cutoff.

Discriminant validity was assessed using an accepted procedure (Gefen et al., 2003a). We first examined the modification indices to determine if any of the undeclared paths between latent constructs and measurement items exceeded 5.0. Such a level would indicate a threat to unidimensionality, since the indicator would “cross-load” with another factor. None of the modification indices exceeded 5.0. We then ran multiple models that constrained each pair of the construct covariances to 1. Of the six constrained models, all exhibited significant increases in chi-square (the lowest differential was $\Delta \chi^2 = 23.23; p<0.001$), indicating that each covariance path was significantly different from 1. Discriminant validity is confirmed.

**Study 1 Results**

Having rejected a one-dimensional model of trustworthiness, we then compared the first-order causal model of trustworthiness with a second-order causal model. Because these scales were originally developed using a second-order conceptualization, we were especially interested in examining the fit levels for a first-order conceptualization.

Both models fit the data well. The first-order model (Figure 3A) exhibits acceptable fit (GFI=0.92; AGFI=0.89; RMSEA=0.060; chi-square/df=1.82; RMR=0.023). Among the first-order factors, ability ($\beta=0.50; p<0.001$) and benevolence ($\beta=0.48; p<0.001$) are similar in their predictive power. The integrity to trust path is not significant, however ($\beta=0.10; p=0.53$). The three constructs explain 69% of the trust variance. The covariance paths among the three first-order dimensions suggest that significant levels of interdependencies among the three trustworthiness dimensions are also expected. This assumption is apparently valid, given the high correlation levels (0.72; 0.73; 0.87) between the first-order constructs. The second-order model also exhibits acceptable fit (GFI=0.91; AGFI=0.87; chi-square/df=1.987; RMR=0.028). Only the RMSEA (0.066) somewhat exceeds the more stringent 0.06 standard (Hu & Bentler, 1999), but is well below the 0.08 standard. Consistent with the first-order model, trustworthiness explains 69% of the trust variance.
Study 1 indicates that while both models of trustworthiness are valid, results for each model, must be interpreted differently. The first-order model for trustworthiness assumes that ability, benevolence, and integrity each contribute independently to the formation of trust. The strong relationships between ability to trust and benevolence to trust indicate that improving perceptions of each may result in increased trust by online consumers. Integrity apparently has no effect within this context. Because trustworthiness is modeled as a collection of the three constructs, no conclusions can be drawn about trustworthiness’ role in the model. In contrast, the second-order model results indicate that ability, benevolence, and integrity are each strong manifestations of trustworthiness. This result supports the assumption that changes in trustworthiness will result in changes to the three underlying factors. Finally, the results indicate that perceptions that the online vendor will act in a beneficial manner are significantly related to trust. No conclusions can be drawn, however, on the direct effects of ability, benevolence, and integrity on trust.

Study 2
To confirm our results, we collected a second sample. Similar to the data collected in Study 1, students attended an introductory class in management information systems. Students used the same survey instrument, and the data were collected approximately four months after the initial data collection. For Study 2, 430 students completed surveys. Nineteen students had previous experience with BAMM.com, and five did not answer the question. To again focus on the effects of initial trust, these twenty-four observations were removed, resulting in a final sample size of 406. Of these, 21 were freshmen (5%), 172 were sophomores (42%), 167 were juniors (41%), and 43 were seniors (11%). Three students (<1%) listed their status as “Other.” Males comprised 62% (n=253) of the sample. The students’ ages ranged from 18 to 46, with the average age being 21. The indicator and construct correlations, means, and standard deviations are listed in Table 2. Composite reliability levels for ability (0.84), benevolence, (0.81), integrity (0.84), and trust (0.87) were again acceptable.
We used the same procedure as Study 1 to assess unidimensionality (Gefen, 2003a). The one-dimensional model covarying with trust was again rejected for unacceptable fit (GFI=0.79; AGFI=0.72; RMSEA=0.12; chi-square/df=6.835; RMR=0.037). The first-order measurement model (Figure 4) exhibited acceptable fit (GFI=0.94; AGFI=0.91; RMSEA=0.059; chi-square/df=2.413; RMR=0.021). An examination of the modification indices indicated that thirteen modification indices exceeded 5.0.6

None of the listed residual covariances was significant, however. All were less than 1.75. Discriminant validity was evaluated using the same procedure as Study 1. No paths between latent variables and measurement items exceeded 5.0. Constraining covariance paths individually again increased the chi-square levels significantly (minimum increase was 69.89, p<0.001). Discriminant validity is confirmed.

Study 2 Results

The results for the first-order and second-order causal models are shown in Models 5A and 5B of Figure 5. Fit levels for the first-order model are acceptable (GFI=0.94; AGFI=0.91; RMSEA=0.059; chi-square/df=2.413; RMR=0.021).

While eleven of the MIs were less than 7.4, two of the MIs were quite high (19.21and 16.09). We added in these covariances to assess the effect on the first- and second-order causal models. For the first-order model, the maximum change was a 0.02 increase in the standardized path between integrity and trust. It remained insignificant, however. For the second-order model, the maximum change was a 0.02 decline in the factor loading between trustworthiness and integrity. It remained highly significant (p<0.001). Because the magnitude of a modification index is a function of sample size (Gefen, 2003a), we also used a random sample of 226 (the same size as Study 1) to judge the magnitude of the MIs in Study 2 versus the MIs in Study 1. The modification indices dropped to 6.62 and to 7.48, respectively. These levels are comparable to the levels from Study 1.
Ability and benevolence are again significantly related to trust (\(p<0.001\)), but integrity is not (\(\beta=0.03\), \(p=0.74\)). The three first-order constructs explain 62% of the trust variance. Fit levels for the second-order model are again somewhat lower, but still acceptable (GFI=0.93; AGFI=0.90; RMSEA=0.065; chi-square/df=2.711; RMR=0.026). All three factor loadings are highly significant (\(p<0.001\)). Trustworthiness explains 66% of the trust variance.

Results for Study 2 confirm results from Study 1. For the first-order model, ability and benevolence are again significant predictors of trust, while integrity is not. For the second-order model, all paths from trustworthiness to the underlying dimensions are highly significant (\(p<0.001\)). The ordering of the magnitude of the three factor loadings is the same. The causal path between trustworthiness and trust is also highly significant (\(\beta=0.81\), \(p<0.001\) versus \(\beta=0.83\), \(p<0.001\)).

**External Validation of Results**

To further assess the external validity of our findings, we tested the first- and second-order models with data from a previously published study (Gefen, 2002b). The original studies relied on the first-order conceptualization of trustworthiness. Our intent was to determine if a second-order conceptualization was applicable within Gefen’s alternative context. Similar to Studies 1 and 2, the Gefen study tested a model of the dimensions of trust and trustworthiness within an Internet purchasing environment. Unidimensionality and reliability results all meet acceptable standards, and are available in Gefen (2002b). Composite reliability levels for ability (0.88), benevolence (0.86), integrity (0.91), and trust (0.91) also exceed accepted standards.
Figure 5A: Study 2 First-Order Causal Model
Note: For the Integrity → Trust Path, p=0.74
All other paths are significant p<0.001.

Figure 5B: Study 2 Second-Order Causal Model
Note: All paths are significant p<0.001.
Some important differences exist between the Gefen study and our two studies. In Study 1 and 2, students had no previous contact with Books-a-million.com. In the Gefen study, participants had probable knowledge of and experience with the online vendor, Amazon.com (see Appendix). The questions used in the Gefen study differed from the ones included in this study, but the definitions of the three trustworthiness constructs closely paralleled our definitions. Ability was defined as the belief that Amazon.com has appropriate skills and competence. Benevolence was defined as the belief that Amazon.com wants to do good to the customer. Integrity was defined as the belief that Amazon.com adheres to accepted rules of conduct. Trust in Amazon.com reflected a respondent’s willingness to purchase an item. Given the similarity in definitions and theoretical foundations, we believe the Gefen study represents a fair comparison with our results. Moreover, the use of different (but theoretically consistent) questions may represent a stronger test of external validity, since the context differs from the one examined in our two studies.

For consistency with the earlier studies, we tested both one-dimensional and a multidimensional CFA measurement model. The one-dimensional model was again rejected based on unacceptable fit results (e.g., RMSEA=0.17). The multidimensional model results were again acceptable (GFI=0.95; AGFI=0.91; RMSEA=0.073; chi-square/df=2.52; RMR=0.029).

Causal model results are listed in Figure 6. The fit levels for the first-order model (Figure 6A) indicate acceptable fit (GFI=0.95; AGFI=0.91; RMSEA=0.073; chi-square/df=2.52; RMR=0.029). Unlike Study 1 and 2, integrity is a significant predictor of trust (β=0.52, p<0.001). The benevolence to trust path is again significant (β=0.27, p=0.03). Ability, which was the strongest predictor of trust in Study 1 and Study 2 is not significant (β=-0.03, p=0.64). The three first-order constructs explain 53% of the trust variance. For the second-order model (Figure 6B), the fit levels are also acceptable (GFI=0.94; AGFI=0.89; RMSEA=0.079; chi-square/df=2.79; RMR=0.036). The standardized regression path between trustworthiness and trust is again highly significant (β=0.74; p<0.001). Trustworthiness explains 55% of the trust variance.

The results for this study contrast somewhat with the earlier two studies. For the first-order model, the integrity to trust path is highly significant. This path was not significant in Studies 1 and 2. We explore possible explanations for this difference in the discussion section, including the additional level of familiarity that the users had with the online vendor. For the second-order model, the ordering of the factor loadings is the same as the earlier studies. Benevolence reflects the strongest factor loading, followed by integrity and ability. The strength of the regression path between trustworthiness and trust is consistent with the prior two studies.

Discussion

The results of this study provide theoretical and practical insights into alternative conceptualizations of trustworthiness by synthesizing previous research and testing three alternative conceptualizations of trustworthiness within the e-commerce context. Data collected using scales originally developed for first- and second-order models of trustworthiness within an e-commerce context were both tested for validity. Our results indicate that viewing trustworthiness as a one-dimensional construct may be somewhat limited, in that this conceptualization’s parsimony may not fully represent the underlying data. Instead, our results suggest trustworthiness is better represented as a multidimensional construct, and that both first- and second-order conceptualizations have a place in e-commerce trust research, depending on the purpose of the study.

Contributions to Theory

This study’s theoretical findings are important, because a construct’s conceptualization has implications for its definition, operationalization, and practical interpretation (Stewart & Segars, 2002). An assumption of the first-order model is that trustworthiness is an aggregation of its dimensions. In contrast, the second-order assumes that consumers will strive to maintain cognitive consistency when considering online vendors. E-commerce researchers must consider carefully the research questions, hypotheses, and design before selecting the appropriate conceptualization for trustworthiness.

While both multidimensional models appear to be valid, each also has relative advantages and disadvantages. Although the results of previous studies into trustworthiness have consistently found high correlations between the three trustworthiness dimensions, our results confirm that they are conceptually different and do represent different characteristics of the trustee (Mayer et al., 1995). Research questions that propose different consequences of ability, benevolence, and integrity
Figure 6A: Confirmatory Study First-Order Model
Note: For the Ability → Trust Path, p=0.74.
For the Benevolence → Trust Path, p=0.03.
All other paths are significant p<0.001.

Figure 6B: Confirmatory Study Second-Order Causal Model
Note: All paths are significant p<0.001.
Adapted with permission from Gefen (2002b)
may, therefore, wish to consider a first-order conceptualization (Law et al., 1998). As an example, studies that utilize experimental designs to control or manipulate the trustworthiness factors should consider treating trustworthiness as three disparate constructs. In contrast, the common theme in the second-order model is a consumer’s composite belief that an online vendor will act in a beneficial manner, where changes in trustworthiness are reflected in all three subdimensions. This conceptualization allows for the study of trustworthiness itself on the formation of trust, in situations where finer grained views of trustworthiness are not necessary.

We also find that the selection of a conceptualization has implications for interpretations of a study’s findings. In Figure 6, for example, the first-order model indicates that Amazon.com’s ability does not play a significant role in trust formation. In contrast, the second-order model indicates that ability, benevolence, and integrity all significantly reflect trustworthiness beliefs and that trustworthiness strongly influences trust formation. In this instance, interpreting trustworthiness as a second-order model suggests a slightly different result, indicating that ability does play an important role in trust formation. In addition, and as discussed earlier, applying the first-order model limits research questions and hypotheses for these studies to only addressing the dimensions of trustworthiness, not the trustworthiness itself (Law et al., 1998). The insights in this study therefore provide a foundation for future studies of trustworthiness, as well as for the potential reinterpretation of the findings from past studies.

This research also contributes theoretical support for the McKnight et al. (2002a) study that presented trustworthiness as a second order factor. For a second-order model to be a valid conceptualization of trustworthiness, researchers must assume that changes in any of the first-order factors results in a consistent change in the other underlying factors. Although McKnight et al. (2002a) positioned trustworthiness as a second-order factor, they were not explicit as to the theoretical rationale. We posit that the commonality across trustworthiness dimensions can be explained by the cognitive consistency literature (e.g., cognitive dissonance). The ability to capture both dimensional differences as well as the commonality across dimensions reflects the richness that is possible with second-order factors.

Another finding of this research relates to the relative importance of ability, benevolence, and integrity in second-order models (Figures 3B, 5B, 6B), which was consistent across all three studies. This result suggests that benevolence is the most significant factor, followed by integrity and then ability in the B2C electronic commerce domain. Interestingly, the same order of significance was found in McKnight et al. (2002a), which this study extends. While this could be dismissed as an artifact of the survey, it should be noted that the Gefen (2002b) data, gathered with a different instrument, also demonstrated the same relative importance. We note, however, that while the ordering was consistent, the differences in the magnitudes were small.

This consistency was not found in the causal paths in the first-order models (Figures 3A, 5A, 6A). Paths between the trustworthiness dimensions and trust were consistent in our Study 1 and Study 2, but differed in the external validation analysis. This variability may stem from the different contexts in which the data were gathered. In the present study, the e-vender was an unknown bookseller, Booksamillion.com. In the Gefen (2002b) study, it was Amazon.com. This illustrates the advantage of using a first-order model for studying the relative effects of the dimensions of trustworthiness on the formation of trust across different contexts.

Finally, this paper clarifies the distinct role of trustworthiness and trust in the nomological network, constructs often not clearly distinguished from one another in the information systems literature. The theory of reasoned action provides a useful framework for understanding the role of trustworthiness in establishing trusting attitudes. Trustworthiness represents the composite belief that an online retailer has beneficial characteristics. In contrast, trust represents a general willingness to rely on the online retailer. The inconsistency in conceptualization of these two constructs in the literature may be partially due to the various interpretations of trustworthiness, and in many instances the lack of an explicit trustworthiness construct. The second-order model establishes this construct, which should facilitate future studies into this important predictor of trust.

**Contributions to Practice**

Although this paper is focused on the theoretical nature of trustworthiness, our findings have implications for e-commerce practitioners. This research examined the effect of the three dimensions of trustworthiness on consumer trust in two contexts, a new online relationship (BAMM.com) and a more established context (Amazon.com).
Applying a first-order model, the relative significance of the three trustworthiness dimensions’ effect on trust was demonstrated to differ across these two contexts. In new online relationships, our results showed that while ability and benevolence were significant factors in trust formation, integrity was not. In Gefen’s more established context, ability became insignificant while integrity and benevolence demonstrated strong effects on trust. This result may indicate that to attract new customers, online vendors should provide more cues on their websites regarding their integrity. The increased focus on privacy policies may be a demonstration of this practice. With repeat customers, however, the insignificance of ability may be due to a consumer comfort level with the online vendor’s ability based on past experiences. This same comfort level does not appear to be reached with integrity and benevolence, since both significantly influence trust in this context.

Applying a second order view of trustworthiness to the same data highlights the need for retailers to signal consumers that they are trustworthy across the three dimensions. Violating one trustworthiness dimension may serve to deflate beliefs on other dimensions. If a product is not shipped in a timely manner, this failure along the ability dimension may also lower a consumer’s perceptions of the vendor’s benevolence and integrity. Similarly, negative information about a vendor’s integrity—perhaps from a third party reputation service—may also shed doubts on the vendor’s ability and benevolence in the eyes of the potential customer. While further research should be directed at this topic, the current message to practitioners is that the three dimensions are closely intertwined and all should be carefully nurtured by online vendors.

Limitations and Future Research

This study is not without limitations. Although two different scales were applied, both were originally developed for multidimensional conceptualizations of trustworthiness. It is possible that a one-dimensional model would have performed better with a scale more focused on one aspect of trustworthiness (e.g., predictability). We note that this approach will likely reduce the explained variance in trust, since only one aspect of trustworthiness would be included. This possibility should be explored in future studies, however, perhaps using other one-dimensional trustworthiness scales (Jarvenpaa et al., 2000).

The generalizability of the results may be limited since we used undergraduate students. In an effort to increase external validity, however, we collected data from two different universities and further validated our results using data from an outside study, which used MBA students. We do encourage other researchers to extend the external validity of our results by replicating our study in other contexts using other samples.

The purpose of this study was to extend the understanding of the role that ability, benevolence, and integrity play in the formation of trustworthiness beliefs and trusting attitudes. We were not focused on how to best demonstrate all three dimensions to consumers. Further research is needed to discover and recommend how online retailers can best convey ability, benevolence, and integrity perceptions to online consumers.

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The DATABASE for Advances in Information Systems - Summer 2005 (Vol. 36, No. 3) 105

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Appendix: Study Questions

Ability
1. Books-a-million.com is competent and effective in selling books online.
2. Books-a-million.com performs its role of selling books online very well.
3. Overall, Books-a-million.com is a capable and proficient Internet bookseller.
4. In general, Books-a-million.com is very knowledgeable about selling books.

Benevolence
1. I believe that Books-a-million.com would act in my best interests.
2. If I required help, Books-a-million.com would do its best to help me.
3. Books-a-million.com is interested in my well-being, not just its own.

Integrity
1. Books-a-million.com is truthful in its dealings with me.
2. I would characterize Books-a-million.com as honest.
4. Books-a-million.com is sincere and genuine.

Trust
1. If I needed a book in a hurry, I would feel comfortable depending on Books-a-million.com.
2. I can always rely on Books-a-million.com whenever I need to buy a book.
3. I feel that I could count on Books-a-million.com to help me purchase the books I need.
4. If I needed the best book on a specific topic, I would be willing to rely on the information provided by Books-a-million.com.

Gefen (2002) Scales

Ability
1. Amazon.com are competent
2. Amazon.com understands the market they work in.
3. Amazon.com knows about books
4. Amazon.com knows how to provide excellent service.

Benevolence
1. I expect that Amazon.com is ready and willing to assist and support me.
2. I expect that Amazon.com have good intentions toward me.
3. I expect that Amazon.com intentions are benevolent.
4. I expect that Amazon.com puts customers’ interests before their own.
5. I expect that Amazon.com are well meaning.

Integrity
1. Promises made by Amazon.com are likely to be reliable.
2. I do not doubt the honesty of Amazon.com.
3. I expect that Amazon.com will keep promises they make.
4. I expect that the advice given by Amazon.com is their best judgment.
5. I can count on Amazon.com to be sincere.

Trust
1. Even if not monitored, I’d trust Amazon.com to do the job right.
2. I trust Amazon.com.