

Trust in Electronic Environments

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Abstract

The objective of this paper is to provide a unified, theoretically grounded framework for trust in electronic environments. An overview of the research on trust is presented, examining the nature of the concept, its definition, and the factors and processes that contribute to trust. The result is an integrated model that provides a comprehensive framework for trust in a variety of settings. This general model of trust is then applied to four domains within electronic environments: information, information systems, electronic commerce, and online relationships.

The benefits of this unified framework for trust are twofold. First, it provides a common language for information systems researchers studying trust in different domains. Second, it provides solid theoretical grounding for the study of trust in information systems. It thus enables the information systems community to engage in a more formal and systematic study of trust.

1 . Introduction

As the Internet becomes more pervasive in our everyday lives, the question of trust in electronic environments is raised with increasing frequency. Many discussions of trust in the context of information systems focus on issues like technical security and reliability [1] or e-commerce [2, 3]. However, some researchers have explicitly raised the problem of trust in information obtained from the Internet [4]. Moreover, others have discussed trust with respect to relationships established through online communities, such as chat rooms and discussion groups [5].

Within the information systems community, studies of trust to date have tended to focus on isolated topics, for example, by discussing trust as it relates to e-commerce exclusively. Moreover, efforts to provide a theoretical grounding for trust in information systems are still underdeveloped.

The objective of this paper is to provide a unified, theoretically grounded framework for trust in electronic environments. An overview of the research on trust is presented, examining the nature of the concept, its definition, and the factors and processes that contribute to trust. This review draws on the vast knowledge of trust that has been assembled in such disciplines as philosophy, psychology, sociology, organization theory, and transaction economics. The result is an integrated model of trust that provides a comprehensive framework for trust in a variety of settings.

This general model of trust is then applied to four domains in electronic environments: information, information systems, electronic commerce, and online relationships. A specific realization of the model in each of these domains is created by mapping elements of the domain into the general framework for trust. Thus the model presents a unified and comprehensive view of trust and its implications for different aspects of information systems.

2 . Trust

The concept of trust has been addressed within many disciplines, including philosophy, psychology, sociology, transaction economics, and organization theory. This has resulted in a body of research that is widely divergent and at times contradictory. It is widely acknowledged that trust is complex and multidimensional [6-11]. However, research often focuses narrowly on specific aspects of trust, failing to fully capture its multidimensional nature [6]. The trust literature also lacks clear differentiation among the factors contributing to trust, the construct of trust itself, and the outcomes of trust [12].

In spite of the variation in the literature on trust, a number of researchers have pointed out that there exist several recurrent themes [6, 12-14]. The following sections synthesize a range of perspectives into a comprehensive integrated framework. This discussion structures the research into the following areas:

- *Nature*: What type of construct is trust?
- *Definition*: What is trust, and what does it entail?

- *Preconditions*: What conditions must be present for trust to be relevant?
- *Dimensions*: What are the manifestations of trust?
- *Trustworthiness*: What attributes are desired of a potential recipient of trust?
- *Influences*: What factors influence trust?
- *Processes*: How does trust develop and evolve?

This theoretical model provides the foundation for examining trust in electronic contexts.

2.1 Nature of trust

There is broad agreement that trust is a social and psychological phenomenon. However, various perspectives differ according to where each locates trust in sociopsychological space. Trust has been studied on four levels: *individual*, as a personality trait; *interpersonal*, as a social tie directed from one actor to another; *relational*, as an emergent property of a mutual relationship; and *societal*, as a feature of a community as a whole. Thus, the individual level simply addresses the statement, “I trust,” the interpersonal level extends this to the statement, “I trust you,” the relational level broadens further to, “You and I trust each other,” and the societal level expands it finally to, “We all trust.”

Individual trust is treated as a purely psychological attribute, a generalized expectancy toward others based on one’s cumulative experience [15]. This approach has been criticized as reductionist for failing to consider the social context in which a particular instance of trust occurs [9]. The psychological attribute in question is not actually trust, but rather a propensity to trust that influences whether an individual will extend trust in a particular instance [12].

The most common approach to trust, *interpersonal* trust, treats it as a social tie between a specific trustor and trustee [12]. This relation is frequently defined in terms of an attitude the trustor holds toward the trustee, such as expectation of or confidence in the trustee’s competence [13, 16], goodwill [13, 17, 18], ethical behavior [8], or future actions [19-22].

A *relational* perspective on trust treats it not as an attitude or behavior directed from one person to another, but as an emergent property of the relationship as a whole. Such models describe trust as the social glue required to sustain interaction in the absence of role expectations [23] or as an ongoing practice that emerges from the relationship over time [24].

Societal models of trust emphasize its importance to the proper functioning of a society. These models provide a functional account of trust, highlighting its role in enabling people to cope with the complexity of society [25]. This type of trust has been described as system trust [9, 16, 25] or social capital [26]. System trust is a necessary prerequisite for social mechanisms and

institutions, such as science [25], government [27], and the economy [28].

2.2 Definition of trust

A wide variety of definitions of trust have been proposed in the literature. In response to the question, “What is trust?” the following answers have been offered:

- Trust is a personality characteristic of an individual that influences that person’s interactions with the world at large [15].
- Trust is a property of the recipient, such as dependability or reliability [16, 29].
- Trust is an attitude, such as expectation or confidence, that is directed toward a specific other [12, 25].
- Trust is an action performed by an individual, such as cooperation or reliance [3].

However, in recent years the research has begun to converge on several important facts about trust:

- Trust is an attitude held by an individual. It is influenced by the personality of the trustor and by the attributes of the recipient, and it in turn influences the behavior of the trustor, but it is equivalent to none of them.
- Trust is directed toward a specific other.
- Trust is an attitude composed of two parts: confidence in positive outcomes, and a willingness to modify one’s behavior in expectation of those outcomes.

Thus an integrated definition of trust recognizes it as the union of three elements: a *trustee* to whom the trust is directed, *confidence* that the trust will be upheld, and a *willingness* to act on that confidence.

Trust is rarely discussed without specifying a particular other in which the trust is placed [11], referred to as the *trustee* [17] or *referent* [6, 22]. Thus, the trustee answers the question, “Whom do you trust?” The role of trustee is frequently interpreted as another person [10, 15, 23, 30, 31], but has also been extended to groups and organizations [13, 14, 20] and computer systems [32-34].

Trust is frequently defined and described in terms of *confidence* [10, 13, 14, 16, 21, 25, 33], expectation [6-8, 10, 12, 13, 15, 18, 22, 25], belief [10, 13, 15, 16, 19, 32], and faith [7, 10, 16, 32]. All of these concepts capture the common theme that the trustor anticipates that the trust will be upheld.

The *willingness* to assume risk, in spite of the freedom to accept or reject the risk, is vital to trust [17, 35]. Trust has been defined in terms of willingness to assume risk [12], intention to make oneself vulnerable [18], acceptance of risk [36], and readiness to assume risk [25]. This willingness also distinguishes trust from reliance or cooperation [31], which may be based on

coercion, and mere confidence or belief [13, 20, 21], which is limited if one has no intention of acting on those beliefs.

Integration of these three elements leads to the following definition of trust:

Trust is the willingness to rely on a specific other, based on confidence that one's trust will lead to positive outcomes.

This definition is similar to several proposed in the literature [12, 13, 18, 37]. Moreover, it is broad enough to encapsulate the many different contexts in which trust has been employed.

2.3 Preconditions for trust

In order for trust to be relevant in a particular situation, two conditions must be present. It is universally recognized that trust can only arise when there exists a state of *dependence* between the trustor and trustee, and when acting on this dependence entails *risk*, i.e., the trustor possesses *uncertainty* about the outcomes and *vulnerability* to a potential loss if the outcomes are undesirable.

The first precondition of trust is the *dependence* of the trustor on the trustee [18]. Dependence entails two things: the trustor has a particular need to fulfill, and the trustee possesses the potential to satisfy this need. This is reinforced by the large body of research that emphasizes the importance of dependence and dependability [10, 14, 20, 32, 33] or reliance and reliability [7, 13, 15, 16, 22, 25, 30, 31, 38].

The concept of *risk*, which encapsulates both *uncertainty* and *vulnerability*, features prominently in the literature. Trust has been defined in terms of acceptance of risk [36] and utility for risk [7]. The presence of risk creates a need for trust [23, 35]. Trust serves to reduce risk [14, 16] and to increase risk taking in a relationship [12]. The conscious acknowledgement and consideration of risk distinguishes trust from related concepts, such as confidence [35], “blind trust” [24, p. 241], and faith [39]. Several authors have emphasized the importance of uncertainty as a necessary condition of trust [17, 20, 23, 40], while others assert that the very function of trust is to decrease one's uncertainty [25, 39]. The question of trust only becomes relevant if the trustor is vulnerable to suffering a loss if the trust is betrayed [40]. Moreover, trust entails a willingness to place oneself in a vulnerable position [13, 18].

2.4 Dimensions of trust

It is widely recognized that trust is multidimensional [6, 11]. The factors that contribute to trust, and the form which trust assumes, vary according to the context of the relationship [7, 9, 36]. Trust is most frequently

characterized as consisting of two dimensions: *cognitive* and *affective* [9, 21].

The *cognitive* dimension focuses on the rational bases for trust. It emphasizes the fact that trust is based on partial knowledge – somewhere between complete knowledge and total ignorance – and thus frequently involves a search for evidence on which to base one's trust [9, 21]. It therefore focuses on characteristics of the trustee such as competence, reliability, and credentials [21, 39, 41, 42]. Models of trust primarily rooted in the cognitive dimension include cognitive trust [9], cognition-based trust [21], knowledge-based trust [41, 42], predictability and dependability [10]. System trust is a form of cognitive trust based on expectations of behavior in accordance with social roles, as is the concept of trust in trust, whereby one relies upon the trust of others as a basis for extending trust [25]. Studies of trust in computers also emphasize this dimension of trust [34, 43].

The *affective* dimension focuses on emotional bases for trust. This dimension incorporates several forms of trust discussed in the literature, including emotional trust [9], affect-based trust [21], identification-based trust [41], faith [10], relational trust [18], and interpersonal trust [25]. This type of trust arises when there exists an emotional bond between trustor and trustee. The trustee is thus motivated to fulfill the trust in order to maintain the relationship [17]. Affective trust does not need to be based on evidence or warrant [24].

The cognitive and affective dimensions of trust are not mutually exclusive, but are present in various mixes and can be mutually reinforcing [9]. The cognitive dimension is more prominent when the trustor and trustee do not have an extensive history of interaction, whereas affective trust develops as the relationship deepens over time [10, 21].

2.5 Trustworthiness

Trustworthiness is the perceived likelihood that a particular trustee will uphold one's trust. It encompasses four classes of attributes, including competence, positive intentions, ethics, and predictability. The effect of each of these attributes is to strengthen the trustor's confidence that the trustee is willing and able to fulfill the trust.

Competence [8, 11-13] implies that the trustee possesses the knowledge, expertise, or skill to fulfill the needs of the trustor. A related attribute is *credibility* [40], the degree to which information provided by the trustee can be believed.

Positive intentions [37] represent the trustee's feelings toward the trustor. They are also referred to as goodwill [13, 30, 44], benevolence [12, 40], loyalty [11] and motivations [6].

Ethics are the moral principles to which the trustee adheres. These differ from positive intentions in that they

are directed toward others in general, rather than toward a specific trustor. Ethical qualities relating to trust include moral order [8], integrity [11, 12], honesty [6], fairness [11, 22], moral commitment [17], fulfillment of obligations [22], and fiduciary obligation, or the putting of others' interests before one's own [8].

Predictability is the degree to which the trustee's behavior conforms to expectations [11, 22, 41]. This is synonymous with *reliability* [6, 16, 17], *consistency* [11], or behaving as expected [36]. These expectations are frequently based on observations of past behavior, but they may also be derived from expectations associated with a particular social role or function [23, 25].

Competence and predictability are typically associated with the cognitive dimension of trust, while positive intentions are frequently (though not exclusively) associated with the affective dimension of trust. Beliefs regarding the ethics of a trustee may be rooted in either the cognitive or affective dimensions of trust, depending on whether they are based on objective evidence or an emotional bond.

2.6 Influences on trust

In addition to the perceived trustworthiness of the recipient, there are several other factors that influence the development of trust. These include the *propensity to trust*, the *context* in which the trust is embedded, and the level of *social trust* in the recipient.

Studies of trust as a purely psychological attribute revealed that each person possesses a stable personality characteristic that influences one's willingness to extend trust in specific situations [15] and is correlated with other aspects of one's personality [45]. This psychological trait is referred to as the *propensity to trust* [12]. The higher a person's propensity to trust in general, the more likely s/he is to trust in a particular instance.

A second factor influencing trust is the *context* in which the trust is embedded. Trust is not generalizable [8], but is specific to the situation at hand [13]. Even with respect to a trusted individual, the context still matters [36]. Trust is a "three-part relation: I trust you to do Y" [17, p. 7].

The third external factor that affects the development of trust is the *social trust* invested in a potential trustee. A person is more likely to trust if the recipient is trusted by others as well. This phenomenon is rooted in the theory of *trust in trust*, i.e., the trust of other people provides a rational basis for one's own trust [9, 25].

2.7 Trust development processes

Trust can develop through several different processes, depending on the context of the relationship. While a variety of frameworks have been used in the literature, the proposed mechanisms can be organized into the

following taxonomy of processes: prediction, attribution, bonding, reputation, and identification. Each of the processes enhances trust by increasing the perceived trustworthiness of the referent.

Prediction [10, 40], also termed knowledge-based trust [41, 42] or relational trust [18], is based on the consistency of the referent's past behavior. This process encapsulates the development of the predictability component of trustworthiness.

Attribution, also described as dependability [10], intentionality [40] or calculus-based trust [18], entails ascribing underlying qualities or motivations to the trustee based on observable evidence. This process may be based on the words and actions of the trustee or on other credible information. It differs from prediction because it shifts the focus from merely observing specific behaviors (e.g., "this trustee has been truthful in the past") to inducing a stable and enduring trait (e.g., "this person is honest"). Attribution is a cognitive process for assessing the trustee's competence, ethics or intentions.

Bonding refers to the development of an emotional relationship between trustor and trustee. This relationship provides the basis for affective trust. This process is incorporated in the concepts of emotional trust [9], relational trust [18], and faith [10]. It frequently involves the reciprocation of trust, which further strengthens the relationship [18, 21, 24].

Reputation [19], also described as transference [40], institution-based trust [18], or institutional trust [36], is the awarding of trust based on the recommendation of others. It is grounded in the concept of trust in trust, which asserts that the level of trust that others place in a trustee can serve as a rational basis for trust [25]. It therefore enhances the cognitive dimension of trust, particularly with respect to the attributes of ethics and competence.

Identification [36, 41, 42], also referred to as relational trust [18] and goal congruence [19], arises from the extent to which the trustor and trustee share a common identity, goals, and values. This process is related to the cognitive dimension of trust [21] and serves to enhance the perceived trustworthiness of the trustee in all respects.

3. Trust in electronic environments

In the context of electronic environments, there are four domains where the question of trust is relevant:

- *Information*: Can we trust the information we obtain from the Internet or other electronic sources?
- *Information Systems*: Are the computing systems upon which we rely trustworthy?

- *E-Commerce*: Can we trust the buyers and sellers with whom we participate in electronic transactions?
- *Online Relationships*: Can we trust the people with whom we form relationships through electronic communities, such as chat rooms, forums, and discussion groups?

Table 1 presents an overview of the four domains and the contexts within which the question of trust has been raised.

In order to develop a comprehensive framework for trust in electronic environments, each of the four domains is mapped to the components of the general trust framework (Table 2). This mapping illustrates the means by which trust is realized in each electronic domain. The presentation begins by considering the question of applying trust, a concept that is generally directed toward people, to an artifact of technology. The remaining sections discuss trust within each of the four domains: Information, Information Systems, E-Commerce, and Online Relationships.

3.1 Trust in people v. technology

It is widely acknowledged that trust as a construct may be applied to people, either individuals or organizations. However, there is debate over whether it is valid to speak of a technological artifact as the recipient of trust. Several researchers have argued that this is inappropriate, because technology lacks the requisite properties of a social actor. Trust requires both parties to be able to extend good will, be vulnerable and experience betrayal [44]. It presumes that the recipient of trust possesses consciousness and agency [44, 46]. Moreover, an inherent quality of trust is its transformative nature and its ability to influence the attitudes and behavior of both parties [24]. These views dismiss the concept of trust in technology as “metaphorical. ... Machines cannot literally be ‘trusted.’ They can only be relied upon” [24, p. 234].

However, studies in human-computer interaction indicate that people relate socially to computer technology, including the social relation of trust [43, 46-48]. This does not necessarily require or imply that people consider the technology itself to be a social agent [47]. “[I]ndividuals can be induced to behave *as if*

computers warranted human treatment, even though users *know* that the machines do not actually warrant this treatment” [49, p. 670]. It is not necessary that the technology assume a sophisticated, human-like persona. This phenomenon of sociability was observed for simple text interfaces [47, 48] as well as computerized agents capable of engaging in conversational behaviors [43]. Furthermore, the social relations are directed toward the technology itself, rather than the human behind the technology. “When the computer is psychologically relevant, then programmers, content providers, and other distant sources are not” [48, p. 156]. It is theorized that the ability of computer technology to mimic human behaviors and to fill roles traditionally occupied by humans pushes the boundaries of our perceptions of it from a simple tool to a social partner [43, 48, 49]. These observations suggest that an appropriate paradigm for human-computer interaction is the model of human-human interpersonal interactions [46, 48, 49].

It thus appears that there is sufficient evidence to indicate that people are capable of instilling trust in an artifact of technology, such as an information document or a computer system. Moreover, researchers have found that user attitudes toward technology, and trust in particular, affect the use of that technology [6, 50].

3.2 Trust in information

Trust in information conforms to the *interpersonal* model of trust. It is a social attitude directed toward a technological artifact, in this case a specific item of information. The *trustee* in this relation is a specific *electronic document*, such as a web page or electronic article. The *confidence* exists because the user expects the information to be *reliable and valid*. Moreover, the user enters into the relation *willingly*, since s/he is free to *accept or discard the information*.

Both preconditions for trust, dependence and risk, are also present in electronic information. A person may search for information to satisfy any of several needs: evidentiary support for a *decision making* process, facts to supplement personal *knowledge*, or reference material for *producing documents* of one’s own. *Risk* arises because users are consciously aware the information is of *uncertain quality* and that relying on poor information renders them *vulnerable* [51] to *errors* in their decisions, knowledge, or the documents they produce.

Of the two dimensions of trust, cognitive and affective, the *cognitive* dimension has received the most attention. *Quality indicators* such as accuracy, coverage, timeliness, and depth provide rational bases for assessing trust. However, Wilson [as cited in 52] has noted that the *affective* dimension of information is just as relevant as the cognitive in understanding user attitudes toward information. This may occur when the information

Table 1. Questions of trust in electronic environments.

Technology		People	
Information	Information Systems	E-Commerce	Online Relationships
Information quality	Trustworthy computing	Privacy Security Fraud	Identity fraud Abuse Predatory behavior

Table 2. Framework for trust in electronic environments.

Topic	Trust	Information	Information Systems	E-Commerce	Online Relationships
Nature	Individual Interpersonal Relational Societal	Interpersonal	Interpersonal or Societal	Interpersonal	Interpersonal
Elements	Trustee Confidence Willingness	Electronic document Reliability, validity Accept or discard information	Hardware/software system Proper functioning Alternate systems or methods	Transaction partner Contract fulfillment Seek other partners	Conversation partner Relationship maintenance Severance
Preconditions	Dependence Risk	Decision making, knowledge, document production Uncertain quality, resulting errors	Communication, computation Failure, loss of data	Goods, funds Nondelivery, nonpayment	Information, friendship, entertainment Faulty information, abuse
Dimensions	Cognitive Affective	Quality indicators Emotional topic, aesthetics	Signals of system state Technophile v. technophobe	Objective knowledge Established relationship	Credentials Emotional bond
Trustworthiness	Competence Positive Intentions Ethics Predictability	Accuracy, currency, coverage, believability Objectivity Validity Stability	Correctness, availability Free of malicious code Security, safety Reliability	Capability Privacy, fraud Transaction integrity Uniformity	Intelligence Identity fraud, predatory behavior Honesty, confidentiality Dependability
Influences	Propensity Context Social Trust	Skepticism Relevance Recommended sources	Technology bias Task Recommended systems, advice	Risk aversion Transaction Buyer/seller ratings	Propensity to trust people plus technology bias Circumstances of relationship Reputations
Processes	Prediction Attribution Bonding Reputation Identification	Prior use of information Compare multiple documents Evoke emotional response Authority, certification, reviews, references Resonance with style, arguments, objectives	Prior technology use Mental model Emotionally charged experiences Technology news and reviews, knowledge bases Usefulness v. alienness	Transaction history Motivations Trade relationship Off-line reputation, online ratings Corporate image, values	Previous interactions Character Friendship, romance Word of mouth Shared values, group membership

addresses an *emotionally charged topic*, such as politics or religion, or it when appeals to the user's *aesthetics*.

The trustworthiness of information is reflected in the criteria used to evaluate information quality. *Competence* is reflected in the qualities of *accuracy*, *currency*, *coverage*, and *believability* [4, 50, 51, 53-57]. *Positive intentions* refers to the *objectivity* of the information [4, 56], the degree to which it is free from bias, deception, or distortion. *Ethics* is captured by the *validity* of the information [51, 54, 57], including issues such as the soundness of the methods used, the inclusion of verifiable data, and the appropriate citation of sources. The attribute of *predictability* refers to the *stability* of the

information over time, that it is not altered, deleted entirely, or moved to an unknown location [c.f., 4].

The three influences on trust – propensity to trust, context, and social trust – are realized in the following ways. The *propensity to trust* corresponds to the *skepticism* with which a person tends to approach new information. The notion of *context* is captured by the dimension of *relevance* in information quality research [50, 51, 54, 57], which measures the degree to which the information matches the requirements of the user. *Social trust* in information is enacted through *recommendations* [4].

Trust in information can develop through any of the five processes. *Prediction* may be used if one *revisits* a known and trusted body of information [58]. *Attribution* is implemented by *comparing information across multiple sources* [54, 57, 58], whereby repeated exposure to information is generalized to ascribe positive attributes to that information. *Bonding* captures the influence of features that *evoke an emotional response*, such as graphic design [55, 59] or aesthetic and affective aspects [57]. *Reputation* may be based on a variety of sources: the *authority* of its author or publisher [3, 53, 54]; *certification* [58] or *reviews* [4] provided by independent agencies, and *references* (hyperlinks or citations) from one source to another [60]. The process of *identification* reflects the degree to which the person's own beliefs *resonate with the style, arguments, or objectives* of the information.

3.3 Trust in information systems

Trust in information systems may conform to one of two perspectives: *interpersonal* trust is invoked with respect to the *specific systems* with which one directly interacts, while *societal* trust applies to *large networks of systems* that are not within one's immediate purview. The *trustee* is the computing system, i.e., *hardware and/or software*, and trust entails an expectation of *proper functioning*. The *willingness* to engage in trust arises because a person is free to choose an *alternate system* (e.g., a different computer or software package), or to select an entirely *different method* of performing an activity (e.g., placing an order by telephone rather than online).

Dependence on an information system arises when a person needs to transmit information (*communication*) or perform operations on data (*computation*). Risk is present because there is the potential for *systems failure*, in which case the user may lose valuable information.

Cognitive bases for trust are provided by *signals of system state* (e.g., a program is running rather than freezing or crashing, a network is operating at normal speed). *Affective* bases are rooted in a person's emotional attitude toward technology, i.e., whether the person is a *technophile* or a *technophobe*.

The trustworthiness of information systems has been the focus of research on trustworthy computing [1]. *Competence* is incorporated by the attributes of *correctness* (the system produces the proper outputs) and *availability* (the system is up and running whenever it is needed). *Positive intentions* requires that the system is *free of malicious code* (the system is not specifically designed to bring harm to the user). *Ethics* is incorporated by *safety* (the system does not produce harmful side effects) and *security* (the system contains adequate protection from intrusion). *Predictability* refers

to the *reliability* of the system in continuing to operate in the same fashion as it has previously.

The *propensity* to trust an information system corresponds to *technology bias*, the attitude a person holds toward computing technology in general. The *context* for a particular instance of trust is provided by the *task* that the person seeks to perform in the system. Finally, *social trust* is embodied in the *recommendations and advice* that people exchange regarding which systems to use.

The trust development process of *prediction* in information systems arises from a person's *prior use of the technology*. *Attribution* corresponds to a person's *mental model* of the inner workings of the system, i.e., the user's explanation for why the system behaves the way it does. *Bonding* occurs through *emotionally charged experiences* with technology; for example, if a systems failure leads to a catastrophic loss, it is likely to have a strong emotional impact on the user. *Reputation* about an information system is spread through *technology news and reviews* and technical support *knowledge bases* that provide users with information regarding others' experience with a system. *Identification* enhances trust if the user perceives the system as *useful* in achieving goals, but may degrade trust if the user perceives the system as *alien* to his or her way of thinking.

3.4 Trust in electronic commerce

Trust in electronic commerce is *interpersonal*, i.e., the *trustee* is a person or organization serving as a *transaction partner*. *Confidence* means that the trustor expects the trustee to *fulfill the contract* underlying the transaction. A person *willingly* enters into a commercial transaction and is always free to *seek other partners* with whom to do business.

Dependence and *risk* are present for both parties in an e-commerce transaction. The buyer is in need of *goods* that s/he may purchase from the seller, but assumes the risk of *nondelivery* of the goods. On the other hand, the seller is interested in acquiring *funds* from the buyer in exchange for the goods, but runs the risk of *nonpayment*.

The *cognitive* dimension of trust is based on *objective knowledge* of one's partner in a transaction, e.g., their reputation, available resources, level of service, or financial history. The *affective* dimension is based on an *established relationship* between trading partners, incorporating feelings of goodwill that have developed over time.

The *competence* aspect of trustworthiness in e-commerce is embodied in the *capability* of the partner to deliver the desired goods or payment. *Positive intentions* are represented by respect for *privacy* rights and a *lack of intent to commit fraud*. *Ethics* implies that the transaction partner takes appropriate steps to protect the *integrity* of

the transaction. *Predictability* refers to the *uniformity* of the trustee's behavior.

In e-commerce, the *propensity* to trust is represented by a person or company's general *tolerance for financial risk*. The *context* for trust is embodied within the specific *transaction* in which the parties are engaged. *Social trust* is propagated subjectively by sharing knowledge of *reputable buyers and sellers*, and objectively through *credit rating* and *market share*, indicating the willingness of others to engage in transactions with a person or company.

Trust in e-commerce may be enhanced through *prediction* based on a *history of transactions* with a buyer or seller. *Attribution* influences trust to the extent that the trustor ascribes positive *motivations* to the transaction partner. *Bonding* leads to trust as the *trade relationship* evolves between the two partners. The *reputations* of e-buyers and e-sellers are developed through their *off-line reputation* or *online ratings* of their performance. *Identification* contributes to trust when one relates with the *corporate image or values* of a potential transaction partner.

3.5 Trust in online relationships

Trust in online relationships also follows the *interpersonal* model of trust. The *trustee* is a person with whom one is engaged in *electronic conversation*, such as email, a chat room, or a newsgroup. The element of *confidence* is represented by the expectation that the trustee will act to *maintain the quality of the relationship*. The *willingness* to trust is indicated by the fact that the trustor has the option to *sever the relationship* if the trustee fails to behave as expected.

The nature of the *dependence* of the trustor on the trustee varies according to the purpose of the trustee in establishing the relationship. The trustee may be interested in obtaining *information*, striking up a *friendship*, or simply looking for a form of *entertainment*. Risk arises because the trustee may provide *faulty information*, or because the trustee may *abuse* the relationship (e.g., by disclosing embarrassing information or engaging in predatory behavior).

Trust in an online relationship may be affected by both the cognitive and the affective dimensions. *Cognitive* trust is rooted in the *credentials* of the trustee, while *affective* trust arises from the *emotional bond* in the relationship.

With respect to online relationships, several aspects of trustworthiness are particularly salient. *Competence* corresponds to the *intelligence* of the trustee, the ability of the trustee to provide valid and correct information as opposed to misinformation. The *positive intentions* aspect of trustworthiness may be violated by such things as *identity fraud*, i.e., deliberately deceiving someone about one's own identity, or *predatory behavior* such as

stalking or pedophilia. *Ethics* are reflected by *honesty* and the respect shown for *confidentiality*. *Predictability* refers to the *dependability* of the trustee.

The *propensity* to trust in an online relationship is influenced by the trustor's general *disposition to trust* as well as *technology bias*. The *context* for trust is embedded in the *circumstances of the relationship*: the type of relationship, how it was established, its history and quality. *Social trust* takes the form of *introductions and referrals*.

Trust in online relationships develops in similar fashion to face-to-face relationships. *Prediction* consists of anticipating the trustee's behavior based on *previous interactions*. *Attribution* becomes relevant as the trustor becomes familiar with the *character* of the trustee. *Bonding* occurs as the relationship evolves into *friendship* or *romance*. *Reputation* is generally spread through *word of mouth*. *Identification* develops trust if the trustor and trustee possess *shared values* or *membership in a common group*.

4. Conclusion

As interest in trust has arisen within the information systems community, researchers and system designers have focused primarily on two areas: technical performance of systems (reliability and security), and the ethics of web site sponsors in respecting the privacy of their users. However, a comprehensive framework for trust in electronic environments must also address questions of trust in the information available on the Internet and the relationships created through online communities.

The contribution of this paper is to develop a unified framework for trust in electronic environments. The first step was to perform a comprehensive review of the reference literature to develop a general model of trust. The second step was to identify the four electronic domains to which trust is relevant: information, information systems, electronic commerce, and online relationships. A specific model of trust in each domain was then developed by mapping elements of the domain to the general framework for trust.

The benefits of this unified framework for trust are twofold. First, it provides a common language for information systems researchers studying trust in different domains. Second, it provides solid theoretical grounding for the study of trust in information systems. It thus enables the information systems community to engage in a more formal and systematic study of trust.

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