

An Examination of Trust Production in Computer-Mediated Exchange

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ABSTRACT

In this paper, we apply principles of trust derived mostly from interpersonal communication and human-computer interaction research to computer-mediated exchange (CME). We define key terms and synthesize relevant literature identifying four sources and seven dimensions of trust. Combining these sources and dimensions, we offer a trust taxonomy enabling trust analysis of exchange partners in CME. To demonstrate the usefulness of the taxonomy, we report on a case study in which we examined trust production methods in three exchange sites and compared the results.

KEYWORDS

Computer-Mediated Exchange, Trust, Trustworthiness, Trust Production, Credibility

1. INTRODUCTION

Over 2,000 years ago, Aristotle gave the concept of trust within the context of interpersonal communication serious theoretical consideration [1]. Since, the concept of trust has been studied in bargaining behavior [26], face-to-face buyer-seller/firm relationships [5], environmental decision making [18], human-computer interaction [6, 7, 28] and interpersonal relationships [3, 4, 20, 23, 25]. But within the anonymous, geographically disperse, and socially filtered context of computer-mediated exchange (CME), the concept of *trust production* (establishing trust) has received little attention.

We use the term *computer-mediated exchange* to collectively refer to the business-to-consumer and consumer-to-consumer electronic exchange models. For example, a consumer purchasing antiques, books, or airline tickets from Ebay, Amazon.com, or Priceline.com qualifies as a CME. We collectively refer to a site or person involved in a CME as an *exchange partner*.

Examining trust production within the exchange process has several benefits. Trust creates more favorable attitudes towards suppliers as well as source loyalties [26], and “helps partners project their exchange relationships into the future” [5]. Trust enhances competitiveness, reduces transaction costs, and mitigates opportunism in uncertain contexts [5]. In fact, trust is

required for all willing transactions; and without it, no market could function [9, 32].

However, further examination of trust production in the context of CME is necessary for at least two reasons. First, CMEs are performed without governing social norms, geographic proximity, or partner identity. Due to this unique context, understanding the dynamics of trust production in CME is even more important than in face-to-face exchanges. In fact, trust production may be one of the most important factors shaping the future landscape of electronic exchange [12]. Second, producing trust in electronic contexts is much more difficult without prior face-to-face interaction [22]. Hence, this paper offers both theoretical and empirical contributions to the analysis of trust production in CME. Specifically, the contributions of this paper are a:

- i) Definition of trust and trustworthiness within the context of CME. This creates a terminological framework promoting discussion and serving as a basis for further research.
- ii) Synthesis of relevant literature identifying four sources and seven dimensions of trust. Understanding these conceptual aspects of trust helps to better understand the practical aspects of analyzing trust production in CME.
- iii) Trust taxonomy enabling the classification, evaluation, and comparison of trust production methods in CME. By applying the taxonomy, e-commerce practitioners can perform trust analysis on an exchange site.
- iv) Case study examining trust production methods in three exchange sites. The case study demonstrates the use and broad applicability of our taxonomy, and the results serve as a reference for both the creation and comparison of exchange sites in terms of trust production.

Two audiences should find this paper interesting: academic researchers and e-commerce practitioners. For academic researchers, this paper offers a novel combination of the sources and dimensions of trust and its subsequent application to performing trust analysis on an exchange site. For e-commerce practitioners, our trust

taxonomy offers a concrete method for performing trust analysis on an exchange site. Just as usability analysis attempts to create a more usable exchange site, trust analysis attempts to create a more trustworthy site.

The rest of this paper is organized as follows. In Section 2 we define key terms and outline the trust production process. In Section 3 we identify the sources and dimensions of trust, and present our trust taxonomy. We report on the application of the taxonomy to three exchange sites in Section 4. In Section 5 we discuss lessons learned and the limitations of our work. In Section 6 we offer concluding thoughts and ideas for future work.

2. DEFINITION OF TERMS

Defining trust-related terms is most effective when considering the entire process of trust production. The trust production process begins with a trustee possessing an objective, intrinsic level of trustworthiness. That is, the trustee knows the degree to which they will fulfill their transactional obligations during an exchange. However, because the trustor cannot precisely know this intrinsic value, they must perceive extrinsic cues produced from the trustee in order to attribute a level of trustworthiness. Thus, we define trust as *the perception of the degree to which an exchange partner will fulfill their transactional obligations in situations characterized by risk or uncertainty*. However, trustworthiness must be defined from both the perspective of the trustee and the trustor. From the perspective of the trustee, we define trustworthiness as *an objective quality governing the degree to which transactional obligations will be fulfilled in situations characterized by risk or uncertainty*. And from the perspective of the trustor, we define trustworthiness as *an attribution of trust*. The trust production process is summarized in Figure 1.

The attribution of trust occurring in Step 3 of Figure 1 may be greater than, less than, or equal to the trustee’s intrinsic value of trustworthiness, each case having significant implications for the exchange [2].

The trust production process just described is reasonable regardless of whether the trustee is another person or a technological entity such as a web site. Substantial

evidence exists indicating that humans interact with technology in a social manner [14, 15, 16, 29]. That is, when humans perceive specific social cues produced by a technological entity, their reactions are *social* reactions. Furthermore, evidence exists indicating that people develop trust not only in salespeople, but also in their suppliers [5]. Together, these results confirm that humans develop trust in an exchange site in the same manner that they develop trust in other people.

3. SOURCES & DIMENSIONS OF TRUST

In the trust production process, extrinsic trust cues are produced from multiple sources and perceived along several dimensions leading to an attribution of trust. A *trust source* refers to the belief, impression, experience, or institution from which a trust cue is produced. A *trust dimension* is an operational attribute of trust to which a trust cue contributes. A person cognitively combines the trust dimensions forming an overall attribution of trust. The sources and dimensions of trust are related in a many-many relationship; i.e., a single trust source may contribute to multiple dimensions of trust, while a single dimension of trust may be contributed to from multiple sources. The next two subsections provide a closer look at these two concepts.

3.1 Sources of Trust

From a synthesis of relevant literature in human-computer interaction [7, 13, 28], social psychology [4, 8, 17, 20, 23], marketing [5, 11], and economics [32], we identified the following four sources of trust:

Presumptions produce trust through general beliefs or levels of confidence maintained in the absence of doubt. These beliefs and confidence levels are derived from general assumptions and stereotypes existing within one’s own culture. For example, an exchange partner may presume that an exchange site is less trustworthy than a brick-and-mortar retailer.

Surface inspection produces trust through an examination of an exchange partner’s external appearance, such as the visual design of a web site or the physical appearance of a person. Once formed, first impressions can be extremely difficult to break [31].

Experience produces trust through repeated successful exchanges with an exchange partner. For example, a person having repeated successful exchanges with an exchange partner will likely perceive that partner as being more trustworthy than an unfamiliar partner. Reputations and brands can also be considered as an experience-based source of trust [32].

Institutions or third parties produce trust through what they report about an exchange partner, i.e., whether an exchange partner deserves the “Good Housekeeping Seal of Approval” or not. In this case, the production of trust is a *transfer* of trust from the institution to the exchange

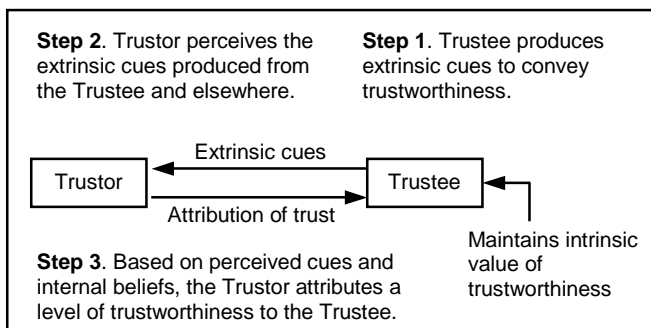


Figure 1: The trust production process.

partner, where the amount of transference is proportional to the perceived trustworthiness of the institution. Although the name *institution* implies a governing body, this source of trust also includes recommendations from family members, friends, or colleagues.

These sources of trust are not mutually exclusive and the contribution of each may change over time. For example, in the absence of previous exchanges and third party recommendations, an exchange partner must rely on presumptions and surface inspection to make an initial attribution of trust. In a future exchange with that same partner, this past experience will contribute more while presumptions and surface inspection will contribute less.

3.2 Dimensions of Trust

While sources of trust are from where trust cues originate, dimensions of trust are the operational attributes to which they contribute. Drawing mainly from the social psychology literature [8, 17, 19, 20], the seven dimensions of trust are:

Attraction of an exchange partner’s physical or non-physical characteristics. For example, we generally perceive an attractive person as being more trustworthy than an unattractive person [17].

Dynamism of the additional (peripheral) communication provided by an exchange partner through oral, written, or visual communication channels. For example, a salesman’s body language or a website’s ticker-tape display can be regarded as dynamism.

Expertness of an exchange partner’s relevant skill, ability, or knowledge. We generally perceive experts as being more trustworthy than non-experts [2, 18].

Faith that an exchange partner will fulfill their obligations despite an uncertain future. Faith is important in exchanges where past experiences are minimal or only indirectly related to the current exchange. For example, suppose a buyer who has previously purchased several inexpensive items from a seller is now considering the purchase of an expensive item from that same seller. The buyer must have faith that the seller will once again act responsibly and fulfill their obligations.

Intentions of an exchange partner in terms of their perceived goals and objectives. For example, a seller who is open and honest, and who discloses relevant information is perceived as having a genuine interest in the welfare of the buyer, and thus, is perceived as being more trustworthy [5].

Localness of an exchange partner’s ideals, beliefs, values, or geography. The closer the perceived proximity along one or more of these dimensions, the more trustworthy an exchange partner appears. For example, a buyer may perceive a seller who donates to or volunteers for the same charitable organization as being more trustworthy than a seller who does not.

Reliability of an exchange partner measured in terms of dependability, predictability, or consistency. Reliability is directly rooted in past experiences and prior interactions. For example, a buyer who has successfully purchased books from a seller will perceive that seller as being more trustworthy than an unknown seller.

The relationship between the sources and dimensions of trust is depicted in Figure 2.

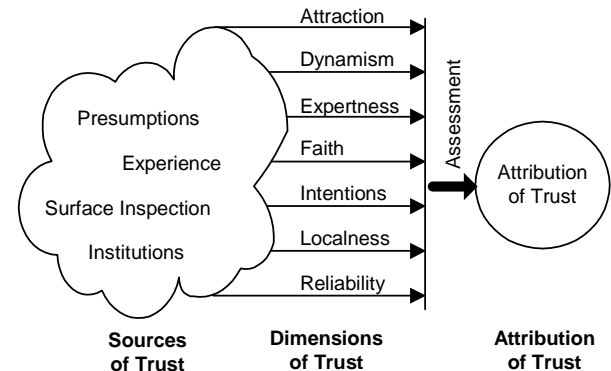


Figure 2: An expanded view of Steps 1 and 2 of the trust production process shown in Figure 1. Trust cues are produced from one or more sources, perceived along one or more dimensions and cognitively assessed, resulting in an attribution of trust.

By combining the sources and dimensions of trust into a matrix, with the sources as rows and the dimensions as columns, a trust taxonomy is created. This trust taxonomy, or classification matrix, provides a concrete mechanism for performing trust analysis of an exchange site. Trust analysis is performed by first inspecting the exchange site for distinct methods of trust production and then placing each method into one or more of the matrix cells. The next section demonstrates the application of our trust taxonomy to three popular exchange sites.

4. CASE STUDY – TRUST PRODUCTION METHODS IN CME

In this case study, we first identify the trust production methods used within three exchange sites and then classify each set of methods according to our trust taxonomy. The three exchange sites analyzed were Ebay, Amazon.com, and Priceline.com, and were chosen because of their familiarity, success, and distinct business models; consumer-to-consumer, business-to-consumer, and mediated business-to-consumer, respectively.

4.1.1 Ebay

Ebay is an electronic auction house where anonymous buyers and sellers meet to exchange goods. A buyer may assess the trustworthiness of the auction site, a seller, or a transaction. Because trust production methods of an exchange site will be examined later, here we focus only on identifying Ebay’s trust production methods related to

Table 1: Classification of Trust Production Methods for Ebay Exchange Partners

| | Attraction | Dynamism | Expertness | Intentions | Faith | Localness | Reliability |
|----------------------|------------|----------|------------|------------|-------|-----------|-------------|
| Presumed | | | | L | L | | L |
| Surface | P | P, M | | P, T | | M | P |
| Experience | | | | | | | |
| Institutional | | | | A, B, F, I | A, F | | A, B, F, I |

A = Achievement awards, **B** = Billpoint payments, **F** = Feedback profile, **I** = Insurance, **L** = length of membership, **M** = member pages, **P** = Product description/picture, and **T** = Transaction information.

an exchange partner (buyer or seller) or transaction. Inspection of the site reveals that Ebay’s trust production methods include the:

Feedback profile of an exchange partner. After any exchange, both the buyer and seller may leave a feedback rating; e.g., positive, negative, or neutral, as well as a comment regarding the quality of the exchange with the other person. In addition, Ebay provides a temporal summary of the feedback profile for the past week, month, and six months. Feedback profiles establish an online, persistent, and evolving reputation for every exchange partner and are readily available for inspection. By inspecting these online reputations, an exchange partner can better estimate the reliability, intentions, and future behavior of another.

Achievement awards (“stars”) bestowed upon an exchange partner who reaches certain milestones in her feedback profile. For example, a yellow star is bestowed upon a partner who achieves 10 positive comments while a shooting star is bestowed upon a partner who achieves 10,000 or more positive comments.

Billpoint payments allowing a buyer to electronically send credit card payments to a seller. Because credit card payments offer a buyer more protection than a personal check or money order, a greater sense of reliability is produced in the transaction. A buyer may also perceive a seller who offers this payment option as having good intentions regarding the transaction.

Insurance (free of charge) on a transaction up to a specified monetary limit. This institutional backing produces a sense of reliability in each transaction.

Length of membership of an exchange partner. An extended length of membership produces a sense of reliability, good intentions, and future consistency. It also provides a temporal context in which to assess the feedback profile.

Member page of an exchange partner, which may include peripheral information such as that person’s hobbies, interests, feedback profile, picture and favorite links. Inspecting a member page helps to assess at least the localness of an exchange partner.

Product description and picture of a sale item. By reading the product description written by a seller, a buyer can obtain a sense for the education and intentions of the seller. A product picture may enhance the belief that the product is real and of high quality.

Transaction information of an exchange partner. Inspecting the type and quantity of products being bought or sold by an exchange partner helps to estimate the intentions of that person.

These methods of trust production have been classified according to our trust taxonomy in Table 1. Visual inspection of the table shows that trust is produced mainly from third parties along the dimensions of intentions and reliability. But perhaps the most salient feature of the table is its sparsity, indicating the possibility of missed opportunities for trust production. For example, Ebay does not provide any convenient mechanism for assessing a seller’s expertness relative to a particular sale item. If a buyer would like to purchase an item that requires special packaging when shipped, knowing how many similar items the seller has sold and shipped in the past may contribute to the buyer’s perception of that seller’s expertness.

4.1.2 Amazon.com

Amazon.com is a leading online retailer of books, music, electronics, and more. Although Amazon.com supports consumer-to-consumer exchange through auctions, here we focus only on the business-to-consumer aspects of its exchange site. Inspection of the site reveals that Amazon.com’s trust production methods include (the):

Affiliations with companies who display links back to Amazon.com. The quantity, quality, and diversity of third party sites displaying links back to Amazon.com helps to produce a sense of localness and reliability.

Brand [10, 26] of the company as well as the products it offers. Brands convey a specific image, reputation, and presumed quality of service that help produce a sense of expertness, localness, and reliability to a buyer.

Community support for a customer. Amazon.com strives to put a customer in touch with other customers through community-oriented product reviews, member pages,

Table 2: Classification of Trust Production Methods for Amazon.com

| | Attraction | Dynamism | Expertness | Intentions | Faith | Localness | Reliability |
|----------------------|------------|------------|-------------|-------------------|--------|---------------|-------------|
| Presumed | | | B | Pi | Pi | B | B |
| Surface | Pe | | Pe | Si | | | Si |
| Experience | | Co, Rc, RI | B, F, N, Pe | Co, Cu, Rc, RI, N | Cu, RI | B, Co, Cu, RI | B, Cu, F, N |
| Institutional | | | Se | Pa, Se | | A, Pa | A, Pa, Se |

A = Affiliations, **B** = Brand, **Co** = Community, **Cu** = Customer service, **F** = Functionality, **N** = Navigation, **Pa** = payment symbols, **Pe** = Presentation, **Pi** = Privacy statement, **Rc** = Recommendations, **RI** = Relationship building, **Se** = Seals of approval, and **Si** = Size.

discussion forums, and more. Through community support, Amazon.com produces dynamism, localness, and good intentions for exchange partners.

Customer service providing extensive help and support for order processing, payment, shipping, tracking, tracking updates, account management, and FAQs. The customer service section explains the return and refund policies, how to report offensive content submitted or maintained by others, and how to submit feedback and comments. This extensive customer service produces a sense of good intentions, availability (localness), reliability, and future dependability.

Functionality [10] or “feel” of the site in terms of working links, speed of page loading, and the intuitive nature of order processing. Amazon.com maintains a high degree of functionality which produces a sense of expertness and reliability.

Navigation [10] of information content, product structure, or services measured in terms of accuracy, efficiency, and search methodology. By offering category browsing, multi-attribute search, and site maps, Amazon.com produces a sense of helpfulness (good intentions), reliability, and expertness.

Presentation [10] and quality of content structure as well as the visual appearance of the site. Quality presentation produces a sense of attraction and expertness, resulting in an increased perception of trustworthiness [13].

Privacy statement clearly explaining if, when, why, and under what circumstances customer’s personal information, e.g., email address, home address, or credit card number is needed, used, stored, or traded to third parties. The privacy statement also explains how to update stored personal information as well as explains the use of cookies and encryption. By disclosing this information, Amazon.com draws upon our cultural beliefs that those who are open and honest have good intentions both now and in the future [5].

Recommendations of products to a customer using several different techniques such as Customers who Bought, Book Matcher, and Customer Comments [24].

Through recommendations, Amazon.com produces a sense of dynamism and good intentions.

Relationship building [5, 10] with a customer through personalized email notifications describing new product offerings, reviews, and articles. By building a relationship with a customer, Amazon.com produces a sense of good intentions, faith, and localness for that customer.

Seals of Approval [10, 26] depicting established security mechanisms such as Verisign, privacy compliances such as TrustE, or delivery companies such as UPS. By including these symbols, Amazon.com produces a sense of expertness, good intentions, and reliability in proportion to a customer’s perceived trustworthiness and selectivity of these third parties.

Size and market share [5] indicating that many other customers trust Amazon.com enough to do business with them. Through its size and market share, Amazon.com produces a sense of reliability and good intentions.

These methods of trust production have been classified according to our trust taxonomy in Table 2. Inspection of the table reveals several interesting features. First, Amazon.com’s trust production methods draw heavily on direct experience to strengthen most of the trust dimensions. A customer must explore Amazon.com and experience its features in order for their attribution of trust to meaningfully increase. Second, Amazon.com effectively leverages the interactive nature of the Internet to provide community support, recommendations, relationship building, and extensive customer service.

Together, these methods convey a strong sense of good intentions and localness to a customer.

4.1.3 Priceline.com

Priceline.com uses an inverted auction model to mediate the exchange of goods and services such as hotel rooms, car rentals, and airline tickets between a customer and any number of suppliers. Inspection of the site reveals that Priceline.com’s trust production methods include (the):

Investor relations links offering a complete suite of investor information such as SEC filings, stock quotes and charts, earnings estimates, and more. By supplying

Table 3: Classification of Trust Production Methods for Priceline.com

| | Attraction | Dynamism | Expertness | Intentions | Faith | Localness | Reliability |
|----------------------|------------|----------|-------------|------------|-------|-----------|-------------|
| Presumed | | | B | Pi, Sn, Sp | Pi | B, Sn | B, M, Sn |
| Surface | L, Pe | | Pe | I, L, Si | I | L | I, Si |
| Experience | | M | B, F, N, Pe | Cu, N | Cu | B, Cu | B, Cu, F, N |
| Institutional | | | Se, T | Se, T | T | A, T | A, Se, T |

A = Affiliations, **B** = Brand, **Cu** = Customer service, **F** = Functionality, **I** = Investor relations, **L** = Letter from president, **M** = Media links, **N** = Navigation, **Pe** = Presentation, **Pi** = Privacy statement, **Se** = Seals of approval, **Si** = Size, **Sn** = Sense of Control, **Sp** = Sneak previews, and **T** = Testimonials.

this information, Priceline.com produces a sense of reliability and good intentions.

Letter from the President offering a warm welcome to the site. In addition, a picture of the President is included to enhance the feeling of sincerity and attraction. By offering this letter, Priceline.com produces a sense of good intentions and localness.

Media links to the latest television commercials that can be downloaded and viewed. By informing a customer of and providing access to these commercials, Priceline.com produces a sense of reliability.

Sense of control over product purchases. Priceline.com's inverted auction model gives a buyer the perception that she is in control of the exchange. By allowing the buyer to set the price, Priceline.com produces a sense of good intentions, localness, and dependability.

Sneak previews of upcoming services such as long distance calling. By offering previews of upcoming services, Priceline.com produces a sense of openness and honesty.

Testimonials from previous customers, celebrities, and the popular press. By sharing these positive statements, Priceline.com produces a sense of expertness, good intentions, localness, faith, and reliability to a customer.

In addition to these methods of trust production, Priceline.com also includes affiliations, brand, customer service, functionality, navigation, presentation, privacy statement, seals of approval, and size in a manner similar to Amazon.com. The trust production methods are classified according to our trust taxonomy in Table 3.

In contrast to the experience-oriented trust production methods of Amazon.com, Priceline.com's trust production methods are well distributed throughout the classification matrix. Because of its inverted auction model, Priceline.com needs to achieve a higher level of trustworthiness than many other exchange sites. With the inverted auction model, a customer cannot browse a specific product; rather, he must give a general description of a product to purchase along with some set of constraints. For example, to purchase an airline ticket, a customer specifies the departure and destination cities,

departure dates, range of times, and a maximum offer price for the flight. However, the customer cannot specify the precise airline carrier, length of layovers, or geographic location of connections for the flight. Thus, a customer must perceive a high level of trustworthiness for Priceline.com in order to allow that site to mediate the transaction. To achieve this, Priceline.com uses a large number of trust production methods that are well distributed throughout the classification matrix as shown in Table 3.

5. DISCUSSION AND FUTURE WORK

Using the taxonomy in our case studies produced two important lessons:

- The same person(s) should perform all classifications of trust production methods to maintain consistency and reliability. The classification process, known as *coding*, is subjective rather than an application of hard and fast rules. For example, consider the classification of Amazon.com's product recommendations. Because these recommendations are withheld until consumers are browsing Amazon.com's site, we classified them as an experienced rather than institutional source of trust. Overcoming the challenges of subjective coding practices is not insurmountable as analogous situations have long been addressed in the area of communication research [21, 27, 30].
- Using our trust taxonomy for trust analysis *works*. Even though the exchange sites chosen for the case study in this paper are mature, and presumably already perceived as trustworthy by most, trust analysis has identified some missed opportunities for increased trust production. For example, Ebay could provide a method for increasing the perception of a seller's expertness relative to a certain product. Or, a seller could include information in their member page indicating that they are knowledgeable within the domain of items they are selling. Amazon.com could increase trust production by adding investor relations links (faith), or by ensuring that a customer is spending adequate time browsing their site. Priceline.com could increase trust production by

adding more peripheral communication with customers, perhaps through community support or an increased investment in relationship building.

The primary limitation of this work is that the exact contribution that each matrix cell or trust production method makes to an overall attribution of trust has not been determined. As a result, practitioners must presently rely on the density of the matrix coupled with an intuitive understanding of the trust production methods in order to estimate someone's attribution of trust. However, previous work has demonstrated that an attribution of trust can be empirically measured [3, 13, 22], including a subset of the trust dimensions presented in this paper [5, 8]. Although we do not measure the resulting attributions of trust, our trust taxonomy is still useful for increasing the trust production of an exchange site. By performing trust analysis of an exchange site using our taxonomy, practitioners can identify areas needing increased trust production, and then integrate trust production methods contributing to those areas into that exchange site.

Trust represents an emerging topic of research within the e-commerce community and we see a need to further explore (the):

Dynamics of an online reputation in terms of the visual display. For example, how much influence does the visual display of an online reputation have on one's assessment of trust, e.g., how does the choice of color for negative ratings influence that assessment?

Transfer of trust between the online versus offline worlds. For example, are the contributions of brands, certifications, and testimonials the same in the online as opposed to the offline worlds?

Trust metrics for measuring the contribution of a trust production method as well as each source and dimension of trust to an overall attribution of trust.

Trust in other areas of the Internet including business-to-business exchange, on-line voting, and information sources such as web sites, message boards, and discussion lists.

6. CONCLUSION

Creating a trustworthy exchange site is a critical requirement for e-commerce practitioners, as an online consumer will not do business with an exchange partner she does not trust. As a first step towards a trust analysis procedure enabling the creation of a more trustworthy exchange site, this paper defines a trust taxonomy enabling the classification of trust production methods in computer-mediated exchange. Applying the taxonomy to an exchange site enables practitioners to compare how that site is to be perceived against the classification of trust cues actually produced, identifying missed opportunities for trust production in terms of untapped sources and dimensions of trust. Although this work

provides a promising first step towards a complete trust analysis procedure, much work still remains in assessing a user's perception of trust cues produced within the unique context of computer-mediated exchange.

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