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# A multidimensional trust formation model in B-to-C e-commerce: a conceptual framework and content analyses of academia/practitioner perspectives

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## Abstract

What dimensions can be identified in the trust formation processes in Business-to-Consumer (B-to-C) electronic commerce (e-commerce)? How do these differ in importance between academia and practitioners? The purpose of this research is to build a model of multidimensional trust formation for online exchanges in B-to-C electronic commerce. Further, to study the relative importance of the dimensions between two expert groups (academics and practitioners), two semantic network and content analyses are conducted: one for academia's perspectives and another for practitioners' perspectives of trust in B-to-C electronic commerce. The results show that the two perspectives are divergent in some ways and complementary in other ways. We believe that the two need to be combined to represent meaningful trust-building mechanisms in websites.

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**Keywords:** Multidimensional trust formation model; Online exchange; B-to-C electronic commerce; Content analysis; Semantic network analysis

## 1. Introduction

Trust is an essential component in any relationship: interpersonal, in social structures, as well as in business relationships. As an interpersonal relationship, trust is the willingness of one person to

increase his or her vulnerability to the actions of another person whose behavior he or she could not control [110]. As a structural relationship between people in a social system [68], trust is a collective and institutional attribute that can be drawn on to achieve certain societal goals. Trust in business relationships or economic transactions encourages exchange partners (agents) to work at preserving relationships through cooperative transactions [1047]. The transactions may occur on an individual-to-individual, individual-to-firm, or firm-to-firm level.

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Trust has been identified as a key component in marketing and e-commerce literature [5,7,23,50,54,75,79,87]. The issue of trust has been addressed from different perspectives, including technological, multiagent approaches [14,18,71]; social, institutional approaches [15,20,42]; behavioral, psychological approaches [32,51]; economic, game-theoretic approaches [24,43,94]; and managerial, organizational approaches [55,80,88,100]. Berry [11] describes trust as a single most powerful relationship-based marketing tool. According to Urban's study [100], consumers make Internet purchasing decisions on the basis of trust. Needless to say, trust plays a vital role in any commercial exchange involving monetary transactions. Trust in electronic commerce (e-commerce) is based on the consumer's confidence in the processes. This contrasts greatly with traditional businesses that involve brick and mortar stores, where trust is based on personal or business relationships and interactions between the consumer and the merchant at an individual or a firm level. Peter Grabosky, in his article on the nature of trust online, supports the idea that the key to success in online business is the establishment of trusted processes [44]. This fact mandates that online sellers create an environment in which a prospective consumer can be relaxed and confident about any prospective transactions. In order to create a trusted process environment in e-commerce, it is necessary to understand the factors that affect a consumers' trust formation processes.

Despite the importance of trust in e-commerce, research has been relatively scarce in this area; particularly in understanding the factors that affect consumers' trust formation processes. In this paper, we attempt to fill this gap. The overall objectives of this study are twofold. First, we propose a holistic, multidimensional trust formation model which captures and portrays in a succinct manner the complex phenomena of trust formation in e-commerce transactions; second, based on the identified dimensions, we utilize content analysis and semantic network analysis to compare and contrast the perspectives taken by practitioners and academics in order to understand how these different expert groups perceive trust and the trust formation process. Their perspectives reflect how the concept

of trust is being used in e-commerce and what elements need to be emphasized to promote e-transactions. Specific research questions are: what dimensions in trust formation process can be identified in Business-to-Consumer (B-to-C) electronic commerce? How do academia and practitioners' descriptions of trust in terms of trust formation dimensions compare and contrast with each other?

This paper is organized as follows. Section 2 discusses background theories on the conceptualization of trust formation from previous literature. We then present a B-to-C electronic commerce structure with four main entities (buyers, sellers, third parties and technology), and propose a process-oriented multidimensional trust formation model in B-to-C electronic commerce as the research framework. Six groups of theoretical rationales found in the literature are discussed to cross-validate the proposed multidimensional trust formation model. Section 3 presents two perspectives on trust, taken from practitioners' and academics' point of views in B-to-C e-commerce. Section 4 presents data collection and analysis, using content analysis and semantic network analysis. The results and comparisons of two perspectives follow in Section 5. Section 6 provides the conclusions from the research.

## 2. A process-oriented multidimensional trust formation model

Trust itself can be very difficult to observe and measure directly. Therefore, to investigate the dimensions affecting the trust-building process in B-to-C online exchange and conceptualize the trust formation model as a set of interdependent beliefs, we follow a two step process: first on the basis of basic rationales and background theories we propose that trust can be modeled as a set of interdependent beliefs in which each belief (dimension) reflects the overarching formation of trust. Second we study the mental models [22] of two key stake holders: academics and practitioners perspectives of e-commerce in this study. We utilize this approach since a mental model is observable and has predictive power [78]; therefore, a consumer's trust formation process can be conceptualized using this method.

### 2.1. Basic rationale and background theories

Trust is a subjective belief about a system or a specific agent within a particular context [73]. In economics, sociology [20], game theory, artificial intelligence and multiagent systems, trust is usually considered to be a belief or cognitive stance [17] that could eventually be quantified with a subjective probability [60].

Before presenting a process-oriented multidimensional trust formation model in B-to-C e-commerce, this section reviews two background theories regarding conceptualization of trust formation in literature. The first theory is a process-outcome trust model in interpersonal relationships proposed by Johns [57]. The model proposes that people (trustors) gather information from two sources (trustee and situation), process it, and form a trustworthiness belief. The contribution of the model is its ability to demonstrate the importance of the trustworthiness belief in the trust formation process. This model consists of four stages: assimilation of information, decision making, trust relationship and consequences of trusting. The first stage of the model, assimilation of information, includes perceptions of the trustee and situational factors. Aspects regarding the trustee include competence, reliability, and relevant past experience with the trustor. Situational factors include the perception of risk inherent in the relationship and the benefits of assuming the risk. The second stage, decision making, then involves processing the information and forming a belief regarding the trustworthiness of the potential trustee. In the third stage of the model, if the potential trustee is believed to be trustworthy in the relevant situation, the trustor will enter into a trusting relationship. The last stage of the model depicts the consequences of entering into a trusting relationship.

Moorman et al. [74] proposed a multilevel characteristic model which illustrates the antecedents and consequences of users' trust in marketing researchers. Antecedents in the model include variables entitled "user characteristics" (e.g., job/firm experience), "perceived interpersonal characteristics of the researcher" (e.g., honesty, expertise, integrity, tactfulness, timeliness), "perceived user organizational characteristics" (e.g., structure, location, culture),

"perceived inter-organizational/interdepartmental characteristics" (e.g., perceived power of department), and "perceived project characteristics" (e.g., perceived importance of project). As a contribution of this model, it identifies several important antecedents to trust formation. The model recognizes that trustor, trustee, and situational variables are used in the trust formation process. Although both models demonstrate the importance of the belief in trustworthiness and its antecedents in the trust formation process at interpersonal and inter-organizational levels, they are limited in conceptualizing the factors that affect the consumer's trust formation in e-commerce. We base our framework in part on these two models and extend them to the online seller environment and the trusted process environment in which a prospective consumer can be confident about any transactions.

### 2.2. Four entities in B-to-C electronic commerce

In order to identify the process of trust formation in B-to-C electronic commerce, it is necessary to understand first the B-to-C electronic commerce market structure and its entities. Based on Shaw's [92] structure, we can view the Internet exchange process as an interaction of four different entities: the buyer, the seller, the third party, and technology (see Fig. 1). The four different entities represent three

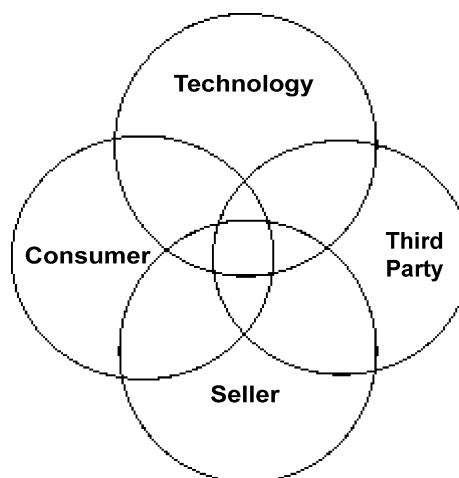


Fig. 1. Four entities of e-commerce markets.

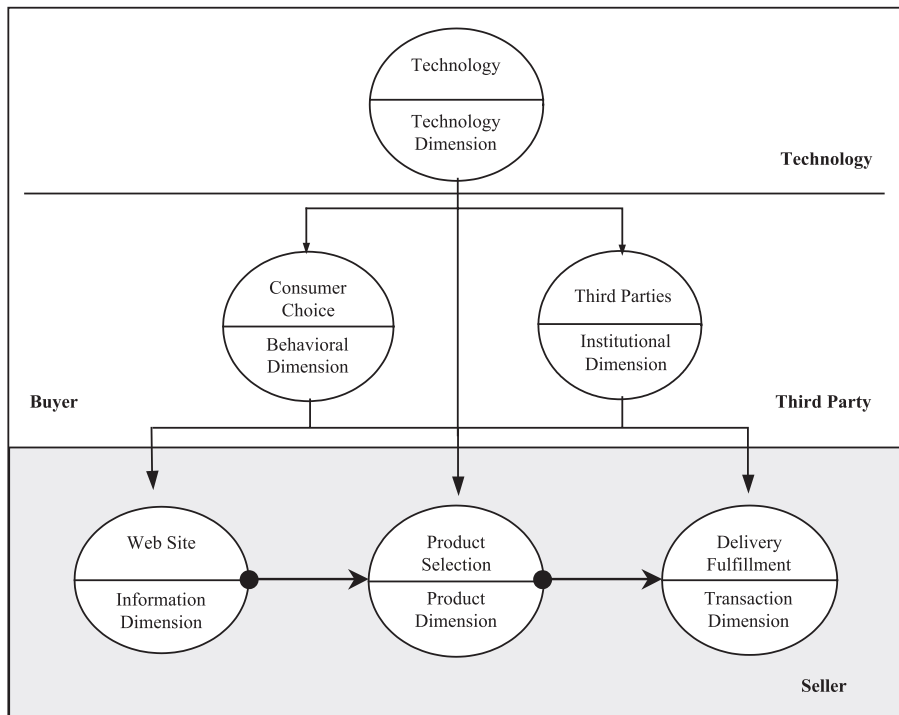


Fig. 2. A process-oriented multidimensional trust formation model.

ingredients in the trust formation process in B-to-C electronic commerce: trustor (buyer), trustee (seller) and environment (technology and third party).

Buyers, sellers, and third parties can connect through an electronic market structure supported by information technology. In B-to-C electronic commerce, buyers are individual consumers and sellers could be online retailers, intermediaries or suppliers. Third parties are impartial organizations including individual mechanisms delivering business confidence through an electronic transaction, using commercial and technical security features [65]. Online transactions for electronic commerce include services provided by many trusted third parties such as banks, credit card authorization organizations, consumer online privacy institutions, and consumer confidence program groups. An example of the third party involved in the trust of online transactions is TRUSTe, a nonprofit, privacy seal program. The TRUSTe mark on Websites informs the buyer that Website owners have openly agreed to disclose their information gathering and dissemina-

tion practices, and the fact that their disclosure is backed by credible third-party assurance [10].

### 2.3. Process-oriented, six dimensional model of trust formation in online exchange<sup>1</sup>

Based on the B-to-C market structure and the interactions of four entities, we argue that trust formation can be described in terms of six dimensions: consumer behavioral, institutional, information, product, transaction, and technology as depicted in Fig. 2.

One of the critical portions of electronic transactions is the technology dimension. The *Technology dimension* captures and portrays the IT infrastructure of e-commerce in a layered architecture, namely (i) the e-commerce technology infrastructure (implemented in both hardware and

<sup>1</sup> In this study, the word 'exchange' is used in the broader sense of the term to depict trade and information transfer as well as purchase, buying, and transactions.

software), (ii) the e-commerce services, and (iii) the e-commerce business applications [92].

Another critical part usually implemented by the seller side includes the process stages that represent the essential steps a buyer goes through to complete an online transaction. The process stages essentially capture the three generic stages of the trust-formulation model in on-line exchanges [100]. The *Website/information dimension* is concerned with the information content of a specific Website. In this stage, a customer is concerned especially with such properties of Websites as accuracy, currency, completeness, its unbiased nature, competitiveness, and credibility. A customer trusts a Website when the information conveyed on the site embodies such qualities. Thus, the Website information dimension affects a consumer's perception of trust as one of the process dimensions for trust formation. The *Product dimension* relates to the specific product/service that a customer intends to purchase. In this stage, a customer is concerned about the properties of the particular product/service portrayed in the Website. The properties include durability, reliability, brand equity, transience, competitiveness, and availability. This dimension also affects a consumer's trust formation. The *Transaction dimension*, the third stage, is concerned about how the delivery will be fulfilled and how the after-sales services will be provided. This stage is involved with factors such as pricing and payment options, financial planning (complexity), sales-related service (refund policy, after-sales, etc.), promotions, and delivery fulfillment. These three stages form a linear process that a buyer must go through to complete a transaction.

The combination of the three stages—Website information, product, and transaction process with the three independent dimensions, the consumer-behavioral dimension, the institutional dimension, as well as the technology dimension provides a powerful way of investigating the trust-building mechanism. The mechanism reflects the complex dynamics of various elements and forces in a B-to-C online exchange. The trust-building process has the following characteristics:

- It is a cumulative process, as the level of trust in prior stages affects the trust level in later stages. For example, Website trust can be enhanced if it also provides privacy to the customers, a property of the

consumer-behavioral dimension [100]. Website trust also affects product information because the brand equity of the company represented by the Website usually affects the product or service that the customer wants to obtain. A customer would have limited trust in a Website when it conveys a highly trustworthy Website and product information, but fails to provide delivery guarantees and after-sales services.

- It also represents an interactive process. For example, the technology dimension confines the capacity of information displayed (i.e., what information is to be displayed and the extent of qualities). The information to be displayed also affects the types and levels of technology to be utilized to build the contents of the Website. The consumer-behavioral dimension also interacts with other dimensions. For example, the degree of a customer's sophistication in e-commerce affects the product contents displayed. However, on the other hand, product availability limits a consumer's choice. When a particular product is available only by a single seller, a lesser level of trust in terms of the consumer-behavioral dimension may be acceptable.

Table 1 defines the multidimensions of trust, related subdimensions, and their literature sources. These six dimensions reflect the actual online exchange process in which four different entities, i.e., seller, buyer, third party, and technology, interact to complete the online transactions. These dimensions are not completely orthogonal as they interact and are interdependent in building trust.

From this perspective, we view trust building as a process mechanism, which will assure the successful completion of transaction. However, we also posit that trust may be a necessary condition for online exchange success, not a sufficient condition. In other words, a high degree of trust does not guarantee the success of transaction because of the trust-building mechanisms.

#### 2.4. Theoretical validation of the six dimensional model of trust-building mechanisms

The identified dimensions of trust-building mechanisms in B-to-C online exchanges are cross-vali-

Table 1  
Definitions of trust dimensions, subdimensions and literature sources

Trust dimensions	Definition	Subdimensions	Literature sources
Consumer-behavioral dimension	Individual attributes that affect the trusting behaviors of consumers	Demographic factors, experience, familiarity, individual culture, traditions, privacy, etc.	[2,6,8,12,28,31,34,62,75,91,100]
Institutional dimension	Third parties and other institutional attributes that shape institutional environment	Reputation, accreditation, authentication, approvals (e.g., advisors and guarantors), customer communities (e.g., eBay’s feedback forum), legal requirements and authorities, etc.	[4,5,10,16,61,64,67,69,90]
Information content dimension	Attributes that determine the trustworthiness of web content	Accuracy, currency, completeness, nonbias, credibility, website brand royalty, entertainment, usefulness, etc.	[1,19,35,38,41,49,52,83]
Product dimension	Attributes of a product that promote or deter online exchange	Durability, reliability, brand equity, quality, variety, customization, competitiveness and availability, etc.	[1,19,38,41,49,83]
Transaction dimension	Attributes that make online transactions trustworthy	Transparency, pricing and payment options, financial planning (complexity), sales-related service (refund policy, after-sales, etc.), promotions, delivery fulfillment, etc.	[36,82,85,99,109]
Technology dimension	Information system and software attributes that enable the online exchange to be effective and safe	Quality of media transmission, interface design and contents, security, reversibility, digital certificate, public-key cryptography (infrastructure), authenticity, integrity, confidentiality, nonrepudiation, attributes of the system (benevolence, competency, predictability), etc.	[3,9,10,13,30,40,58,59,70,86,89,97,103]

dated by examining the major theoretical rationales supported by the previous literature in trust. The extensive literature review reveals six major groups

of rationales that render the elements of ‘trust’ to be essential in online exchanges: (a) uncertainty, opportunism, lack of a perfect contract, communication

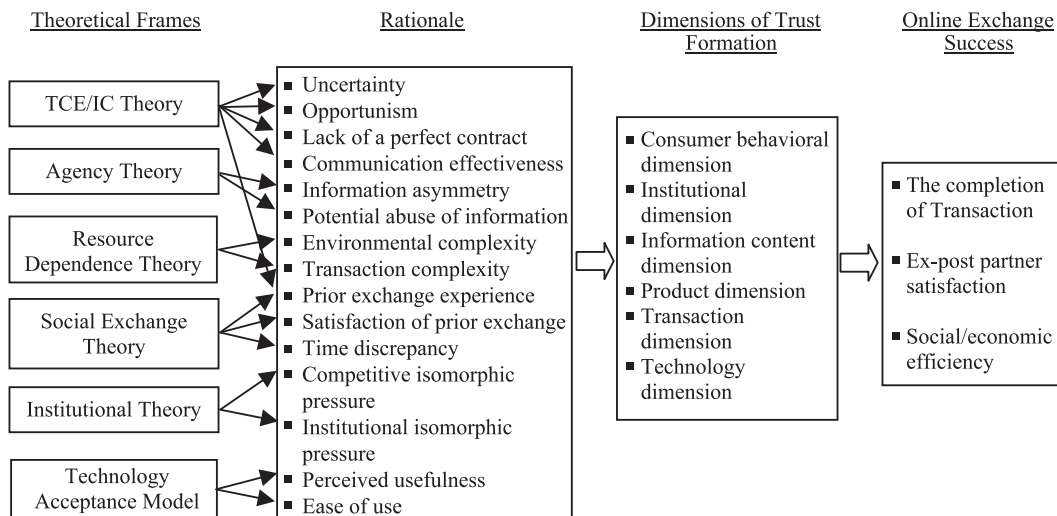


Fig. 3. Conceptual formulation of the model.

effectiveness, and prior transaction experience [46,47,72,104–107], (b) information asymmetry, and potential abuse of information [39,56], (c) environmental, and transaction complexity [84,98], (d) prior exchange experience, satisfaction of prior exchange, and time discrepancy [66,101], (e) competitive isomorphic pressure, and institutional isomorphic pressure [29,93], and (f) perceived usefulness and ease of use [25–27]. These rationales are supported by transaction cost economics (TCE) and incomplete contract (IC) theory, agency theory, resource dependence theory, social exchange theory, institutional theory, and a technology acceptance model, respectively.

The six groups of theoretical rationales found in the prior literature are found to support the six dimensions of the trust-building mechanism. For instance, TCE/IC maps into the consumer behavioral and technology dimensions; agency theory into the institutional and transaction dimensions; social exchange theory into the consumer behavioral and

information content dimensions; institutional theory into the institutional, product, and information content dimensions; resource dependence theory into the product and information content dimensions; and technology acceptance model into the consumer behavioral, product, transaction, and technology dimensions. Fig. 3 shows the relationships among the theoretical frames, theoretical rationales for the multidimensions of trust formation process and online exchange success. Because we focus primarily on the dimensions of trust formation, detailed discussions regarding theoretical frameworks and rationales are beyond the scope of this study.

### 3. Perspectives of practitioners vs. academia on trust formation

Investigating the trust-building mechanism in the B-to-C online exchange process, we posit that consumers' trust in online transactions is a funda-

Table 2  
Number of authors and 20 popular publications for peer and non-peer reviewed

Peer-reviewed publications				Non-peer-reviewed publications			
Academia <sup>a</sup>		Practitioners		Academia		Practitioners	
1st author	Others	1 <sup>st</sup> author	Others	1st author	Others	1st author	Others
14	12	9	2	6	3	172	0
Academy of Management Journal				Advertising Age			
Aviation Week and Space Technology				Advisor Today			
California Management Review				Bank Systems and Technology			
Communications of the ACM				Business Week			
Competitiveness Review				CA Magazine			
Database for Advances in Information Systems				CMA Management			
Decision Support Systems, Amsterdam				Computer Reseller News			
European Management Journal				Computer Technology Review			
International Tax Review				Computerworld			
Journal of Accountancy				Credit Union Magazine			
Journal of Management Information Systems				Direct Marketing			
Journal of Marketing				Forbes			
Library Journal				InformationWeek			
Management Services				InfoWorld			
Marketing Management				InternetWeek			
MIT Sloan Management Review				Marketing			
S.A.M. Advanced Management Journal				Mediaweek			
Strategic Finance				Security			
The CPA Journal				Supply Management			
The Internal Auditor				Telecommunications			

<sup>a</sup> We consider professors at educational institutions or members of research institutions as representatives of academia. All others are practitioners.

mental element. We also posit, as explained above, that trust is formed through the interaction of four different entities in online transactions: buyers, sellers, third parties and technology. The B-to-C online e-stores implemented by sellers provide buyers with at least three types of information which include site-related, product-related, and transaction-related information, among which trust is embedded in the transaction-related information but, how are these elements in B-to-C trust-building mechanisms viewed in the e-commerce area? Since trust as a phenomenon is difficult to observe and measure [45,53], it is not, then, an easy task to empirically identify the dimensions of trust formation in elec-

tronic commerce. Thus, in order to answer the question, we utilize a secondary method to measure the dimensions of trust formation in B-to-C e-commerce. As observers or opinion leaders, both practitioners and academics have described trust-related issues in electronic commerce areas. Therefore, we utilize their descriptions as proxies of consumers' description of the dimensions of trust formation. How do practitioners and academics perceive the six dimensions? Along with previous questions, we also investigated how academics, vis-a-vis practitioners, put their emphasis in trust-building mechanisms, and what the differences in perspective, if any, means to us.

Table 3  
Keywords and search strings for content analysis

Dimensions	Keywords	Search strings
Consumer-behavioral dimension	Consumer (consumer*, customer*, user*, people, individual), demograph*, experience, familiarity, culture, tradition*, belief, habits, local*, technolo* awareness, income, attitude, relationship*, risk	((trust*) w/50 (1 OF {consumer*, customer*, user*, people, individual}) w/50 (1 OF {culture* demograph*, experience, familiarity, tradition*, belief, habit*, local*, technolo* awareness, novice, expert*, disposition*, income, attitude, relationship*, risk}))
Institutional dimension	Institution (third part*, institution*, organization*, bank*, firm*, TRUSTe, VeriSign, BBB Online Privacy, BBB Online Reliability, WebTrust, Online privacy alliance), reputation, accreditation, approvals, seal*, certification, audit, business practice, security assurance, privacy assurance, privacy policy, standard*, guarantee, credit card, legal requirements, law, regulation	((trust*) w/50 (1 OF {institution*, third part*, organization*, bank*, firm*, TRUSTe, VeriSign, BBB Online Privacy, BBB Online Reliability, WebTrust, Online privacy alliance}) w/50 (1 OF {reputation, accreditation, approvals, seal*, certification, audit, business practice, security assurance, privacy assurance, privacy policy, standard*, guarantee, credit card, legal requirements, law, regulation}))
Web information content dimension	Web content (web information, web content, web interface), accuracy, availability, comprehensiveness, completeness, credibility, website reputation, usefulness, neutrality, information quality	((trust*) w/50 (1 OF {world wide web, web, website, www, e-market*, market*, e-shopping site*, e-shop*, e-retailer*}) w/50 (1 OF {content*, information, interface*, accuracy, availability, comprehensiveness, completeness, credibility, website reputation, usefulness, neutrality, information quality}))
Product dimension	Product (product*, selling item*, commodity), Durability, reliability, brand equity, variety, customization, availability, warranty, rebate, promotion, discount, price, product brand equity, product quality	((trust*) w/50 (1 OF {product*, good* selling item*, commodit*, procurement*, logistic*}) w/50 (1 OF {durability, reliability, brand equity, variety, customization, availability, warranty, rebate, promotion, discount, price, royalty, product quality}))
Transaction dimension	Transaction (transaction*, online order, shipping, delivery, shipment), payment, after sales service, refund, return policy, order tracking, support, service, complaint, grievance, guarantee, safeguard, protect*, order number, contact e-mail	((trust*) w/50 (1 OF {transaction*, e-transaction, online order, shipping, delivery, shipment}) w/50 (1 OF {payment, after sales service, refund, return policy, order tracking, support, service, complaint, grievance, guarantee, safeguard, protect*, order number, contact e-mail, e-mail}))
Technology dimension	Technology (technolog*, information system), firewall, intrusion, detection, traffic volume, back-up, authenticity, encryption, SSL, unauthorized access, cookies, cryptography, PKI, digital signature, cookies, password, infrastructure	((trust*) w/50 (1 OF {technolog*, information system*}) w/50 (1 OF {firewall, intrusion, detection, traffic volume, back-up, authenticity, encryption, SSL, unauthorized access, cookies, cryptography, PKI, digital signature*, digital certificate*, cookies, password, infrastructure}))

From a detailed reading of the literature, we observe the following. Practitioners tend to focus more on current issues and take on prescriptive approaches posed mainly from the e-merchant viewpoint. They directly ask how e-merchants deal with the identified issues in the trust-building mechanism, especially in terms of technical solutions and implementation. In other words, their primary concerns are with regard to the structure of the raised issues, such as technical platforms that generate a trust-building environment, software agents and public key infrastructure (PKI), product features and characteristics that create trust on the part of consumers, etc. Therefore, their discussions are centered more around current technological constraints, viable product features, and available online transaction tools, around which other elements of the trust-building mechanism should be built [3,9,58,86].

In contrast, academic researchers tend to focus more on the identification of issues and the deep structure of trust-building mechanisms. Their approaches are more holistic and generalized. They take on issues like the stages of trust building, structural elements of a trust-building mechanism, antecedents and outcomes of consumer trust, etc. Academics are primarily concerned about such issues as the impacts of consumer behavioral dynamics in trust-building mechanisms (i.e., trends in consumer e-marketing behavior, the impact of sophistication of consumers, etc.), institutionalization of trust-building mechanism and its effectiveness (i.e., the issues of utility and availability of trusted third parties and their impact on actual transactions), the issues of information trustworthiness in terms of quality and credibility in

website layouts, etc. These are more foundational issues of trust building, which are embedded in the meta-structure of IT technology, trust management tools, and trusting behavior of consumers. Therefore, academic discussions tend to have implications more on emerging issues and trends, rather than on current ones [10,48,50,77,81]. From the academics' perspective these three dimensions, i.e., consumer behavioral, institutional, and web information dimensions, may jointly form the cognitive basis of trust in an online exchange, around which other elements of trust might be built.

Based on the above, we postulate the following:

**Proposition 1a.** *Out of the six-dimensions of the trust-building mechanism, academia will place more emphasis on the consumer behavioral, institutional, and web information content dimensions.*

**Proposition 1b.** *Out of the six-dimensions of trust-building mechanism, practitioners will place more emphasis on the technological, transaction and product dimensions.*

#### Corollaries:

**Corollary 2a.** *Compared to practitioners, academics will emphasize more the consumer behavioral, institutional, and web information content dimensions.*

**Corollary 2b.** *Compared to academics, practitioners will emphasize more the technological and product dimensions.*

Table 4  
Hit density and *t*-test results

Dimensions	Peer-reviewed publications			Non-peer-reviewed publications			Mean difference	Test of differences	
	Mean	S.D.	Observations	Mean	S.D.	Observations		<i>t</i> -stat	<i>p</i> (one-tail)
Consumer-behavioral	1.60	1.52	27	0.99	0.86	75	0.61	1.754***	0.046
Institutional dimension	1.38	1.46	16	1.33	1.22	53	0.05	0.097	0.462
Web information content	1.58	1.66	20	0.77	0.52	53	0.81	1.799**	0.047
Product	0.68	0.89	16	1.24	1.05	23	-0.55	-1.446**	0.081
Transaction	0.78	0.78	20	1.02	0.89	41	-0.23	-0.896	0.189
Technology	0.93	1.05	18	1.67	1.51	45	-0.74	-1.911**	0.034

\* Significant at the 0.1 level.

\*\* Significant at the 0.05 level.

#### 4. Research methodology, data collection and data analyses

A combination of computer-aided semantic network content analysis and quantitative content analysis is used to determine the presence of certain dimensions of trust within a set of texts that describe or represent trust in electronic commerce. Information (articles) regarding trust on electronic commerce is obtained from the ABI/Inform database. The ABI/Inform database is selected for several reasons. First, the database is in a machine-readable electronic form; second, it is one of the world's leading databases for business-related periodicals. More importantly, the ABI/Inform covers not only academic journals, but also practitioner magazines and newspapers portraying the perspectives of practitioners in the industry.

We collected and conducted semantic network analysis on 235 full text articles on trust and electronic commerce from the ABI/Inform. We used guided searches for the last 3 years, from January 1, 1999 through December 31, 2001. The articles were selected using the query “trust AND (electronic commerce OR e-commerce OR electronic business OR e-business OR online transaction OR Internet business)” in the abstract, title and keywords fields. After eliminating some articles that were utilized in the prior theory-building process, redundant or obviously not relevant to this study (e.g., announcements about e-business product launches), we chose 218 full text articles: 32 from peer-reviewed publications and 186 from non-peer-reviewed publications.

Although there is no clear boundary of academia and practitioners' publications, for this research's

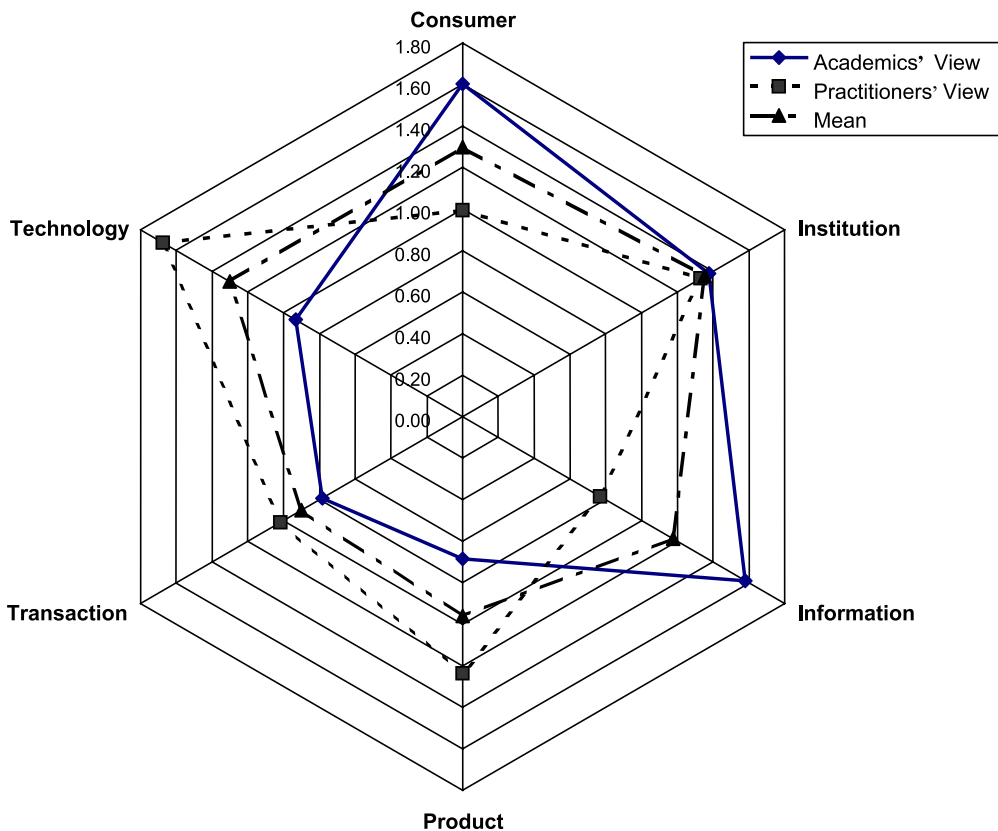


Fig. 4. Radar plots of six dimensions (academia, practitioners, and their mean).

purpose, peer-reviewed and non-peer reviewed publications in ABI/Inform are used, respectively, as proxies of academics and practitioners' descriptions of trust in B2C e-commerce.

Table 2 shows the number of authors for both publications and 20 sample publications in each category. To identify the dimensions of trust in electronic commerce, semantic network content analysis was conducted on both of the categories: one for the academics' descriptions of trust in peer-reviewed publications and another for practitioners' representations in non-peer-reviewed publications. We assumed that the former represents the perception of academics on the issues of trust with respect to how they perceive it and what elements they value; the latter represents the practitioners' perspective on the same issues. We found this to be a reasonable classification, as 70% of authors (26 out of 37) in peer-reviewed publications are from academia and 95% of authors in non-peer reviewed publications are practitioners.

A semantic network is a network of interconnected concepts [95,96]. It is a research method that allows the measure of the importance of terms and their associations [33]. Semantic network analysis focuses on the structure of a system based on shared meaning rather than on links. In other words, two nodes are connected in a semantic network to the extent that their use of concepts overlap [33].

The first step in semantic network analysis requires a content analysis of textual data to determine the most frequently used symbols or words. In this study, CATPAC, a computer-based content analysis software, is employed for the analysis of text. CATPAC is a self-organizing artificial neural network computer program that has been optimized for analyzing text such as open-ended survey responses, news stories, speeches, and contents of papers [21]. This program is able to identify the most frequently occurring words in a text and determines the patterns of similarity based on their co-occurrence [108]. The frequency of words occurs in a stream of messages tends to be interpreted as a measure of importance, attention, or emphasis [63]. The program reads through the text, identifies when specific words occur together, and performs a clustering of words based on the degree of sharing attributes which occur in the cases. Thus, there is no need

for preconceived categories and tests of inter-coder reliability [33].

Based on the keywords that were identified from literature sources and produced by semantic content analysis, we created the coding scheme for a quantitative content analysis tool. The output of semantic content analysis was used as the input for quantitative content analysis. The coding scheme is a collection of thesauruses that include concepts having more specific key words, synonyms, and the dictionary that will serve as the coding scheme for the quantitative content analysis [102].

Tables 6 and 7 in the appendix are actual outputs of CATPAC which show the 50 most frequently occurring words in the sets. We summarize in the following table the top 25 most frequently occurring words.

	Top 25 most frequently occurring words
Academics	(1) Trust, (2) E-Commerce, (3) Consumer, (4) Online, (5) Information, (6) Business, (7) Internet, (8) System, (9) Web, (10) Service, (11) Security, (12) Firm, (13) Transaction, (14) Technology, (15) Privacy, (16) Users, (17) People, (18) Website, (19) Relationships, (20) Risk, (21) Power, (22) Industry, (23) Different, (24) Market, (25) Bank
Practitioners	(1) Consumer, (2) Business, (3) E-Commerce, (4) Service, (5) Internet, (6) Trust, (7) Online, (8) Security, (9) Information, (10) System, (11) Bank, (12) Web, (13) Technology, (14) Transaction, (15) Privacy, (16) Electronic, (17) Permission, (18) Management, (19) Site, (20) Certificate, (21) Industry, (22) Public, (23) Financial, (24) PKI, (25) Website

The words and terms are grouped together to represent the dimensions and used to generate the key strings. For example, both lists include the words reflecting the consumer-behavioral dimension of trust building such as consumer, privacy, service, etc. The data set also identifies terms reflecting technology and institutional dimensions like system, PKI, technology, and certificate, and transaction dimensions like shipping, store terms, return, shopping, etc. (see Tables 6 and 7 for details). Other outputs from CATPAC are shown in Figs. 5 and 6 in the appendix. These figures, called dendrograms,

describe the relationships between the top 50 most commonly occurring words (concepts). We can get clustering word information from these dendrograms. For example, the words *different*, *trading*, *partners*, and *suppliers* cluster very sharply together.

After several pilot tests to refine and validate the coding scheme, computer-aided quantitative content analysis was conducted using ZyLab, an information retrieval software. The frequency of “events” or “hits” for each search string relevant to a particular trust dimension is used as an indicator of the importance or emphasis [76]. For more complete results, we use wild card characters (\*) with the AND operator in search statements containing content words with similar meaning. Trust\* retrieves both trust and trustworthiness. The within operator “(W/n)” limits the search to content words that appear within a defined range (n) in either direction. To calculate the relevance of a document we utilize

the number of hits per document and the total amount of words contained in that document. In the ZyLab program, this is called ‘hit-density’ which refers to term-based frequency ranking [37]. The hit density is a ratio of the number of hits divided by the number of content-bearing words in an article, representing how densely the words in the particular key string are populated in the article. For example, the hit density 1.60 is the percentage of occurrence of the total content-bearing words. The words in the search strings occur as 1.6% of the total words excluding noncontent-bearing words such as determiners, prepositions, conjunctions, etc.

The coding scheme consists of three parts, (i) trust related, (ii) dimension related, and (iii) sub-dimensional related keywords. For example, to get the occurrence of hits on the consumer-behavioral dimension, we define a set of search strings as the following parts.

---


$$\text{Search strings for consumer-behavioral dimension: } \left( \frac{(\text{trust}^*)}{(1)} \text{w}/50 \left( 1 \text{ OF } \frac{\{\text{consumer}^*, \text{customer}^*, \text{user}^*, \text{people}, \text{individual}\}}{(2)} \right) \text{w}/50 \right. \\ \left. \left( 1 \text{ OF } \frac{\{\text{culture}^* \text{demograph}^*, \text{experience}, \text{familiarity}, \text{tradition}^*, \text{belief}, \text{habit}^*, \text{local}^*, \text{technolo}^* \text{awareness}, \text{novice}, \text{expert}^*, \text{disposition}^*, \text{income}, \text{attitude}, \text{relationship}^*, \text{risk}\}}{(3)} \right) \right)$$


---

The meaning of the search string is that trust related terms (such as trust, trustworthy, trustworthiness, etc.) occur within 50 words in a data set

Table 5  
Analysis of variance (ANOVA) tables for dimensions

		Sum of squares	df	Mean square	F	Sig.
<i>ANOVA (academics' view)</i>						
Hit density	Between groups	11.641	5	2.328	1.360	0.249
	Within groups	128.361	75	1.711		
	Total	140.002	80			
<i>ANOVA table (practitioners' view)</i>						
Hit density	Between groups	21.354	5	4.271	4.037	0.002
	Within groups	262.345	248	1.058		
	Total	283.699	253			
<i>ANOVA (pooled)</i>						
Hit density	Between groups	12.842	5	2.568	2.055	0.071
	Within groups	411.239	329	1.250		
	Total	424.081	334			

together with consumer related terms {such as consumer/s, customer/s, user/s, people, individual, etc} and with consumer subdimensional keywords (such as culture, experience, familiarity, etc.). If in that case, ZyFind, the ZyLab’s advanced search engine module, counts the number of words as hits. The “w/50”, within 50 words positional operator, is used based on the assumption that one paragraph consists of 50 conceptual words in general. Table 3 shows the six search strings used for content analysis in this study.

## 5. Results and discussion

In order to test the propositions, we first computed hit densities of the key strings for each dimension. For peer-reviewed publications, all 32 articles are examined for each dimension and the same procedure is applied to all 186 non-peer

Table 6  
50 frequency of words in the data set from 32 peer-reviewed publications

Total words	7180	Threshold	0.000	
Total unique words	50	Restoring force	0.100	
Total episodes	7174	Cycles	1	
Total lines	8632	Function	Sigmoid (−1 − +1)	
		Clamping	Yes	
Descending frequency list				
Word	FREQ	PCNT	Case FREQ	Case PCNT
Trust	594	8.3	2565	35.8
E-commerce	463	6.4	2358	32.9
Consumer	418	5.8	2147	29.9
Online	407	5.7	1979	27.6
Information	369	5.1	1862	26.0
Business	354	4.9	1793	25.0
Internet	349	4.9	1856	25.9
System	249	3.5	1263	17.6
Web	228	3.2	1122	15.6
Service	220	3.1	1192	16.6
Security	195	2.7	998	13.9
Firm	186	2.6	885	12.3
Transaction	165	2.3	914	12.7
Technology	156	2.2	885	12.3
Privacy	140	1.9	726	10.1
Users	140	1.9	765	10.7
People	134	1.9	697	9.7
Website	106	1.5	619	8.6
Relationships	99	1.4	604	8.4
Risk	98	1.4	448	6.2
Power	94	1.3	406	5.7
Industry	88	1.2	510	7.1
Different	84	1.2	415	5.8
Market	82	1.1	462	6.4
Businesses	79	1.1	511	7.1
Computer	79	1.1	440	6.1
Personal	79	1.1	520	7.2
Management	78	1.1	477	6.6
Permission	78	1.1	325	4.5
Research	75	1.0	478	6.7
Trading	72	1.0	391	5.5
Environment	71	1.0	454	6.3
Relationship	69	1.0	437	6.1
Control	68	0.9	379	5.3
Financial	68	0.9	416	5.8
Government	68	0.9	371	5.2
WebTrust	68	0.9	279	3.9
Process	67	0.9	412	5.7
Social	66	0.9	390	5.4
Electronic	65	0.9	424	5.9
Behavior	64	0.9	381	5.3
Marketing	63	0.9	363	5.1
Suppliers	63	0.9	320	4.5
Partners	62	0.9	375	5.2
Exchange	61	0.8	349	4.9
Alphabetically sorted list				
Word	FREQ	PCNT	Case FREQ	Case PCNT
Behavior	64	0.9	381	5.3
Business	354	4.9	1793	25.0
Bank	79	1.1	511	7.1
Computer	79	1.1	440	6.1
Consumer	418	5.8	2147	29.9
Control	68	0.9	379	5.3
Different	84	1.2	415	5.8
Digital	59	0.8	329	4.6
E-commerce	463	6.4	2358	32.9
Electronic	65	0.9	424	5.9
Environment	71	1.0	454	6.3
Exchange	61	0.8	349	4.9
Financial	68	0.9	416	5.8
Firm	186	2.6	885	12.3
Government	68	0.9	371	5.2
Industry	88	1.2	510	7.1
Information	369	5.1	1862	26.0
Interaction	61	0.8	326	4.5
Internet	349	4.9	1856	25.9
Legal	60	0.8	364	5.1
Management	78	1.1	477	6.6
Market	82	1.1	462	6.4
Marketing	63	0.9	363	5.1
Online	407	5.7	1979	27.6
Partners	62	0.9	375	5.2
People	134	1.9	697	9.7
Permission	78	1.1	325	4.5
Personal	79	1.1	520	7.2
Power	94	1.3	406	5.7
Privacy	140	1.9	726	10.1
Process	67	0.9	412	5.7
Relationship	69	1.0	437	6.1
Relationships	99	1.4	604	8.4
Requirements	60	0.8	314	4.4
Research	75	1.0	478	6.7
Risk	98	1.4	448	6.2
Security	195	2.7	998	13.9
Service	220	3.1	1192	16.6
Social	66	0.9	390	5.4
Suppliers	63	0.9	320	4.5
System	249	3.5	1263	17.6
Technology	156	2.2	885	12.3
Terms	59	0.8	388	5.4
Trading	72	1.0	391	5.5
Transaction	165	2.3	914	12.7

(continued on next page)

Table 6 (continued)

Descending frequency list					Alphabetically sorted list				
Word	FREQ	PCNT	Case FREQ	Case PCNT	Word	FREQ	PCNT	Case FREQ	Case PCNT
Interaction	61	0.8	326	4.5	Trust	594	8.3	2565	35.8
Legal	60	0.8	364	5.1	Users	140	1.9	765	10.7
Requirements	60	0.8	314	4.4	Web	228	3.2	1122	15.6
Digital	59	0.8	329	4.6	Website	106	1.5	619	8.6
Terms	59	0.8	388	5.4	WebTrust	68	0.9	279	3.9

reviewed publications. We also conducted *t*-tests between pairs of hit densities for non-peer reviewed and peer-reviewed articles in all the six dimensions.

One of the limitations of the study is the assumption that one paragraph consists of 50 conceptual words. This may not be true in some cases, thus to validate and test the sensitivity of this assumption, two more sets of analyses with “w/40” and “w/60” within-words positional operator were used. The results are in Table 8 in the appendix. According to the results, there are no significant mean differences in the case of w/40. However, the cases with w/50 and w/60 positional operators show the same significant patterns, i.e., consumer-behavioral, web information-content, product and technology dimensions are significantly different. It is generally true that the average number of words in one paragraph is over 40 words. Thus we could either chose the results of w/50 or w/60 positional operators for comparison analysis. For simplicity of analysis, we use the results of “w/50” words positional operator in the Results and discussion and Conclusion.

Table 4 summarizes the results of the w/50 words positional operator. The results include the hit densities in the peer and non-peer reviewed publications and the *t*-statistic for comparisons of the two data sets in terms of trust formation dimensions.

### 5.1. Comparisons of academic and practitioner perspectives

According to the results, the differences between the pairs within consumer-behavioral, web information-content, product, and technology dimensions

are significant. The results generally support our propositions. As postulated, practitioners seem to have a higher emphasis on the product and technology dimensions while academics put more stress on consumer-behavioral and web information content. Contrary to our expectations, however, the institutional dimension and the transaction dimension do not seem to reveal any significant differences between the two. Fig. 4 plots the means of hit densities of the six dimensions for the academics’ and practitioners’ views.

Although there is no statistical evidence in the context of mean differences with regard to the institutional and transaction dimensions between practitioners and academic researchers, this does not mean that institutional and transaction dimensions are not emphasized by practitioners and researchers. Actually, according to the analysis results the average hit densities of institutional dimension of peer reviewed and non-peer reviewed publications are 1.38 and 1.33, respectively, which means the institutional dimension is highly valued by both. The average hit densities of transaction dimensions are also higher than the production dimension of peer reviewed publications and the consumer-behavioral and Web information content dimensions of non-peer reviewed publications.

In order to test the mean differences among the dimensions within each group (academia and practitioners), three ANOVA tests were conducted for peer-reviewed, non-peer-reviewed, and pooled publications. Table 5 presents analysis of the variance results for the dimensions. According to the ANOVA results, there is sufficient evidence that the mean hit density differs among the six dimensions for non-peer reviewed and pooled samples at the 0.1 level of significance.

Table 7  
50 frequency of words in the data set from 186 non-peer-reviewed publications

Total words	19946	Threshold	0.000						
Total unique words	50	Restoring force	0.100						
Total episodes	19940	Cycles	1						
Total lines	29881	Function	Sigmoid ( - 1 - + 1)						
		Clamping	Yes						
Descending frequency list									
Alphabetically sorted list									
Word	FREQ	PCNT	Case FREQ	Case PCNT	Word	FREQ	PCNT	Case FREQ	Case PCNT
Consumer	1233	6.2	5963	29.9	Abstract	190	1.0	1327	6.7
Business	1230	6.2	5916	29.7	Access	182	0.9	1137	5.7
E-commerce	940	4.7	5372	26.9	Applications	186	0.9	1057	5.3
Service	926	4.6	4799	24.1	Bank	610	3.1	2601	13.0
Internet	919	4.6	5040	25.3	Brand	178	0.9	848	4.3
Trust	864	4.3	4717	23.7	Business	1230	6.2	5916	29.7
Online	801	4.0	4189	21.0	Card	187	0.9	945	4.7
Security	786	3.9	4088	20.5	Certificate	322	1.6	1380	6.9
Information	720	3.6	3756	18.8	Classification	182	0.9	1274	6.4
System	702	3.5	3924	19.7	Communications	192	1.0	1307	6.6
Bank	610	3.1	2601	13.0	Computer	184	0.9	1080	5.4
Web	576	2.9	3069	15.4	Consumer	1233	6.2	5963	29.9
Technology	555	2.8	3140	15.7	Digital	200	1.0	1171	5.9
Transaction	473	2.4	2606	13.1	Durable	188	0.9	1310	6.6
Privacy	435	2.2	1950	9.8	E-commerce	940	4.7	5372	26.9
Electronic	392	2.0	2054	10.3	Electronic	392	2.0	2054	10.3
Permission	381	1.9	2085	10.5	E-mail	184	0.9	1020	5.1
Management	338	1.7	2095	10.5	Financial	281	1.4	1693	8.5
Site	328	1.6	1649	8.3	Industry	301	1.5	1860	9.3
Certificate	322	1.6	1380	6.9	Information	720	3.6	3756	18.8
Industry	301	1.5	1860	9.3	Infrastructure	208	1.0	1339	6.7
Public	286	1.4	1637	8.2	Internet	919	4.6	5040	25.3
Financial	281	1.4	1693	8.5	Management	338	1.7	2095	10.5
PKI	277	1.4	1334	6.7	Market	256	1.3	1534	7.7
Website	277	1.4	1582	7.9	Marketing	249	1.2	1469	7.4
Market	256	1.3	1534	7.7	Network	249	1.2	1489	7.5
Marketing	249	1.2	1469	7.4	Online	801	4.0	4189	21.0
Network	249	1.2	1489	7.5	Owner	194	1.0	1351	6.8
Software	239	1.2	1394	7.0	People	210	1.1	1330	6.7
Products	224	1.1	1385	6.9	Permission	381	1.9	2085	10.5
People	210	1.1	1330	6.7	PKI	277	1.4	1334	6.7
Infrastructure	208	1.0	1339	6.7	Privacy	435	2.2	1950	9.8
Digital	200	1.0	1171	5.9	Process	179	0.9	1063	5.3
Owner	194	1.0	1351	6.8	Product	190	1.0	1184	5.9
Communications	192	1.0	1307	6.6	Products	224	1.1	1385	6.9
Sites	192	1.0	1047	5.3	Prohibited	184	0.9	1283	6.4
Abstract	190	1.0	1327	6.7	Public	286	1.4	1637	8.2
Product	190	1.0	1184	5.9	Reproduced	184	0.9	1288	6.5
Durable	188	0.9	1310	6.6	Reproduction	182	0.9	1271	6.4
Card	187	0.9	945	4.7	Security	786	3.9	4088	20.5
Applications	186	0.9	1057	5.3	Service	926	4.6	4799	24.1
Computer	184	0.9	1080	5.4	Site	328	1.6	1649	8.3
E-mail	184	0.9	1020	5.1	Sites	192	1.0	1047	5.3
Prohibited	184	0.9	1283	6.4	Software	239	1.2	1394	7.0
Reproduced	184	0.9	1288	6.5	System	702	3.5	3924	19.7

(continued on next page)

Table 7 (continued)

Descending frequency list					Alphabetically sorted list				
Word	FREQ	PCNT	Case FREQ	Case PCNT	Word	FREQ	PCNT	Case FREQ	Case PCNT
Access	182	0.9	1137	5.7	Technology	555	2.8	3140	15.7
Classification	182	0.9	1274	6.4	Transaction	473	2.4	2606	13.1
Reproduction	182	0.9	1271	6.4	Trust	864	4.3	4717	23.7
Process	179	0.9	1063	5.3	Web	576	2.9	3069	15.4
Brand	178	0.9	848	4.3	Website	277	1.4	1582	7.9

The ANOVA test results show that the mean values of the six dimensions obtained for the non-peer-reviewed and pooled publications are not identical, implying that the different dimensions among the groups have different weights. In other words, the results regarding non-peer reviewed articles show that practitioners value the product and technology dimensions more than the remaining ones. However, there is not sufficient evidence that the mean values for the peer-reviewed publications are significantly different at the 0.1 level of significance. This implies that academics emphasize the different dimensions more or less equitably as compared to practitioners.

## 6. Conclusion

Based on the results, we may conclude that practitioners are more likely concerned with the issues related to application levels of trust building from e-merchant viewpoints, i.e., issues such as current technological constraints, technical platforms, viable product features and characteristics, and technical solution/implementation of trust building, while academic researchers are more concerned on foundational levels of trust-building mechanisms, such as the impacts of consumer e-marketing behavioral, and web information trustworthiness in terms of quality and credibility of web content dimensions. This supports the propositions and corollaries of this study in general.

There are some limitations to this study. First of all, since the trust formation process is difficult to observe and measure, we utilized practitioners' and academics' conceptual models of trust and trust descriptions as proxies. Although the data set used in this study clearly represents the conceptual

models of two key stakeholders, it may not support the actual nature of the trust formation process from a consumer's perspective. It may be true that there are differences between the theoretical view and the actual implementation view of trust building in transaction websites. Therefore, we admit that this is a possible operational limitation of model. Thus, future research would be to apply the same content analysis technique with the same coding schemes to data collected from real online market places (Websites).

Another limitation of the study concerns the possibility of ignorance of current thinking of trust in e-commerce. Since the 235 full text articles on trust and electronic commerce were collected from January 1, 1999 to December 31, 2001, some new references, which were published after that time, are not considered. Thus, another study using full text articles for another 3 years from January 1, 2002 will be an interesting aspect for a longitudinal perspective study on trust in e-commerce.

This study offers three contributions. First, the current research proposes a framework by which multiple dimensions of trust building in online exchanges may be investigated in a holistic manner. The trust-building mechanism can in turn be applied to actual online exchange situations. As such, this study has provided insights into the dynamics of trust in online exchanges and has contributed to the literature in the electronic commerce research area. Second, the research utilizes a combination of semantic network content analysis and quantitative content analysis to determine empirically the presence of certain dimensions of trust formation in electronic commerce. From a research methodology perspective, this is a relatively new approach in the information systems area.

Finally, the results offer new insights that can help both academics and e-commerce practitioners in en-





Table 8  
Comparisons of hit densities and *t*-test results (w/40, w/50, and w/60 cases)

“w/40” within-words positional operator	Peer-reviewed publications			Non-peer-reviewed publications			Mean difference	Test of differences	
	Mean	S.D.	Observations	Mean	S.D.	Observations		<i>t</i> -stat	<i>p</i> (one-tail)
Consumer-behavioral	1.31	1.14	24	0.96	0.77	65	0.34	1.477	0.072
Institutional dimension	1.36	1.46	15	1.26	1.37	48	0.10	0.143	0.443
Web information content	1.17	1.44	17	0.80	0.75	40	0.37	1.236	0.112
Product	0.70	0.96	9	1.18	1.25	11	−0.48	−0.731	0.246
Transaction	0.72	0.91	17	0.93	1.18	36	−0.21	−0.758	0.227
Technology	0.74	1.20	11	1.31	1.64	47	−0.57	−1.296	0.101
“w/50” within-words positional operator	Peer-reviewed publications			Non-peer-reviewed publications			Mean difference	Test of differences	
Dimensions	Mean	S.D.	Observations	Mean	S.D.	Observations		<i>t</i> -stat	<i>p</i> (one-tail)
Consumer-behavioral	1.60	1.52	27	0.99	0.86	75	0.61	1.754**	0.046
Institutional dimension	1.38	1.46	16	1.33	1.22	53	0.05	0.097	0.462
Web information content	1.58	1.66	20	0.77	0.52	53	0.81	1.799**	0.047
Product	0.68	0.89	16	1.24	1.05	23	−0.55	−1.446**	0.081
Transaction	0.78	0.78	20	1.02	0.89	41	−0.23	−0.896	0.189
Technology	0.93	1.05	18	1.67	1.51	45	−0.74	−1.911**	0.034
“w/60” within-words positional operator	Peer-reviewed publications			Non-peer-reviewed publications			Mean difference	Test of differences	
Dimensions	Mean	S.D.	Observations	Mean	S.D.	Observations		<i>t</i> -stat	<i>p</i> (one-tail)
Consumer-behavioral	1.72	1.77	28	1.12	0.85	78	0.59	2.304**	0.012
Institutional dimension	1.68	1.62	17	1.49	1.31	56	0.19	0.100	0.460
Web information content	1.56	1.44	20	0.94	0.71	62	0.62	2.294**	0.012
Product	0.62	0.99	16	1.27	1.34	23	−0.64	−1.322*	0.099
Transaction	0.85	0.86	20	1.05	1.02	53	−0.20	−0.677	0.250
Technology	0.90	1.25	18	1.74	1.62	50	−0.85	−1.674*	0.050

\*Significant at the 0.1 level.

\*\*Significant at the 0.05 level.

consider both the perspectives of academics and corporate practitioners simultaneously.

## Appendix A

Tables 6 and 7  
Figs. 5 and 6  
Table 8

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