ELSEVIER

On-line trust: concepts, evolving themes, a model

Cynthia L. Corritore[a,*], Beverly Kracher[a], Susan Wiedenbeck[b]

[a] College of Business Administration, Creighton University, Omaha, NE 68178, USA
[b] College of Information Science and Technology, Drexel University, Philadelphia, PA 19104, USA

Abstract

Trust is emerging as a key element of success in the on-line environment. Although considerable research on trust in the offline world has been performed, to date empirical study of on-line trust has been limited. This paper examines on-line trust, specifically trust between people and informational or transactional websites. It begins by analysing the definitions of trust in previous offline and on-line research. The relevant dimensions of trust for an on-line context are identified, and a definition of trust between people and informational or transactional websites is presented. We then turn to an examination of the causes of on-line trust. Relevant findings in the human–computer interaction literature are identified. A model of on-line trust between users and websites is presented. The model identifies three perceptual factors that impact on-line trust: perception of credibility, ease of use and risk. The model is discussed in detail and suggestions for future applications of the model are presented.
© 2003 Elsevier Science Ltd. All rights reserved.

Keywords: On-line trust; Trust; Internet trust; User trust; Website trust; Credibility; Risk; Ease of use

1. Introduction

As website and Internet technologies become more established and dependable, attention is turning to the factors that impact the success of websites. Key among these is trust (Cheskin Research and Studio Archetype/Sapient, 1999; Jarvenpaa et al., 1999; Marcella, 1999; Sisson, 2000). Currently trust is garnering the attention of those who employ websites to make available information, services or products to others (Cheskin Research and Studio Archetype/Sapient, 1999; Nielsen et al., 2000).

---

*Corresponding author.

E-mail addresses: cindy@creighton.edu (C.L. Corritore), bkracher@creighton.edu (B. Kracher), susan.wiedenbeck@cis.drexel.edu (S. Wiedenbeck).

This includes website designers, developers, consultants and marketers. Many of them claim that the presence of trust in person–website interactions is crucial to the ultimate success of the interaction. Such assertions seem reasonable, as they extend what we know about trust in the "real world", that is, that trust is an important social lubricant for cooperative behavior. While the importance of trust in the on-line world is accepted, there is limited theoretical support for its role in on-line interactions. Fortunately, extensive research has been conducted on trust in the offline world. It is on this body of work that we can begin to build a theory of on-line trust.

Trust and trust relationships in the offline world have been a topic of research in many disciplines since the 1950s (Corritore et al., 2001). Streams of research on trust can be found in the fields of philosophy, sociology, psychology, management, marketing, ergonomics, human–computer interaction (HCI), industrial psychology and electronic commerce (e-commerce). When one considers these multiple disciplines together, the literature on trust is quite extensive. However, although trust has been studied in a variety of disciplines, each of these disciplines has produced its own concepts, definitions and findings. In fact, even within a given field, there is often a lack of agreement and focus of effort (Lewicki and Bunker, 1995). The outcome is a multi-dimensional family of trust concepts, each with a unique focus.

Despite the eclectic nature of trust research, researchers from every discipline do acknowledge the value of trust. Trust enables people to live in risky and uncertain situations (Deutsch, 1962; Mayer et al., 1995). It provides the means to decrease complexity in a complex world by reducing the number of options one has to consider in a given situation (Luhmann, 1979; Barber, 1983; Lewis and Weigert, 1985). Trust can also be viewed as a kind of social capital that makes coordination and cooperation between people possible (Putnam, 1995; Misztal, 1996). In the world of business, trust is key to successful transactions and long-term relationships (Koehn, 1996). It has even been proposed as an alternative form of control in place of price and authority (Creed and Miles, 1996).

We propose that research on on-line trust can build on the body of work examining trust in the offline world. Many offline trust findings appear to be applicable to an on-line environment, since offline and on-line situations have much in common. One obvious commonality is exchange. In both settings, risk, fear, complexity and costs restrict exchange. However, cooperation and coordination enhance exchange. Furthermore, the social rules of interaction between people appear to function in both the offline and on-line environment. Thus, offline trust research is relevant to on-line trust. Since trust can mitigate risk, fear and complexity in the offline environment, it is likely that it can do the same in the on-line environment. Likewise, since trust is the social capital that can create cooperation and coordination in the offline environment, it probably can do the same in the on-line environment. Without trust, it is conceivable that a robust, interactive on-line environment would not be possible, just as it would not be in the offline world.

In this paper we explore the definitional and empirical aspects of on-line trust by drawing on the offline trust literature from several fields. First, we define the form of

on-line trust that is the object of our investigation. Our efforts in this paper focus on trust related to informational and transactional websites. Second, we survey the HCI literature on trust. Last, we develop a causal on-line trust model that presumes our definition and can serve as a framework for posing empirically testable research questions.

2. Definition and dimensions of on-line trust

In order to identify the antecedents of on-line trust needed to develop a model, we first have to define on-line trust. While this may appear to be a relatively straightforward task, defining on-line trust is inherently difficult (Husted, 1998).

2.1. On-line trust relationships

We begin our exploration of on-line trust by discussing the several combinations of trustor/trustee relationships occurring both offline and on-line. Psychologists, sociologists and others have discussed several forms of trustor/trustee relationships as they occur in the offline world (Deutsch, 1958, 1960, 1962; Rotter, 1967, 1971, 1980; Baier, 1986; Good, 1988; Giddens, 1990; Macy and Skvoretz, 1998). Trustors and trustees, that is, objects of trust, can be individual people or groups. Groups may be families, neighbors, organizations or even societies.

In the on-line world, there are two approaches to defining relationships between trustors and objects of trust. Computer-mediated communication researchers study individual-to-individual trust relationships mediated through technology (Olson and Olson, 2000a, b). In contrast, other researchers focus on technology as the object of trust. We propose that websites can be the objects of trust. The traditional literature in psychology and sociology does not include discussion of technologies as objects of trust. However, other fields have addressed this issue. For example, researchers in the field of intelligent agents have looked at trust between software agents, in which agents can be objects of trust (Sycara and Lewis, 1998; Wong and Sycara, 1999). Reeves and Nass (1996) have examined how people treat new technologies as real people, and by extension, as objects of trust. They and their collaborators (Nass et al., 1994, 1995, 1996; Reeves and Nass, 1996) have conducted a series of experiments in which they have studied participants' responses to computers. They found that people do enter into relationships with computers, websites and other new media. Similarly, their findings indicate that people appear to respond to these technologies based on the rules that apply to social relationships. In their studies, people were polite or rude to their computers, identified them as assertive, timid or helpful, and had physical responses to them. This body of work also points to another issue, that of moral agency. Philosophers define a moral agent as something that has intentionality and free will (Solomon and Flores, 2001). They argue that since only moral agents can be trustworthy by intentionally and freely refraining from harm or doing good, only moral agents can be the objects of trust. Consequently, technologies cannot be the objects of trust because technologies do

not have intentionality. However, the work done by Reeves, Nass and their collaborators indicates that, even though computers and software are not moral agents since they do not have intentionality and free will, these technologies are social actors in the sense that they have a social presence. It is to this social presence that people respond. Computers are participants in our social relationships. They do not have to be moral agents in order to be trusted. They merely have to be social actors.

2.2. On-line trust defined

As suggested above, on-line trust can emerge in numerous trustor/trustee relationships. However, it is not obvious that all forms of on-line trust relationships can be understood through one definition. Therefore, we restrict our definition of on-line trust to one form of relationship, namely, the trust that occurs for an individual person towards a specific transactional or informational website. The object of trust in our model is the website. The term website can be used to refer to the underlying Internet technology, the interactive user experience with the website, and/or the people behind the website. We see the website as having features of both a salesperson and a storefront in the offline world.

In order to limit the scope of our research, we do not address Internet technologies such as chat, email, instant messenger, educational or gaming websites. They tend to be primarily facilitating person-to-person communication via technology rather than focusing on websites as the object of trust. In addition, while the levels and types of trust in informational and transactional websites may differ, we feel that they are similar because both address trust in a context of acquisition: of information or of products.

Since our understanding of on-line trust builds on offline definitions of trust, we provide an approach to on-line trust akin to that in the offline literature (Rempel et al., 1985; Lewicki and Bunker, 1995, 1996). We state our definition of on-line trust and follow with an elucidation of its form and components. Our definition of on-line trust for the individual person towards a specific transactional or informational website is:

an attitude of confident expectation in an online situation of risk that one's vulnerabilities will not be exploited.

Implicit in our understanding of on-line trust, we distinguish developmental stages, as proposed by others (Lewicki and Bunker, 1995, 1996). At the most rudimentary level, we posit that a trustor acts in a trusting manner in a situation of risk in which there is not much at stake (e.g. much money, very personal information) and in which there is a recognized system of rewards and punishments (e.g. Verisign trust seal). At an intermediate level, a trustor has some experience and familiarity with a website, and so is in a situation of risk in which such knowledge can be used to predict behavior and thus assign trust. Last is the most developed level, which is the deepest level of trust. At this level, a trustor expects that his or her interests will be respected by the website and that he/she does not have to calculate the level of

risk anymore. Such calculation can be based on deterrence, as in the rudimentary level, or on predictability and knowledge, as in the intermediate level. In some cases the most developed level includes a shared identification of the user with the website.

2.3. What on-line trust is not

In order to understand trust, we must clarify what trust is not. There are many related concepts that are often confused with trust. Trust is not the same as *trustworthiness*, a distinction that is not always made clear in the literature (Blois, 1999). Trust is an act of a trustor. A person places his or her trust in some object. Regardless of whether the person's trust proves to be well placed or not, trust emanates from a person. In contrast, trustworthiness is a characteristic of someone or something that is the object of trust. Although trust and trustworthiness are distinct, there is a logical link between them (Solomon and Flores, 2001). This is illustrated by the statement, "I trust in [an object] because it exhibits characteristics that signal its trustworthiness to me".

Likewise, cooperation and faith are not the same as trust. *Cooperation* is often used synonymously with trust by game theorists (Deutsch, 1962). However, cooperation is either a cause or a manifestation of trust rather than trust itself (Good, 1988; Mayer et al., 1995). In fact, cooperation prompts trust, and likewise trust can produce cooperation. Trust is also not the same as *faith*. Though we may commonly say "I have faith in you" to mean "I trust you", faith is the opposite of reason. But trust encompasses reason because one makes a strategic decision to take a risk in a condition of uncertainty. Faith, on the other hand, involves taking a leap that is not fully supported by reason (Macy and Skvoretz, 1998).

Competence and trust have also not been clearly differentiated. We suggest that competence is only one of many cognitive cues for trust (Dunn, 2000). That is, while people form trust based, in part, on their perception of the competence of the object to be trusted, trust goes beyond a belief in the competence of the object. Trust has also been used to mean *credibility*. For example, in the phrase "trust in information", a person really means that the information is credible or believable (Fogg and Tseng, 1999). Trust is also confused with *reliance*. However, it is possible to rely on a person without trusting him (Blois, 1999).

2.4. Key conditions of on-line trust

The key concepts of our definition are risk, vulnerability, expectation, confidence and exploitation.

Lewis and Weigert (1985) and Deutsch (1962) focus on the concept of *risk* in their definitions of trust. For example, Deutsch defines trust as "the willingness of an individual to behave in a manner that assumes another party will behave in accordance with expectations in a risky situation". Likewise, Mayer et al. (1995) state that there is no need for trust if there is no risk in a situation. Risk, therefore, is

a key element of our definition, and we believe it is particularly salient in the on-line environment.

Deutsch (1962), Rotter (1971) and Baier (1986) focus on the attitude of *expectation* in their definition of trust. For example, Rotter defines trust as "an expectancy held by an individual or group that the word, promise, verbal or written statement of another individual or group can be relied on". Sabel (1993) and others (Deutsch, 1958; Lewicki and Bunker, 1995) see trust as a kind of *confidence*. They state that trust is "the mutual confidence that no party to an exchange will exploit another's vulnerabilities". We incorporate these two concepts in our definition and so speak of on-line trust as involving an attitude of confident expectation. It should be understood that an attitude of confident expectation is a psychological state of a trustor. Attitude includes both cognitive and affective components. So we argue, along with others (Lewis and Weigert, 1985; Brenkert, 1998) that both cognition and affect are aspects of trust. Confidence is both cognitive and affective, and necessary for trust (Luhmann, 1988; Muir, 1994). Similarly, expectation has a strong cognitive component of predictability as well as a hopeful future-oriented component (Shneiderman, 2000), which is affective.

While expectation, confidence and risk are essential components of trust, they alone are not sufficient for offline trust (Luhmann, 1988; Muir, 1994) nor, by extension, for on-line trust. *Vulnerability*, with the concommittent possibility of *exploitation*, must also be included in a definition of trust (Deutsch, 1962; Zand, 1972; Mayer et al., 1995). Vulnerability means that the trustor must be exposed in some way. In the on-line environment, the trustor could be exposed due to a lack of knowledge or expertise, or the inability to acquire goods or services without the assistance of others. The perception of possible exploitation of one's vulnerability must also be present. Sabel (1993) recognizes this in his definition of trust as "the...confidence that no party to an exchange will exploit another's vulnerabilities". Trust encompasses the perception that a person has vulnerabilities and that those vulnerabilities could be breached or capitalized on. For example, a website could include deceptive or biased information or falsely promise the delivery of goods or the security of personal information.

2.5. Dimensions of on-line trust

Offline trust research shows that trust is multi-dimensional and can vary with respect to generality, kind, degree, stage and level. This is likely also true of on-line trust. To clarify the multi-dimensional nature of on-line trust we discuss each dimension and its instantiation in offline and on-line contexts. We identify which aspects of each dimension are relevant for our model of on-line trust.

2.5.1. Generality
Generality refers to the breadth of the trust, and extends from general to specific trust (Rotter, 1971). At the level of the individual trustor, a person can have overall trust *in* another person, group or technology (general trust) or trust *that* a person, group or technology will perform a particular way in a particular situation (specific

trust). In the offline world, general trust occurs when I trust doctors, as a group, to have the medical skills and abilities necessary to treat my physical ailments. Specific trust is employed when I trust my primary care physician to carry out a routine physical examination but not to perform heart surgery. In the on-line world, general trust occurs when I trust government websites to provide timely, trustworthy information. I have specific trust in epa.gov when I trust it to give me accurate data on urban recycling information but not on fast breaking news on bioengineering. In this paper we are ultimately interested in specific trust, since we focus on the trust an individual has for a particular transactional or informational website.

2.5.2. Kinds

One classic differentiation in the offline literature is between slow and swift trust (Meyerson et al., 1996). Slow trust occurs over time and is the kind of trust typically seen in long-term working relationships. Swift trust occurs when relationships are quickly created and then quickly cease to exist. The trust that exists between individuals in temporary workgroups in the offline world is a prime example of swift trust. In the on-line world, I acquire slow trust over time by return visits to Ebay.com. I have swift trust when I give out my credit card number to purchase a wall poster on-line after a 3-min search on barewalls.com, a website I was completely unfamiliar with before the purchase. In addition, it is likely that swift trust tends to apply to specific trust while slow trust is required for general trust. However, since an individual can have swift, specific trust for a particular website or acquire slow, general trust for a particular website, both are relevant to our on-line trust model.

Lewis and Weigert (1985) propose two other kinds of trust: cognitive and emotional trust. A trustor can have cognitive trust, which is ''good rational reasons why the object of trust merits trust'' (p. 972) or emotional trust that is motivated by strong positive feelings towards that which is trusted. Lewis and Weigert argue that cognitive trust is more typical at the macro level in large settings or societies whereas emotional trust is more typical in primary, close-knit groups or situations. However, McAllister (1995) shows that both kinds of trust occur in interpersonal relationships. Indeed, cognitive trust and emotional trust can exist at the same time for the same person(s) towards the same object. Thus, it is best to see cognitive and emotional trust on a continuum (Picard, 2002). At one end, pure cognitive trust can exist without emotional trust, and at the other end, pure emotional trust can exist without cognition. Typically, however, cognition and emotion are intertwined (Zajonc, 1980). As an example, in the offline world an individual's trust in the New Yorker magazine is based on both cognition and emotion. While the New Yorker has predictably high quality stories and reliable movie reviews, it also has humorous cartoons, and a consistently beautiful layout. An individual who trusts the New Yorker magazine may even appreciates the feel of the pages on his fingers. The individual's trust has both cognitive and emotional elements. Similar examples occur in the on-line world. An individual's trust in gardnersnet.com, for example, is facilitated by the reliable information about plants and planting techniques as well as the rich green background scheme on the website, and the colorful pictures of new

varieties of flowers and vegetables. For our model, we are interested in trust that has both cognitive and emotional elements.

2.5.3. Degrees

"Degrees of trust" refers to the depth of trust that an individual has. Degrees of trust run from basic to guarded to extended (Brenkert, 1998). Basic trust is an underlying, background form of trust that is a precondition of social life. In the offline world, it includes the trust an individual has that his neighborhood will be as safe tomorrow as it is today. Guarded trust is trust protected by formal contracts, agreements and promises. It is limited in time and assumes competence of the object of trust to carry out a contract, agreement or promise. For example, in the offline world I have guarded trust in the painter that I do not know but hired to paint my house. Extended trust is trust based on openness. It is given in relationships that are so deep that formal contracts are unnecessary. In the offline world, good friends give extended trust. Firms in strategic alliances, who open up their books for each other, give extended trust. In the on-line world, basic, guarded and extended trust also exist. I must have basic trust in order to participate in on-line transactions. This would include trust in the underlying technologies such as computers and networks. I have guarded trust when I use my credit card to purchase a used book from an unknown seller on Amazon.com's used booksellers network. I have extended trust when I enter into a deeper relationship with amazon.com by sharing my reading tastes, setting up a shopping profile or leaving my credit card number on their system. For our model, we are interested in all of the degrees of trust.

2.5.4. Stages

Trust is also characterized by its stage of development. Jarvenpaa et al. (1999) differentiate between the initial development of trust and mature trust. In the offline world I have initial trust in an automobile repair company when I take my car in for the first time. But over time, I develop mature trust in the company after I am consistently satisfied with the work that is done. In the on-line world, I have initial trust in buyrite.com, an on-line electronics store, when I place my first order. I have mature trust after I have had many transactions with the on-line company and I am consistently satisfied with their products and services.

Lewicki and Bunker (1996) promote a developmental view of trust that incorporates the previously described guarded and extended degrees of trust as well as the initial and mature stages of trust. They propose that trust is developmental, and moves from a deterrence-based, to a knowledge-based, to a shared identification-based trust. Deterrence-based is defined as an initial trust that is guarded by contracts and the threat of punishment. Knowledge-based trust is an intermediate stage of trust that is characterized by knowledge of the object of trust and an ability to predict the behavior of the object of trust. Shared identification-based trust is a mature trust that is extended without the need for formal contacts or agreements. These three stages of trust exist in the offline and the on-line environments. In the offline world, deterrence-based trust occurs when I am assured that the clothes I leave at the dry cleaners will be cleaned, pressed and returned to me per my

instructions because I have a ticket that proves my instructions and ownership. Knowledge-based trust occurs when I have frequented the same dry cleaners several times. They have become familiar with me and my dry cleaning needs, I know and like the quality of their work, and I no longer feel the need to retain my receipt to ensure that my clothes will be returned. Lastly, trust has evolved into shared-identification based trust when I am confident that my dry cleaners shares my understanding of good business relationships. I no longer feel the need to specify in detail my every cleaning need because the cleaner knows my preferences. I do not feel that my cleaner will take advantage of the fact that I forgot a coupon and charge me a higher cleaning price. Our business relationship has become friendly and we communicate our respect in nonverbal and implicit ways. In the on-line world, deterrence-based trust occurs when I place my first order for airline tickets on cheaptickets.com, an airline reservation service. My trust is grounded in the belief that I can rely on my credit card company to refund my purchase amount if the purchase is not satisfactory. Knowledge-based trust describes the trust I develop after dealing with cheaptickets.com for a length of time. After several transactions I can predict with reasonable certainty how the website will act in response to my inputs. Lastly, trust for cheaptickets.com can grow and deepen, at which point it would be called shared identification-based trust. There is a shared identification that respect and not harming are essential to business. At this stage, my trust in cheaptickets.com includes the attitude that it will not take advantage of my incomplete knowledge of airline flights and prices and will give me what they say is the cheapest airline ticket.

3. On-line trust in the HCI literature

Recently, researchers in HCI and human factors have begun to study trust in an on-line context. Some researchers are focusing on the effect of computer errors on trust. Others are examining the cues that may affect trust. These cues range from design and interface elements, to perceived website credibility, to the extent to which the technology is perceived and responded to as a social actor. In addition, research on reputation systems has shown an effect on trust. Finally, HCI research is examining the role of trust in computer-mediated communication. We will give an overview of each of these streams of research in turn, with the exception of computer-mediated communication, which is outside the scope of this discussion.

3.1. "Lifecycle" of trust

Research in ergonomics has examined how trust is established, maintained, lost and regained in human–machine systems. Trust is seen as an intervening variable that mediates users' behavior with computers (Muir, 1994). Muir and Moray (1996) argue that trust in automated machines is based mostly on users' perceptions of the expertise of the machine, i.e. the extent to which the automation performs its function properly.

Empirical studies of trust in automated machines show that performance and trust increase following a similar learning curve as long as there are no errors (Lee and Moray, 1992). However, machine errors have a strong effect on trust. The magnitude of a error is an important factor in loss of trust (Lee and Moray, 1992; Muir and Moray, 1996; Kantowitz et al., 1997). Lee and Moray (1992) found that errors lead to a precipitous drop in trust roughly proportional to the magnitude of the error. If the error is not repeated, performance recovers immediately, but recovery of trust to prior levels occurs over a longer time. An accumulation of small errors also decreases trust (Lee and Moray, 1992; Muir and Moray, 1996) and these small errors appear to have a more severe and long-lasting impact on trust than a single large error. Recovery of trust can occur even when small errors continue, if the user is able to understand and compensate for the errors, but trust may not be restored to its level prior to the series of errors (Lee and Moray, 1992; Muir and Moray, 1996). Errors encountered in one function of an automated system can lead to distrust of related functions, but do not necessarily generalize to an entire system (Muir and Moray, 1996).

3.2. When do people trust computers?

By definition, trust is necessary only in situations of vulnerability and risk. Risk arises from interactions of the user, the system and the environment. Users who have low knowledge or self-confidence of the situation at hand tend to trust a computer system because it provides expertise that the user lacks (Lee and Moray, 1992; Hankowski et al., 1994; Kantowitz et al., 1997). Conversely, when users are familiar and self-confident about a situation they have a higher standard for acceptance of advice and, therefore, a higher threshold for trust (Kantowitz et al., 1997). Users have also been shown to trust a computer if they have tried and failed to solve a problem on their own (Waern et al., 1992; Waern and Ramberg, 1996). Generally, trust in a computer system declines when computer errors occur (Lee and Moray, 1992; Muir and Moray, 1996; Kantowitz et al., 1997). However, even in the face of computer errors, a user may continue to trust a computer system in certain situations, for example, if workload is high (Lee, 1991) or if the errors are predictable (Muir and Moray, 1996).

3.3. Trust cues

Work on trust cues focuses on the cues that convey trustworthiness to users of websites. Aspects of the interface design can give cues about trustworthiness. Cues that have been found to have an impact on trustworthiness perceptions include ease of navigation (Cheskin Research and Studio Archetype/Sapient, 1999; Nielsen et al., 2000), good use of visual design elements (Kim and Moon, 1997), professional images of products (Nielsen et al., 2000), freedom from small grammatical and typographical errors (Nielsen et al., 2000; Fogg et al., 2001b), an overall professional look of the website (Cheskin Research and Studio Archetype/Sapient, 1999; Nielsen et al., 2000; Fogg et al., 2001b), ease of searching (Nielsen et al., 2000) and ease of

carrying out transactions (Lohse and Spiller, 1998; Nielsen et al., 2000). In fact, Stanford et al. (2002) found that consumers tend to rely heavily on website design when assessing websites, in contrast to experts who focused on factors related to information quality. Easy access to live customer representatives via a website is also a positive cue (Nielsen et al., 2000). However, research on the use of images of website personnel is contradictory, with some studies finding such images to be a positive cue (Nielsen et al., 2000; Fogg et al., 2001a; Steinbrück et al., 2002), and others finding them to be neutral or negative cues (Riegelsberger and Sasse, 2001). The value of third-party trust logos and seals of approval is not clear. In one e-commerce study (Nielsen et al., 2000) users appeared to not notice or not care about them.

Information content also provides cues. Providing content that is appropriate and useful to the target audience has been identified as a strong cue to trustworthiness (Shelat and Egger, 2002). Further, it has been found that mixing advertisements and content is a negative cue (Fogg et al., 2001b; Jenkins et al., 2003), as are banner ads for products of low reputability (Fogg et al., 2001a), and impolite and non-constructive error messages (Nielsen et al., 2000). Poor website maintenance also provides negative cues to a user. Such cues include broken links, outdated information, missing images and download problems such as long download times (Nielsen et al., 2000). On the other hand, conveying expertise, providing comprehensive information, and projecting honesty, lack of bias and shared values between the website and the user provide positive cues (Lee et al., 2000; Nielsen et al., 2000; Fogg et al., 2001b). In electronic commerce not just the website but the entire shopping experience, including company information, range of merchandise, branding, promotions, security, fulfillment and customer service, affect the user's trust of a website (Lohse and Spiller, 1998; Cheskin Research and Studio Archetype/ Sapient, 1999; Nielsen et al., 2000; Fogg et al., 2001b; Riegelsberger and Sasse, 2001).

3.4. Beyond trust cues

Reputation systems, also known as recommender systems, collaborative filtering or social navigation, provide a mechanism for judging who is trustworthy when parties lack a personal history of past experience with each other (Resnick and Varian, 1997; Dieberger et al., 2000; Resnick et al., 2000). In commercial transactions, buyers and sellers can rate each other's performance. In information seeking, receivers of information can rate the value of information provided by another. The aggregated ratings provide a meaningful history that can be used by other people to judge the risk of a transaction or the value of information from a given provider. Recent research has suggested that trust in an automated recommender can be increased by a conversational interface and disclosure of what the recommender system knows about the user (Zimmerman and Kurapati, 2002). Reputation systems face several challenges. To be successful users must give feedback on their interactions, and this may require incentives (Resnick and Varian, 1997; Resnick et al., 2000). Also, people tend not to give negative feedback except in

the case of terrible performance (Resnick et al., 2000; Resnick and Zeckhauser, 2001). Reputation systems may also face the problem of ratings retaliation by people who receive poor ratings, as well as the problem of connivance to artificially inflate reputations (Resnick et al., 2000; Resnick and Zeckhauser, 2001). Pseudonyms complicate the picture by allowing participants to effectively erase their prior history.

3.5. On-line credibility

Fogg and Tseng (1999) have argued that credibility is an important factor in users' perceptions of on-line environments (Fogg and Tseng, 1999). They say that credibility is synonym for believability. The further propose that trustworthiness is a key component of credibility, rather than credibility being a cue for trustworthiness. By contrast, we see credibility as a cue for trustworthiness. That is, if an object has credibility (e.g. the author is a recognized expert), that credibility is a positive signal of the trustworthiness of the object. Hence, credibility provides a reason to trust but is not trust itself.

4. Toward a causal model of on-line trust

We have developed a model of on-line trust that can be used to study an individual person's trust in a specific transactional or informational website. Our model is grounded in our definition, incorporates the dimensions of trust we have discussed, namely generality, kind, degrees and stages, and builds upon previous research. In this section we will offer an overview of the important aspects of our model of on-line trust, then present the model along with a discussion of each of its elements, illustrated by examples.

The model purposely describes on-line trust at an abstract rather than an operational level so that it can be potentially useful in a wide variety of contexts. For example, the model does not focus on one particular kind of on-line trust, but is applicable to both swift and slow trust. Furthermore, the model is not stage specific and thus applies to all development stages. Likewise, the model is also applicable to different degrees of trust, i.e. guarded as well as extended. However, we expect that the influence of the constructs of the model will be different as the dimensions of trust vary (Fig. 1).

The model has not been designed to cover all possible scenarios related to humans interacting with Internet technologies, which we believe is a much larger issue. Thus, our model focuses on on-line trust as it relates to transactional and informational websites, but not to email, chat, instant messaging, entertainment (including on-line gaming) or on-line educational courses. This basically reflects our focus on situations in which the trust is primarily person-to-website rather than person-to-person communication mediated through technology. It is also consistent with our interest in specific trust in a website rather than general trust in the Internet as a medium. In addition, the model focuses on factors that impact trust in a website, but not on
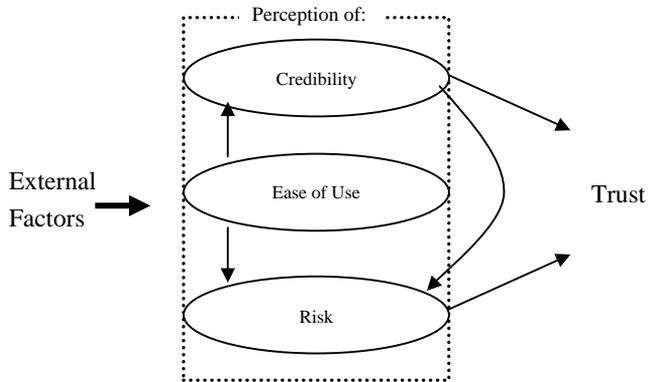
Fig. 1. Model of on-line trust.

behaviors that such trust might make possible. Consequently, the final outcome in the model is an attitude and not a behavior.

4.1. Model elements

The model identifies two main categories of factors that can impact an individual's degree of trust in a website. These are external factors that exist explicitly or implicitly in a particular trust context and the individual trustor's perception of these factors. We propose that the perception of three factors, i.e. credibility, ease of use and risk, impact a decision to trust in an on-line environment. We examine each of these in turn below.

4.1.1. External factors
External factors are aspects of the environment, both physical and psychological, surrounding a specific on-line trust situation. These factors, represented by a square in the model, include characteristics of the trustor, the object of trust (the website) and the situation. Some examples of external factors related to the trustor are the trustor's general propensity to trust, prior experience with a similar situation/object of trust, and experience with Web technologies (Kee and Knox, 1970; Rotter, 1971; Shapiro et al., 1992; Fogg et al., 2001a; Lee and Turban, 2001; McKnight and Chervany, 2002). Possible external factors related to the object of trust (the website) would include navigational architecture, interface design elements, information content accuracy, seals of approval from organizations such as VeriSign or BBBOn-line, branding and reputation (Ganesan, 1994; Doney and Cannon, 1997; Kim and Moon, 1997; Cheskin Research and Studio Archetype/Sapient, 1999; Marcella, 1999; Milne and Boza, 1999; Nielsen et al., 2000; Fogg et al., 2001a, b). Finally, possible external factors inherent in a trust situation could include the level of risk or the control the user has in interacting with the website. Of the existing studies of on-line trust, most have focused on external factors related to characteristics of the website

interface such as the navigational scheme and typographical errors (Cheskin Research and Studio Archetype/Sapient, 1999; Nielsen et al., 2000; Fogg et al., 2001b). Others have emphasized external factors relating to the structure of the Internet (Tan and Thoen, 2001; McKnight and Chervany, 2002).

4.2. Perceived factors

A key premise of our model is that on-line trust is a perceptual experience, an assertion supported by Muir and Moray (1996) and others (Deutsch, 1958; Kee and Knox, 1970; Rotter, 1980; Giddens, 1990). External factors impact an individual's trust in a website via the trustor's perception of the factors. The perception of external factors then fall into three groups: credibility, ease of use and risk. These three factors are based on both existing offline and on-line trust literature, although most research has not explicitly differentiated between external factors and the perception of these factors by trustors. By including both external factors and the perceived factors the model is able to provide for individual differences in trust, since external factors can be perceived differently by different individuals in a given situation.

4.2.1. Perceived factor 1: credibility

We have identified four dimensions of credibility: honesty, expertise, predictability and reputation. These have been repeatedly identified as important characteristics of an object of trust in previous research of both on-line and offline trust (for example, Deutsch, 1958; Kee and Knox, 1970; Rotter, 1971; Barber, 1983; Dasgupta, 1988; Giddens, 1990; Lewicki and Bunker, 1995; Lee et al., 2000; Nielsen et al., 2000; Fogg et al., 2001a, b; McKnight and Chervany, 2002). Fogg and Tseng (1999) define credibility using the constructs of expertise and trustworthiness. They define trustworthiness as synonymous with honesty. It is characterized by well-intentioned, truthful and unbiased actions. They see expertise as typified by knowledge, experience and competence. Ganesan (1994) identified reputation as a characteristic of credibility. Reputation of a website captures the quality of recognized past performance. Credibility also involves predictability. The offline trust research suggests that predictability is a trustor's expectation that an object of trust will act consistently based on past experience (Kee and Knox, 1970; Rotter, 1971; Barney and Hansen, 1994; Fogg et al., 2001a). When an object of trust acts in a predictable manner, credibility is lent to that object. Note that our model distinguishes between predictability (as a dimension of credibility) and consistency of an interface. In our model interface consistency, such as consistent look and feel of pages, navigation and terminology, reflects ease of use. In contrast, examples of predictability as credibility include the expectation that future transactions will be successfully completed or that information will continue to be of high quality.

As an example, consider a patient newly diagnosed with osteoporosis. The patient wants to obtain more information about her condition and possible treatment. She accesses the website of the Mayo Clinic, a well-known medical center. She has used the website previously, and is returning to it as a result of her perception of its strong

reputation in the medical field. The information on the website has proven to be accurate, truthful and unbiased in all of her previous visits. This holds true for her current visit as well. The website has many sections on osteoporosis that are clearly based on extensive osteoporosis research. As a result, she has strong trust in the website and the information she obtains from it.

4.2.2. Perceived factor 2: ease of use

Perception of ease of use reflects how simple the website is to use. Ease of use is a construct in the Technology Acceptance Model (Davis, 1989; Davis et al., 1989). The Technology Acceptance Model has been used extensively to predict adoption of technologies (e.g. Davis, 1989; Davis et al., 1989; Segars and Grover, 1993; Davis and Venkatesh, 1996; Gefen and Straub, 1997; Igbaria et al., 1997; Wiedenbeck and Davis, 1997). Davis's (1989) definition of ease of use focuses on how easily users can achieve their goals using a computer. Other studies have also indicated that ease of use impacts on-line trust. For example, ease of searching, transaction interaction, broken links and navigation have all been associated with changes in on-line trust (Igbaria et al., 1997; Lohse and Spiller, 1998; Cheskin Research and Studio Archetype/Sapient, 1999, 2000; Nielsen et al., 2000).

We incorporate Davis's Perceived Ease of Use construct in our model. To illustrate its use in this context, consider a user who is seeking information on how to install a false ceiling in his basement. He finds a home repair website that he has not visited before. He notices that home repair topics are presented in a clear, easy to understand manner, and can be quickly accessed from the home page of the website. The website is uncluttered by needless graphics, and has a simple design and color scheme. There are no moving graphics to distract the user. He easily and quickly finds information on false ceiling installation, and is delighted to also find several insightful comments left by other users in an attached comments section about their basement ceiling installation experiences. As a result of the ease of use, he has an increased likelihood of developing trust in the website and using the information to install his basement ceiling.

4.2.3. Perceived factor 3: risk

Risk has been identified as a significant factor in trust in the offline trust literature (Deutsch, 1962; Luhmann, 1988; Giddens, 1990; Snijders and Keren, 1999; Onyz and Bullen, 2000). Risk is the likelihood of an undesirable outcome (Deutsch, 1958). Users' perceptions of risk are closely related to their trust (Mayer et al., 1995; Jarvenpaa and Leidner, 1999; Pavlou, 2001). The body of work on risk has also shown that control reduces risk and that risk is higher in the absence of control (Lewicki and Bunker, 1996). Since total control defines a situation in which trust is unnecessary, the higher the user's perception of control, the less the user has a need to trust. The reverse is true of risk. Of the three perceived factors in our model, risk is the least studied in the on-line literature. However, we include it as the third dimension in our model based on its pervasiveness as a key factor in trust in the offline trust literature, as well as indications in the on-line literature of its importance in on-line trust. For example, work on on-line reputation systems indicates that

reputation systems may reduce the perceived risk of a purchase by providing historical or missing experiential information about a seller or a product, thus providing a potential mechanism to increase trust (Resnick and Varian, 1997; Dieberger et al., 2000; Resnick et al., 2000).

An example illustrating the role of risk in on-line trust is a user attempting to purchase a new computer monitor in a particular price range. She has very little knowledge of monitor characteristics or prices. She finds a website that sells monitors, but is unfamiliar with the company. In fact, no one she knows personally has purchased from the website. In addition, she cannot find a return policy on the website, and discovers that the company has no offline presence; it only exists as an on-line company. She has never purchased anything on-line that costs over 20 dollars. As a result, she views the purchase as risky and feels she has little control over the situation; she feels at the mercy of the website. In this context, the user's perception of risk is high and the perception of control is low. Consequently, her trust in the website is minimal.

4.3. Relationships of model elements

Our model of on-line trust contains relationships among external factors, perceived factors and trust. Trust is a complex, multi-dimensional concept, which is reflected by the relationships among the factors in our model. There are three types of these relationships in our model, for a total of six relationships.

- External factors to perceived factors.
- Perceived factors to perceived factors.
- Perceived factors to trust.

A lack of previous research clarifying these relationships has led us to hypothesize what they might be. We have consequently identified what we believe are reasonable relationships, which we shall present and discuss below.

External factors can impact the three perceived factors directly. Direct effects are also shown between perception of credibility and trust as well as between perception of risk and trust.

The remaining three relationships are between perceived factors. The relationship between perceived ease of use and credibility has not been studied in the offline or on-line trust literature. However, it is reasonable to think that a user who finds a website easy to use will tend to have a more positive perception of that website's credibility. This effect is illustrated by a user who finds it very easy to book a flight on an on-line airline reservation system. His goal in going to the website is to book a flight, and he succeeds with little effort. We predict that this ease of use will influence his perception of the credibility of the website, i.e. he will be more likely to find the website to be predictable and honest. Another aspect of this relationship is that a user who finds a website easy to use will have a lower cognitive load and so have more cognitive resources available to attend to credibility cues. Such cues might not

be noticed if much of the user's cognitive resources are being dedicated to interacting with a hard to use website.

Our model also specifies that perception of credibility affects perception of risk. This relationship is inverse. That is, if a user has a perception of high credibility, that user will perceive a lower risk in interacting with the website. To our knowledge, this relationship has not been studied with respect to on-line trust. As an example, consider a nurse accessing a website to obtain information about a new high blood pressure treatment. She has expert knowledge of disease states, medications and treatment regimes in general. She knows that the website has a good reputation in the medical community and recognizes that the information being presented is accurate and honest. So she perceives the website as having high credibility. It is likely that she subsequently perceives low risk in trusting treatment information from the website.

We also predict a relationship between perceived ease of use and perceived risk. Ease of use may signal some higher degree of control over the website environment, and so may have a direct effect on perceived risk. This is consistent with others who associate usability with user control of technology (Maes et al., 1997). For example, consider a user transferring money between two accounts on a banking website. If the site has strong ease of use (i.e. good navigation and feedback), the user has a greater sense of control of the interactive session. In addition, good feedback on the status of the transfer further minimizes feelings of uncertainty and risk.

5. Conclusions and recommendations

This paper defines on-line trust for an individual user towards an informational or transactional website, examines fundamental trust characteristics and dimensions, and reviews the key HCI literature that forms a basis for a proposed model of on-line trust. The value of our model is that it has a strong theoretical base and is general enough to be applied to a wide variety of on-line trust situations. In addition, the model can be incorporated into larger, more complex models in which trust is one of many factors under study.

Our model is useful in examining questions about on-line trust over a wide range of factors and a multiplicity of trust dimensions. For example, how does the perception of expertise or predictability affect on-line trust? How does the perception of risk affect on-line trust? Which external factors affect the perception of honesty? How do these perceived factors affect on-line trust? How do the internal factors vary in swift and slow trust or in different developmental stages of trust? Another direction of research would be to investigate the differential roles of the cognitive and affective dimensions of on-line trust. Further research might also investigate differences in on-line trust between transactional and informational websites. Also of interest is the question of how on-line trust transfers from one website to another.

We also envision our model being incorporated into larger models describing on-line intentions and behaviors in which trust is one of several factors. For example, a

comprehensive model of on-line purchasing might include factors such as perceived usefulness (Davis, 1989) of a website that, along with on-line trust, contribute to a user's intention to buy on-line. Likewise, researchers studying the effectiveness of on-line health care information in the treatment of chronic disease could include the effect of on-line trust as one factor in a larger model of patient compliance with medical treatment. Such research would move us closer to understanding how on-line trust affects actual on-line behaviors.

Acknowledgements

References

Baier, A., 1986. Trust and antitrust. Ethics 96, 231–260.

Barber, B., 1983. The Logic and Limits of Trust. Rutgers University Press, New Brunswick, NJ.

Barney, J.B., Hansen, M.B., 1994. Trustworthiness as a source of competitive advantage. Strategic Management Journal 15, 175–190.

Blois, K.J., 1999. Trust in business to business relationships: an evaluation of its status. Journal of Management Studies 36 (2), 197–215.

Brenkert, G.G., 1998. Trust, morality and international business. Business Ethics Quarterly 8 (2), 293–317.

Cheskin Research and Studio Archetype/Sapient, 1999. Ecommerce trust study, http://www.sapient.com/cheskin/, accessed 5/9/2000

Cheskin Research and Studio Archetype/Sapient, 2000.Trustin the wired Americas, http://www.cheskin.com. Accessed 5/25/2000

Corritore, C.L., Kracher, B., Wiedenbeck, S., 2001. Trust in the online environment. In: Smith, M.J., Salvendy, G., Harris, D., Koubek, R.J. (Eds.), Usability Evaluation and Interface Design: Cognitive Engineering, Intelligent Agents and Virtual Reality. Erlbaum, Mahway, NJ, pp. 1548–1552.

Creed, W.E.D., Miles, R.E., 1996. Trust in organizations: a conceptual framework linking organizational forms, managerial philosophies, and the opportunity costs of controls. In: Kramer, R.M., Tyler, T.R. (Eds.), Trust in Organizations: Frontiers of Theory and Research. Sage Publications, London, pp. 16–38.

Dasgupta, P., 1988. Trust as a commodity. In: Gambetta, D. (Ed.), Trust: Making and Breaking Cooperative Relations. Basil Blackwell, New York, pp. 49–72.

Davis, F.D., 1989. Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quarterly 13 (3), 319–340.

Davis, F.D., Venkatesh, V., 1996. A critical assessment of potential measurement biases in the technology acceptance model: three experiments. International Journal of Human–Computer Studies 45, 19–45.

Davis, F.D., Bagozzi, R.P., Warshaw, P.R., 1989. User acceptance of computer technology: a comparison of two theoretical models. Management Science 35 (8), 982–1003.

Deutsch, M., 1958. Trust and suspicion. Conflict Resolution, II 4, 265–279.

Deutsch, M., 1960. The effect of motivational orientation upon trust and suspicion. Human Relations 13, 123–139.

Deutsch, M., 1962. Cooperation and trust: some theoretical notes. Nebraska Symposium on Motivation 10, 275–318.

Dieberger, A., Dourish, A., Höök, K., Resnick, P., Wexelblat, A., 2000. Social navigation: techniques for building more usable systems. Interactions 7 (6), 36–45.

Doney, P.M., Cannon, J.P., 1997. An examination of the nature of trust in buyer–seller relationships. Journal of Marketing 61, 35–51.

Dunn, P., 2000. The importance of consistency in establishing cognitive-based trust: a laboratory experiment. Teaching Business Ethics 96, 231–260.

Fogg, B.J., Tseng, H., 1999. The elements of computer credibility. In: Proceedings of the CHI '99. ACM Press, New York, pp. 80–87.

Fogg, B.J., Marshall, J., Kameda, T., Solomon, J., Rangnekar, A., Boyd, J., Brown, B., 2001a. Web credibility research: a method for online experiments and early study results. In: Proceedings of the Conference on Human Factors in Computing Systems CHI 2001 Extended Abstracts. ACM Press, New York, pp. 295–296.

Fogg, B.J., Marshall, J., Laraki, O., Osipovich, A., Varma, C., Fang, N., Paul, J., Rangnekar, A., Shon, J., Swani, P., Treinen, M., 2001b. What makes web sites credible? A report on a large quantitative study. In: Proceedings of the Conference on Human Factors in Computing Systems CHI 2001. ACM Press, New York, pp. 61–68.

Ganesan, S., 1994. Determinants of long-term orientation in buyer–seller relationships. Journal of Marketing 58, 1–19.

Gefen, D., Straub, D.W., 1997. Gender differences in the perception and use of e-mail: an extension of the technology acceptance model. MIS Quarterly 21 (4), 389–400.

Giddens, A., 1990. The Consequences of Modernity. Polity Press, Cambridge, UK.

Good, D., 1988. Individuals, interpersonal relations, and trust. In: Gambetta, D. (Ed.), Trust: Making and Breaking Cooperative Relations. Basil Blackwell, New York, pp. 32–47.

Hankowski, R.J, Kantowitz, B.H., Kantowitz, S.C., 1994. Driver acceptance of unrealiable route guidance information. In: Proceedings of the Human Factors and Ergonomics Society 38th Meeting, HFES, Santa Monica, CA, pp. 1062–1066.

Husted, B., 1998. The ethical limits of trust in business relations. Business Ethics Quarterly 8 (2), 233–248.

Igbaria, M., Zinatelli, N., Cragg, P., Cavaye, A.L.M., 1997. Personal computing acceptance factors in small firms: a structural equation model. MIS Quarterly 17 (3), 279–302.

Jarvenpaa, S.L., Leidner, D.E., 1999. Communication and trust in global virtual teams. Organization Science 10 (6), 791–815.

Jarvenpaa, S.L., Tractinsky, N., Saarinen, L., 1999.. Consumer trust in an Internet store: a cross-cultural validation. Journal of Computer-Mediated Communication 5 (2).

Jenkins, C., Corritore, C.L., Wiedenbeck, S., 2003. Patterns of information seeking on the Web: a qualitative study of domain expertise and Web expertise. Information Technology and Society 1 (3), 64–89.

Kantowitz, B.H., Hankowski, R.J., Kantowitz, S.C., 1997. Driver acceptance of unreliable traffic information in familiar and unfamiliar settings. Human Factors 39 (2), 164–176.

Kee, H.W., Knox, R.E., 1970. Conceptual and methodological considerations in the study of trust and suspicion. Conflict Resolution 14 (3), 357–366.

Kim, J., Moon, J.Y., 1997. Designing towards emotional usability in customer interfaces-trustworthiness of cyber-banking system interfaces. Interacting With Computers 10, 1–29.

Koehn, D., 1996. Should we trust in trust? American Business Law Journal 34 (2), 183–203.

Lee, J.D., 1991. The dynamics of trust in a supervisory control simulation. In: Proceedings of the Human Factors Society 35th Annual Meeting, HFS, Santa Monica, CA, pp. 1128–1232.

Lee, J., Moray, N., 1992. Trust, control strategies and allocation of function in human–machine systems. Ergonomics 35 (10), 1243–1270.

Lee, M.K.O., Turban, E., 2001. A trust model for consumer internet shopping. International Journal of Electronic Commerce 6 (1), 75–91.

Lee, J., Kim, J., Moon, J.Y., 2000. What makes Internet users visit cyber stores again? Key design factors for customer loyalty. In: Proceedings of the Conference on Human Factors in Computing Systems CHI 2000. ACM, New York, pp. 305–312.

Lewicki, R.J., Bunker, B.B., 1995. Trust in relationships: a model of development and decline. In: Bunker, B.B., Rubin, J.Z. (Eds.), Conflict, Cooperation, and Justice: Essays Inspired by the Work of Morton Deutsch. Jossey-Bass, San Fransicso, CA, pp. 133–173.

Lewicki, R.J., Bunker, B., 1996. Developing and maintaining trust in work relationships. In: Kramer, R., Tyler, T. (Eds.), Trust in Organizations: Frontiers of Theory and Research. Sage, Newbury Park, CA, pp. 114–139.

Lewis, D., Weigert, A., 1985. Trust as a social reality. Social Forces 63 (4), 967–985.

Lohse, G.L., Spiller, P., 1998. Electronic shopping. Communications of the ACM 41 (7), 81–87.

Luhmann, N., 1979. Trust and Power. Wiley, Chichester, UK.

Luhmann, N., 1988. Familiarity, confidence, trust: problems and alternatives. In: Gambetta, D. (Ed.), Trust: Making and Breaking Cooperative Relations. Basil Blackwell, New York, pp. 94–107.

Macy, M.W., Skvoretz, J., 1998. The evolution of trust and cooperation between strangers: a computational model. American Sociological Review 63 (10), 638–660.

Maes, P., Shneiderman, B., Miller, J., 1997. Intelligent software agents vs. user-controlled direct manipulation: a debate. In: Proceedings of the Conference on Human Factors in Computing Systems CHI '97. ACM, New York, pp. 496–502.

Marcella, A.J., 1999. Establishing Trust in Virtual Markets. The Institute of Internal Auditors, Altamonte Springs, FL.

Mayer, R.C., Davis, J.H., Schoorman, F.D., 1995. An integrative model of organizational trust. Academy of Management Review 20 (3), 709–734.

McAllister, D.J., 1995. Affect- and cognition-based trust as foundations for interpersonal cooperation in organizations. Academy of Management Journal 38 (1), 24–59.

McKnight, D.H., Chervany, N.L., 2002. What trust means in e-commerce customer relationships: an interdisciplinary conceptual typology. International Journal of Electronic Commerce 6 (2), 35–59.

Meyerson, D., Weick, K.E., Kramer, R.M., 1996. Swift trust and temporary groups. In: Kramer, R.M., Tyler, T.R. (Eds.), Trust in Organizations: Frontiers of Theory and Research. Sage Publications, Thousand Oaks, CA, pp. 166–195.

Milne, G.R., Boza, M.-E., 1999. Trust and concern in comsumers' perceptions of marketing information management practices. Journal of Interactive Marketing 13 (1), 5–24.

Misztal, B.A., 1996. Trust in Modern Societies: The Search for the Bases of Social Order. Polity Press, New York.

Muir, B.M., 1994. Trust in automation: Part I, theoretical issues in the study of trust and human intervention in automated systems. Ergonomics 39 (3), 429–460.

Muir, B.M., Moray, N., 1996. Trust in automation: part II, experimental studies of trust and human intervention in a process control simulation. Ergonomics 39 (3), 429–460.

Nass, C., Steuer, J., Tauber, E.R., 1994. Computers are social actors. In: Proceedings of the Conference on Human Factors in Computing Systems CHI '94. ACM, New York, pp. 72–78.

Nass, C., Moon, Y., Fogg, B.J., Reeves, B., Dryer, D.C., 1995. Can computer personalities be human personalities? International Journal of Human–Computer Studies 43, 223–239.

Nass, C., Fogg, B.J., Moon, Y., 1996. Can computers be teammates? International Journal of Human–Computer Studies 45, 669–678.

Nielsen, J., Molich, R., Snyder, C., Farrell, S., 2000. E-commerce user Experience: Trust. Nielsen NormanGroup, Fremont, CA. http://www.nngroup.com/reports/ecommerce/, accessed 3/2001

Olson, G.M., Olson, J.S., 2000a. Distance matters. Human–Computer Interaction 15 (2&3), 139–178.

Olson, J.S., Olson, G.M., 2000b. I2i trust in e-commerce. Communications of the ACM 43 (12), 41–44.

Onyz, J., Bullen, P., 2000. Measuring social capital in five communities. The Journal of Applied Behavioral Science 36 (1), 23–42.

Pavlou, P.A., 2001. Integrating trust in electronic commerce with the technology acceptance model: model development and validation. In: Proceedings of the Seventh Americas Conference on Information Systems. Association for Information Systems, Atlanta, GA, pp. 816–822.

Picard, R., 2002. Comments made during a CHI 2002 panel. Future Interfaces: Social and Emotional, Minneapolis, MN, April 24.

Putnam, R.D., 1995. Bowling alone: America's declining social capital. Journal of Democracy 6 (1), 3–10.

Reeves, B., Nass, C., 1996. The media equation: how people treat computers, television, and the new media like real people and places. Center for the Study of Language and Information/Cambridge University Press, Stanford, CA.

Rempel, J.K., Holmes, J.G., Zanna, M.P., 1985. Trust in close relationships. Journal of Personality and Social Psychology 49 (1), 95–112.

Resnick, P., Varian, H.R., 1997. Recommender systems. Communications of the ACM 40 (3), 56–58.

Resnick, P., Zeckhauser, R., 2001. Trust among strangers in Internet transactions: empirical analysis of eBay's reputation system. http://www.si.umich.edu/∼presnick, accesed 6/22/2001.

Resnick, P., Kuwabara, K., Zeckhauser, R., Friedman, E., 2000. Reputation systems. Communications of the ACM 43 (12), 45–48.

Riegelsberger, J., Sasse, M.A., 2001. Trust builders and trustbusters: the role of trust cues in interfaces to e-commerce applications. In: Towards the E-Society: Proceedings of the First IFIP Conference on E-Commerce, E-Society, and E-Government. Kluwer, London, pp. 17–30.

Rotter, J.B., 1967. A new scale for the measurement of interpersonal trust. Journal of Personality 35, 651–665.

Rotter, J.B., 1971. Generalized expectancies for interpersonal trust. American Psychologist 26, 443–452.

Rotter, J.B., 1980. Interpersonal trust, trustworthiness, and gullibility. American Psychologist 35 (1), 1–7.

Sabel, C.F., 1993. Studied trust: building new forms of cooperation in a volatile economy. Human Relations 46 (9), 1133–1170.

Segars, A.H., Grover, V., 1993. Re-examining perceived ease of use and usefulness: a confirmatory factor analysis. MIS Quarterly 17 (4), 517–525.

Shapiro, D.L., Sheppard, B.H., Cheraskin, L., 1992. Business on a handshake. Negotiation Journal 8 (4), 365–377.

Shelat, B., Egger, F.N., 2002. What makes people trust online gambling sites? Proceedings of Conference on Human Factors in Computing Systems CHI 2002, Extended Abstracts. ACM Press, New York, pp. 852–853.

Shneiderman, B., 2000. Designing trust into online experiences. Communications of the ACM 43 (12), 57–59.

Sisson, D., 2000. Ecommerce: trust and trustworthiness. http://www.philosophe.com/commerce/trust.html, accessed 5/17/2002.

Snijders, C., Keren, G., 1999. Determinants of trust. In: Budescu, D.V., Erev, I., Zwick, R. (Eds.), Games and Human Behavior: Essays in Honor of Amnon Rapoport. Lawrence Erlbaum, Mahwah, NJ, pp. 355–383.

Solomon, R.C., Flores, F., 2001. Building Trust in Business, Politics, Relationships, and Life. Oxford University Press, New York.

Stanford, J., Tauber, E.R., Fogg, B.J., Marable, L., 2002. Experts vs. online consumers: a comparative credibility study of health and finance web sites. http://www.consumerwebwatch.org/news/report3_credibilityresearch/slicedbread_abstract.htm, Accessed 11/19/02.

Steinbrück, U., Schaumburg, H., Duda, S., Krüger, T., 2002. A picture says more than a thousand words—photographs as trust builders in e-commerce websites. In: Proceedings of Conference on Human Factors in Computing Systems CHI 2002, Extended Abstracts. ACM Press, New York, pp. 748–749.

Sycara, K., Lewis, M., 1998. Calibrating trust to integrate intelligent agents into human teams. Proceedings of the 31st Hawaii International Conference on System Science (HICSS-98), Hawaii, January 5–9, 1998. IEEE, New York.

Tan, Y., Thoen, W., 2001. Toward a generic model of trust for electronic commerce. International Journal of Electronic Commerce 5 (2), 61–74.

Waern, Y., Ramberg, R., 1996. People's perception of human and computer advice. Computers in Human Behavior 12 (1), 17–27.

Waern, Y., Hägglund, S., Löwgren, J., Rankin, I., Sololnicki, T., Steinmann, A., 1992. Communication knowledge for knowledge communication. International Journal of Man–Machine Studies 37, 215–239.

Wiedenbeck, S., Davis, S., 1997. The influence of interaction style and experience on user perceptions of software packages. International Journal of Human–Computer Studies 46, 563–587.

Wong, H.C., Sycara, K., 1999. Adding security and trust to multi-agent systems. In: Proceedings of the Autonomous Agents '99: Workshop on Deception, Fraud and Trust in Agent Societies, May 1999, Seattle, WA, pp. 149–161.

Zajonc, R.B., 1980. Feeling and thinking: preferences need no inferences. American Psychologist 35 (2), 151–175.

Zand, D.E., 1972. Trust and managerial problem solving. Administrative Science Quarterly 17, 229–239.

Zimmerman, J., Kurapati, K., 2002. Exposing profiles to build trust in a recommender. In: Proceedings of the Conference on Human Factors in Computing Systems CHI 2001 Extended Abstracts. ACM Press, New York, pp. 608–609.