

Trust in Electronic Networks of Practice: An Integrative Model

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Abstract

Trust plays an important role in facilitating knowledge sharing, but few studies have systematically investigated trust development in online communities, a popular tool for knowledge sharing. This paper presents one such exploratory study that investigated how knowledge seekers form trust toward knowledge contributors in electronic networks of practice. Knowledge seekers' perceptions of knowledge contributors' ability and benevolence are argued to mediate the trust development formation; and three bases on which perceptions of ability and benevolence are formed – cognition, affection, and situation – were identified. An integrative model was developed and a preliminary test reported with encouraging results. Implications of the findings were also discussed.

1. Introduction

Trust plays an important role in facilitating information and knowledge sharing (e.g. Levin and Cross 2004; Szulanski et al. 2004). It helps create a knowledge-sharing culture by encouraging knowledge seeking and motivating knowledge contribution (Kankanhalli et al. 2005). It increases the effectiveness of knowledge sharing: A trusting knowledge contributor gives out more information and information of higher quality (Tsai and Ghoshal 1998), and a trusting recipient perceives the received information more favorably and is more likely to act on it (Sussman and Siegal 2003). The importance and the effects of trust for knowledge sharing are well documented; however, much less research has explored the development of such trust.

In particular, recently there has been strong interest in utilizing online communities as a means for knowledge sharing (e.g. Zetlin 2002). Such online communities offer an online commonplace where people who share the same interests can gather and interact with each other. Utilizing computer-mediated communication (CMC) technologies, online communities help overcome the gaps between communicators with diverse geographical locations, temporal availabilities, and social backgrounds. They bring community members

together virtually. Members benefit by gaining access to information and knowledge that are not available otherwise. Previous research has shown that people contribute to such communities (Wasko and Faraj 2005) and take knowledge away from them (Constant et al. 1996; Zhang and Watts 2004).

Considering that the term “online communities” or “virtual communities” has been used to refer to many different kinds of online social gatherings (e.g. Armstrong and Hagel 1996), in this paper I limit my discussions to online communities that focus on facilitating knowledge sharing among their members in the ways discussed above. Built around a shared practice, such communities have been called “electronic networks of practice” (eNoPs) (Wasko and Faraj 2005). The shared practice may result from being in the same profession (Wasko and Faraj 2005), sharing the same interest or passion (Zhang and Watts 2002), or having similar experiences (Leimeister et al. 2005). The use of *networks* in the terminology distances eNoPs from typically closely-knit *communities* of practice (Brown and Duguid 1991; Wenger 1998), where members are collocated and interact mainly face-to-face. Despite the online nature of eNoPs, having a shared practice offers the common ground that enables their members to understand and interact with each other. Individual members may not meet or know each other in real life, but they still can share a great deal of what they know with each other (Brown and Duguid 2000).

Research has suggested that just as in traditional contexts, trust plays an important role in facilitating knowledge sharing in eNoPs (Preece 2000; Ridings et al. 2002; Zhang and Watts 2004). However, eNoPs represent a unique environment for trust development among members. Many factors that have been shown to induce trust in traditional contexts – “familiarity, shared experience, reciprocal disclosure, threats and deterrents, fulfilled promises, and demonstrations of nonexploitation of vulnerability” (Meyerson et al. 1996, p167) – are absent or mitigated in eNoPs. At the same time, though, the virtual environment also introduces some new features that are conducive to trust development, as will be discussed below. Here I report a study on how the trust of knowledge seekers toward knowledge contributors is formed in eNoPs. Three bases upon which such trust is formed are identified and how each contributes to the trust is examined. I then introduce an integrative model and develop hypotheses. I also present a preliminary test of the model using data collected for another study. Discussions on the preliminary findings conclude the paper.

2. Theoretical Development

In this paper, trust is defined as a knowledge seeker’s willingness to rely on a knowledge contributor’s opinion in an uncertain situation. For example, it is typical for a member of an eNoP to ask other members for advice or information when solving a problem at hand. Following such advice exposes the member who asks – a knowledge seeker – to certain risks: Adopting false advice may lead to a wrong solution or at least a delay in identifying the correct solution to the problem. Adopting inferior advice may lead to a suboptimal solution. Aware of the risks, the knowledge seeker (the trustor) demonstrates trust toward the knowledge contributor (the trustee) who offers the advice when he decides to follow it. Emphasizing the *willingness* to take risk, this definition is consistent with previous trust definitions (Mayer et al. 1995; Williams 2001). In eNoPs, the risks incurred by trust stem more from the inherent uncertainty involved in the problem-solving facing the trustor than from the concerns over opportunistic behavior of the trustee as implied in previous definitions.

Previous studies have identified a set of trustee attributes that are key to the formation of trust (for a review, see Mayer et al. 1995). Among the attributes identified, two have been regarded as particularly relevant in knowledge-sharing contexts (Levin and Cross 2004): ability, which is the “group of skills, competence, and characteristics that enable a party to have influence within some specific domain” (Mayer et al. 1995, p.717), and benevolence, which is “the extent to which a trustee is believed to want to do good to the trustor” (Mayer et al. 1995, p.718). Given the focus on knowledge sharing in eNoPs, a knowledge contribu-

tor's ability in the domain of the practice is evidently an important factor that affects trust. Responding to a fellow member's request for help – even when the chance of future direct or indirect reciprocity is slim – shows the knowledge contributor's goodwill toward the knowledge seeker (Wasko and Faraj 2000). Both ability and benevolence should work and lead to trust in eNoPs in the same way as in other contexts. Therefore, in an eNoP,

H1: Having a higher level of perceived ability of a knowledge contributor by a knowledge seeker is associated with a higher level of trust toward the knowledge contributor.

H2: Having a higher level of perceived benevolence of a knowledge contributor by a knowledge seeker is associated with a higher level of trust toward the knowledge contributor.

Since perceptions of ability and benevolence lead to trust, we can better understand how trust forms in eNoPs by exploring the bases upon which the perceptions are formed. Previous studies conducted in both offline and online contexts suggest three bases for trust: cognition, affection, and situation. Below I explore how each of these affects knowledge seekers' perceptions of knowledge contributors' ability and benevolence in eNoPs.

2.1 Cognition-based Trust

Trust is cognition-based in that the development of trust toward an individual is also an experience of learning about the individual's characteristics and reasoning how trustworthy the individual is. Based on what we have learned, we form an expectation of the individual's trustworthiness, predict how the individual will behave, observe how the individual actually behaves, and further adjust our perceptions of the individual (Mayer et al. 1995). Such learning occurs as long as a trustor can repeatedly interact with a trustee, regardless whether the interactions are face-to-face or computer-mediated (Jarvenpaa et al. 1998).

Repeated interactions between any two members in eNoPs, however, are rare. Open and virtual, eNoPs usually draw many members. While a few of the members are quite active and participate regularly, most only interact with other members occasionally (Finholt and Sproull 1990; Zhang and Storck 2001). When a knowledge seeker requests helps, she is depending on "the kindness of strangers" (Constant et al. 1996). She may receive a reply from someone with whom she has never interacted before and may never interact again (Zhang and Storck 2001). She will have to base the assessment of the knowledge contributor's trustworthiness in part on the current reply posted by the knowledge contributor.

Many factors within and surrounding the reply can affect the knowledge seeker's trust in the knowledge contributor. In this paper, I focus on the inherent quality of the information embedded in a reply message. After all, eNoPs are about knowledge sharing, and the to-be-shared knowledge is embedded in the replies. A message that communicates more accurate and complete information should generate more favorable thoughts about the knowledge contributor's ability.

Research has shown that knowledge contributors offer helps out of prosocial motives (Constant et al. 1996) or simply because they enjoy helping others (Wasko and Faraj 2005). When reading replies from such contributors, the knowledge seeker may sense that the knowledge contributor is not holding out information or is trying to help as much as possible. They may be more convinced of the knowledge contributor's altruistic intention. Thus a reply message of higher information quality likely leads the knowledge seeker to think more highly not only of the ability, but also of the benevolence bestowed by the knowledge contributor. Put in a formal way,

H3a: A reply with higher information quality leads to a higher level of a knowledge contributor's perceived ability.

H3b: A reply with higher information quality leads to a higher level of a knowledge contributor's perceived benevolence.

While the current reply is important for evaluating the knowledge contributor's trustworthiness, the knowledge seeker does not have to rely solely on it in eNoPs. The persistent nature of CMC utilized by eNoPs makes it possible to view not only members' current contributions, but also their past involvements in online communities. For example, the bulletin board system (BBS) is the most popular CMC technology used by eNoPs. With BBS, members communicate with each other by exchanging text-based messages. Many eNoPs keep an archive of all messages posted by all members because the electronic communications can be saved and stored easily. In this way, all members' participation histories are faithfully recorded and can be easily reconstructed (Zhang and Watts 2002). These archives make it easier for a knowledge seeker to view a knowledge contributor's previous interactions with other members, essentially allowing the knowledge seeker to utilize other members' interactions with the knowledge contributor to learn about the contributor.

ENoPs are about knowledge sharing, but the members can and do forge social relationships with others when exchanging messages (Wellman 2001). One way to examine these relationships is to consider the network of the ties among members that are formed when posting messages and replies. Most eNoPs keep records of these ties by recording the message sequences and information that suggests who replies to whom. These relationships collectively consist of the social network woven in the eNoPs. The position one occupies in the network affects how others regard him or her. Within offline social networks, a person who is at the center is considered a prestigious member of the network (Wasserman and Faust 1994, chapter 5), who likely commands more trust. Similarly, a recent study in an eNoP found that knowledge contributors central to the network contribute more responses, which indicates a higher level of benevolence, and more helpful responses, which indicates a higher level of ability (Wasko and Faraj 2005). One often-used measure of the degree to which one holds a central position in a network is centrality (Wasserman and Faust 1994, chapter 5). Thus I propose that:

H4a: A knowledge contributor with a higher level of centrality is perceived to have a higher level of ability.

H4b: A knowledge contributor with a higher level of centrality is perceived to have a higher level of benevolence.

In summary, eNoPs offer a unique environment for knowledge seekers to learn about knowledge contributors' trustworthiness. They make up for the possible lack of repeated, direct experience with a knowledge contributor by allowing a knowledge seeker to observe and to review the knowledge contributor's participation history. The knowledge seeker can use both direct and indirect experience with the knowledge contributor to draw inferences about how much the contributor can be trusted. In these ways, trust development in eNoPs is cognition-based.

2.2 Affection-based Trust

ENoPs resemble face-to-face, closely knit communities of practice in that participants in both are volunteers who choose to participate. A community of practice (Brown and Duguid 1991; Wenger 1998) involves members who share the same passionate about the practice. The members take pride in their involvement in the joint enterprise endorsed by the community, and identify themselves with the community and their fellow members. Similarly, strong identifications with other members and the community are found in eNoPs, even though the ties between any individual members of an eNoP may not be as strong or as close as those between members of a community of practice (Zhang and Watts 2002).

Williams (2001) used group identification and category-driven processing to explain how simply being in the same group can cause group members to generate positive affects and trust toward each other. ENoPs are typically too large to be considered a group, but identification and categorization can still work similarly. In particular, when a knowledge seeker reads a reply message by another member, that he is focusing on in-

teracting with the contributing member may make the network appear much smaller to him, at least for the moment. The sense of we-group and identification can be further enhanced when the knowledge seeker knows that the contributor volunteered to reply with little hope for reciprocity. Out of such identification, the knowledge seeker will think fondly about the contributor, creating a positive affect toward the contributor. The positive affect triggers the category-based processing. Subconsciously or consciously using the heuristics that members of the eNoP are able and benevolent, the knowledge seeker concludes to trust the contributor.

Following this reasoning, I argue that when members interact with other members or when members witness other members engaging each other (which is facilitated by the persistent nature of CMC technologies), they develop emotional bonds with other members and with the community in general. Eventually, they identify themselves with the community. Such identifications give birth to affection-based trust in eNoPs. Thus,

H5a: A knowledge seeker that identifies himself more with the eNoP perceives a knowledge contributor to have a higher level of ability.

H5b: A knowledge seeker that identifies himself more with the eNoP perceives a knowledge contributor to have a higher level of benevolence.

2.3 Situation-based Trust

Trust is situational because the context in which it develops can affect the assessment of ability and benevolence (Mayer et al. 1995). One way to understand such effects is to examine the ways in which trust-related issues – vulnerability, uncertainty, and risk – are handled, as Meyerson et al. (1996) did when studying trust development in temporary groups, groups assembled to finish a complex task under time pressure. According to these authors, the best way to handle these issues in temporary groups is to disregard them: Because temporary groups neither provide enough background nor allow enough time for their members to develop trust, group members resort to swift trust, presuming trust immediately and expecting trustworthy cooperation from others to get their tasks finished as expected.

The interactions in eNoPs resemble the dynamics in temporary groups in two senses. First, interactions between a knowledge seeker and a knowledge contributor are occasional and occur over only a limited period of time and hence are temporary. Second, few eNoPs offer sufficient background information for a knowledge seeker to draw inferences on the trustworthiness of a knowledge contributor. Unlike in temporary groups, the knowledge seeker and knowledge contributor do not share a common task. However, the knowledge seeker wishes that the contributor would cooperate and give out the needed knowledge much in the same way that members of temporary groups expect others to cooperate and work together to finish their tasks before the deadline. It is reasonable to theorize that a knowledge seeker holds swift trust toward a knowledge contributor.

Besides, the virtual nature of the eNoPs suggests that a knowledge seeker and a knowledge contributor do not have conflicting interests in real life. The knowledge seeker can assume that there is little to gain and hence no incentive for the knowledge contributor to behave opportunistically (e.g., by providing false information). Since the knowledge contributor is unlikely to hold any ill will, the knowledge seeker does not have to accept vulnerability to the contributor's malignant behavior, which makes it easier for the knowledge seeker to presume trust. The knowledge seeker does accept uncertainty and risk in trusting the knowledge contributor and adopting the advice. However, the risk and uncertainty result more from the very nature of the knowledge work the knowledge seeker is involved in than from concerns about the contributor's unpredicted behaviors. After all, acting on advice from others to solve a problem is inherently risky and

outcomes are always uncertain. Nevertheless, such uncertainty and risk should not prevent the knowledge seeker from forming swift trust.

With swift trust, a knowledge seeker expects to believe in the ability and benevolence of a knowledge contributor in eNoPs. How much she expects to trust can affect how much she actually trusts. One situational factor that can affect the expectation is how much the knowledge seeker wishes to acquire knowledge from the knowledge contributor: The more she wishes to gain the knowledge, the more she is motivated to trust the contributor, the more she desires to believe in the ability and benevolence of whomever is contributing the knowledge, and the more she actually trusts the knowledge contributor. This leads to the following hypotheses:

H6a: A knowledge seeker who more strongly wishes for the knowledge perceives a knowledge contributor to have a higher level of ability.

H6b: A knowledge seeker who more strongly wishes for the knowledge perceives a knowledge contributor to have a higher level of benevolence.

Length of tenure with an eNoP also may affect expectations about a knowledge contributor’s trustworthiness. Swift trust is not baseless trust: People just draw upon various experiences from their past to rapidly form an opinion about how much they would like to trust (Meyerson et al. 1996). Knowledge seekers who have been with the eNoP for some time have more experience with the community and its members. Their expectations of knowledge contributors’ ability and benevolence are likely to be more realistic and accurate. Newcomers, however, may have an overly sanguine view of an eNoP (Kling and Courtright 2003), which subsequently leads to higher expectations of the community overall and the knowledge contributors in particular. Thus newcomers can be more trusting than old-timers in eNoPs:

H7a: A knowledge seeker with shorter tenure in the eNoP perceives a knowledge contributor to have a higher level of ability.

H7b: A knowledge seeker with shorter tenure in the eNoP perceives a knowledge contributor to have a higher level of benevolence.

Figure 1 presents the research model and hypotheses graphically.

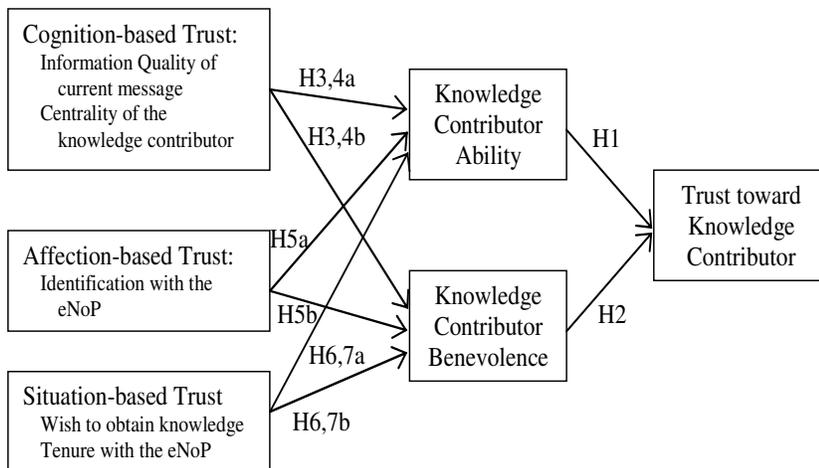


Fig. 1. Research Model

3. Research Method

Survey data collected for another study were used to offer a preliminary test of the research model and the hypotheses.

3.1 Research Site and Survey Administration

The research site in which the survey was conducted was CFD Online, the most popular eNoP for Computational Fluid Dynamics (CFD) professionals at the time of the survey, as evidenced by usage statistics. CFD Online employed web-based bulletin-board systems (BBS) to allow its members to communicate with each other by posting messages and replies. When posting a message or a reply, a member must provide an ID together with a message subject and content. There was no requirement for a member to always use the same ID, but members seemed to use IDs consistently. CFD Online kept an archive of all posted messages, storing them by the year in which they were posted. A simple, full-text search engine allowed members to search both the archives and current messages.

We solicited online survey participation from members who had posted a message requesting help in the three most popular BBS systems during the three months prior to survey administration. The potential participants were contacted by email. The final sample pool in CFD Online included 159 threads from the main forum and 108 threads from the two software-specific forums, which resulted in 267 total invitation emails. No incentive was offered to participants of this survey.

The survey asked how a participant – a knowledge seeker for the purpose of this study – treated a randomly selected reply to the most recent help that the participant had requested. The authors of the selected replies thus became the knowledge contributors for this study. The replies were displayed at the beginning of survey webpages. The purpose of doing so was to minimize inaccurate memory recall, to approximate random sampling, and to avoid potential selection bias by our survey participants had they been allowed to choose their own messages.

3.2 Respondents

25 of 267 invitation emails could not be delivered. 112 usable responses were received after one round of reminder emails, which resulted in an effective response rate of 46%. Demographically, a typical respondent was a highly educated young male: 71% of respondents had earned a master's degree, with another 24% holding a bachelor's degree. More than 80% of the respondents were 35 years old or younger, and only about 10% of them were female. Average experience in the CFD domain was around 3 years (mean = 3.07; standard deviation = 2.69; N = 111). More than half of the respondents had been visiting the CFD forums for more than a year, with an average of 22.95 months (standard deviation = 20.90; N = 111). In average, they visited the forums almost four times per week (mean = 3.80; standard deviation = 5.23; N = 112) and spent about three hours per week (mean = 3.02; standard deviation = 10.47; N = 112) in the forums.

3.3 Measures and Measurement Properties

Since the survey was originally designed and administrated to test a different research model, surrogate constructs and measures had to be used for many constructs in the current research model. Instead of directly measuring the dependent variable – *trust* toward a knowledge contributor, I measured *perceived trustworthiness* of a knowledge contributor. Many trust researchers consider perceived trustworthiness an antecedent that directly leads to trust (e.g. Mayer et al. 1995; Williams 2001). The perceived ability of a knowledge contributor was measured with items that asked a knowledge seeker's perception of the knowledge contributor's expertise in CFD in general and in the particular area of the information requested. Benevolence was measured with 4 surrogate items that were used to measure how likeable the knowledge contributor was.

The items used to measure the information quality of current messages were adopted from (Bailey and Pearson 1983). Centrality was measured by the number of unique members the knowledge contributor had interacted with during the previous six months before the reply message was posted, as in Wasko and Faraj (2005). Assuming that a knowledge seeker who identified more with CFD Online would spend more time in

the eNoP, I measured identification with the number of hours the knowledge seeker spent in CFD Online every week. The original survey asked when a knowledge seeker started to visit CFD Online. Answers to this question were converted into the number of months the knowledge seeker had been visiting CFD Online and were used to measure tenure with the eNoP. To reduce skewness, these three scores were transformed using a log transformation. Finally, the extent to which a knowledge seeker wished to obtain the needed knowledge from the knowledge contributor was measured with two items that asked the knowledge seeker the degree to which she hoped the reply contained the desired information. Appendix 1 enumerates all the items used and the sources for the items.

Table 1. Composite reliabilities, square roots of the AVEs, and correlations of constructs

	CR	1	2	3	4	5	6	7	8
1. Knowledge contributor trustworthiness	0.93	0.93							
2. Knowledge contributor ability	0.92	0.70	0.86						
3. Knowledge contributor benevolence	0.89	0.45	0.28	0.83					
4. Information quality of current message	0.93	0.61	0.65	0.45	0.84				
5. Centrality of knowledge contributor*	1.00	-0.09	-0.11	-0.01	0.03	1.00			
6. Weekly number of hours spent in the eNoP*	1.00	-0.01	-0.05	-0.05	-0.09	0.11	1.00		
7. Strength of wish for needed knowledge	0.77	0.31	0.36	0.13	0.23	0.03	-0.01	0.80	
8. Tenure with the eNoP*	1.00	-0.08	-0.10	-0.03	0.03	-0.08	-0.22	-0.05	1.00

CR Composite reliabilities.

N = 112. Diagonal elements (bold) are the square roots of the average variance extracted (AVE) by latent constructs from their indicators. Correlations > 0.20 significant at the 0.05 level and > 0.25 significant at the 0.01 level (two-tailed).

* Scores are log transformed.

A Structural Equation Modeling technique, Partial Least Squares (PLS, Chin 1998), was used to evaluate the measurement properties together with the structural model. The following were examined to determine the psychometric properties of measures: composite reliabilities of latent constructs, average variance extracted (AVE) by latent constructs from their indicators, correlations among the latent constructs, and the indicator-factor (cross-) loadings (Chin 1998). Table 1 reports correlations between constructs together with their composite reliabilities and square roots of the average variance extracted, and Table 2 presents the (cross-)loadings. I omit reporting detailed analyses in the interest of space, but suffice it to say, all measures displayed good measurement properties.

Table 2. Loadings and Cross-loadings for Constructs

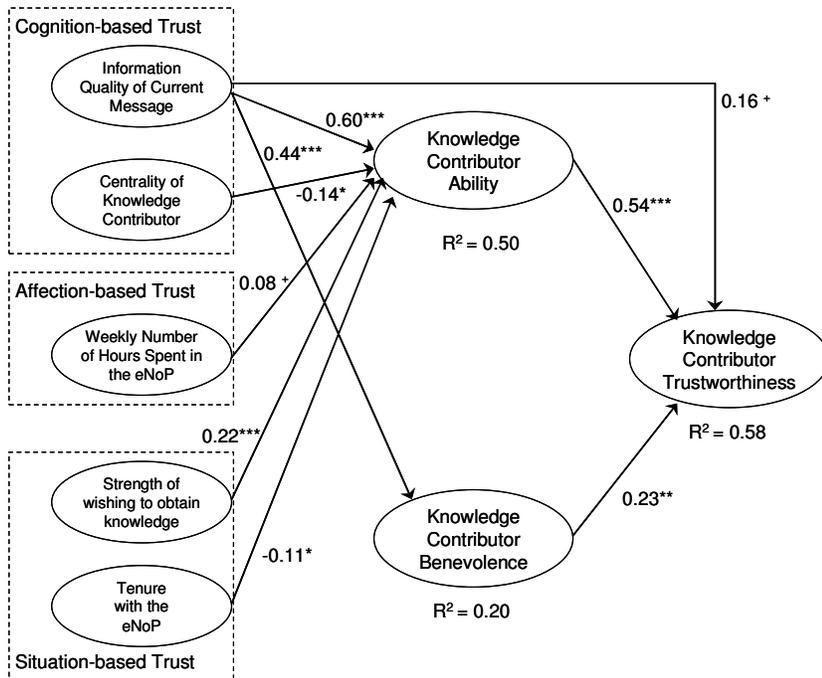
	T	A	B	IQ	S	Cent.	WH	Tenure
T1	0.93	0.64	0.41	0.54	0.33	-0.09	-0.03	-0.06
T2	0.94	0.67	0.42	0.59	0.24	-0.07	0.00	-0.07
A1	0.69	0.90	0.35	0.62	0.36	-0.03	0.02	-0.11
A2	0.58	0.88	0.24	0.53	0.35	-0.18	-0.04	-0.12
A3	0.64	0.86	0.22	0.51	0.31	-0.01	-0.02	-0.12
A4	0.49	0.78	0.12	0.56	0.20	-0.17	-0.17	0.03
B1	0.36	0.22	0.87	0.33	0.09	0.07	-0.01	-0.02
B2	0.37	0.20	0.86	0.40	0.16	-0.01	-0.10	0.05
B3	0.35	0.24	0.79	0.43	0.11	-0.08	0.00	-0.11
B4	0.39	0.26	0.78	0.29	0.08	0.01	-0.04	0.00
IQ1	0.62	0.49	0.44	0.83	0.26	0.02	-0.12	0.00
IQ2	0.59	0.61	0.40	0.87	0.21	0.06	-0.03	-0.03
IQ3	0.38	0.55	0.31	0.86	0.15	0.09	-0.18	0.05
IQ4	0.47	0.60	0.30	0.85	0.17	-0.01	0.01	0.02
IQ5	0.47	0.47	0.42	0.81	0.16	-0.03	-0.08	0.09
S1	0.10	0.08	0.12	0.01	0.59	0.05	0.04	0.07
S2	0.32	0.39	0.12	0.26	0.97	0.02	-0.02	-0.08
Cent.*	-0.09	-0.10	-0.01	0.03	0.03	1.00	0.11	-0.07
WH*	0.10	0.09	0.03	0.00	0.05	0.04	1.00	0.01
Tenure*	-0.07	-0.10	-0.03	0.03	-0.05	-0.07	-0.22	1.00

T knowledge contributor trustworthiness, *A* knowledge contributor ability, *B* knowledge contributor benevolence, *IQ* Information quality of current message, *S* Strength of wish for knowledge, *Cent.* Centrality of knowledge contributor, *WH* number of hours spent in the CFD Online weekly, *Tenure* Length of tenure with the CFD Online.

*Scores log transformed.

4. Results

Figure 2 graphically presents results from testing the structural model, showing only the paths that are significant at a minimum of the 0.15 level. Structural paths from both ability and benevolence to trustworthiness were significant ($\beta = 0.54$, $p < 0.001$ for ability and $\beta = 0.23$, $p < 0.01$ for benevolence), supporting H1 and H2.



Note: *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$; + $p < 0.15$.

Fig. 2. Results from testing the structural model

All hypothesized predictors were shown to affect knowledge contributor ability. The path between the information quality of the current message and knowledge contributor ability was highly significant ($\beta = 0.60$, $p < 0.001$), supporting H3a. Contrary to H4a, which predicted a positive influence of the centrality of the knowledge contributor on ability, the results showed a negative link between centrality and ability ($\beta = -0.14$, $p < 0.01$). H5a suggested that a knowledge seeker more identifying with the eNoP perceives the knowledge contributor's ability more favorably. It was moderately supported ($\beta = 0.08$, $p < 0.15$). H6a and H7a were about situation-based trust: H6a predicted that a knowledge seeker who strongly wishes for knowledge from the knowledge contributor is motivated to believe in the knowledge contributor's ability, and H7a predicted that a knowledge seeker who was a newcomer would have more favorable thoughts of the knowledge contributor's ability. Both were supported as the paths from both constructs to knowledge contributor ability were significant and in the predicted direction ($\beta = 0.22$, $p < 0.001$ for strength of wishing to obtain knowledge and $\beta = -0.11$, $p < 0.05$ for tenure with the eNoP).

The path between information quality and knowledge contributor benevolence was highly significant ($\beta = 0.44$, $p < 0.001$), supporting H3b. Information quality was also the only variable that could predict benevolence. No other significant effects on benevolence were found.

5. Discussion

The aim of this study was to shed more light on trust development in eNoPs by investigating the formation of a knowledge seeker's trust toward a knowledge contributor. For this purpose, I identified three bases upon which such trust is formed: cognition, affection and situation. ENoPs offer a unique environment for a knowledge seeker to examine, explore, and learn about the trustworthiness of a knowledge contributor, primarily because of the persistent nature of the CMC technologies employed by eNoPs. In this sense, trust in an eNoP is cognitive. Using social identification and social categorization theories, I argued that members

can develop strong emotional bonds with an eNoP and its members, which leads to affection-based trust. Finally, trust in eNoPs is situational in that the circumstance under which a knowledge seeker is searching for knowledge and the knowledge seeker's experience with the eNoP can affect the perceptions of trust, much in the same way as swift trust occurs in temporary groups. Survey data were used to offer a preliminary evaluation of the integrative model. Since the survey was not designed specifically for testing the current model, surrogate measures had to be used when necessary. The following discussions were developed with this limitation in mind.

The results indicated that both perceived ability and benevolence of a knowledge contributor are strongly significant antecedents of the contributor's perceived trustworthiness. *Post hoc* analyses on the direct links between the five independent variables and trustworthiness showed only a moderate effect of information quality on trustworthiness ($\beta = 0.16$, $p < 0.15$). Thus this study joined numerous previous studies in confirming that ability and benevolence are trustee characteristics that lead to trust toward a trustee. Future studies on trust development in eNoPs may focus on how perceptions of ability and benevolence are formed.

Among the five factors that were included in this study, only information quality of the current message simultaneously affected both ability and benevolence. All other factors appeared to work through ability only. This may indicate the central role that ability plays in affecting perceptions of trustworthiness. Given the focus on knowledge sharing in eNoPs, one may argue that a knowledge contributor's trustworthiness is built more on his ability than on his goodwill. Of course, in this preliminary test, benevolence was measured with items that were used to measure likeability. Future studies that measure perceived benevolence directly should generate more definite results on the role played by benevolence.

That information quality of the current message affects perceptions about both the ability and the benevolence of the knowledge contributor – in addition to perhaps directly affecting perceptions about the trustworthiness – suggested the importance of cognitive experience based on the current interaction with the knowledge contributor in the formation of trust toward the contributor. A knowledge seeker appears to base much of his assessment of a knowledge contributor's trustworthiness on the quality of the content of the message the contributor posted. Higher-quality reply messages can lead the knowledge seeker to trust the contributor more.

The negative relationship between centrality and knowledge contributor ability was surprising (Table 1). In this preliminary study, a knowledge contributor's centrality in the eNoP was measured by how many unique members she had interacted with. In retrospect, this measure might have picked up some other characteristics of a knowledge contributor, for example, her visibility in the eNoP, in addition to centrality. When a knowledge contributor is more visible, other members will have more opportunities to witness how she interacts with other members. The increased opportunities enable other members to form an accurate assessment of the knowledge contributor's ability and benevolence. In this way, the effect of centrality, as measured in the current study, resembles how tenure with the eNoP works: It curbed a knowledge seeker's sanguine expectation of the knowledge contributor's ability and benevolence.

Moreover, it is argued that a knowledge seeker could learn of a knowledge contributor's position in the social network in an eNoP in two ways: by observing how the knowledge contributor had interacted with other members when the interactions occurred, or by reconstructing the participation history of the knowledge constructor and then reviewing how the knowledge contributor interacted with other members. However, reconstructing the participation history in the CFD Online may be more difficult than in other eNoPs. The CFD Online offered rather rudimentary searching functionalities. Its search engine performed only simple, full-text searches that did not allow users to specifically search by authors. It might be neither efficient nor effective for a knowledge seeker to review a knowledge contributor's past involvement in CFD Online by searching through the archived messages. More likely than not, a knowledge seeker must invoke memo-

ries of having observed the knowledge contributor's past interactions in CFD Online. If this was true, then the effect of centrality should be more significant for members who had been with CFD Online longer. To probe whether this was the case, an interaction term between the centrality of the knowledge contributor and the length of tenure of a knowledge seeker with the CFD Online was added to the model. Analysis suggested that the interaction term did not change the negative effect of centrality on ability, but it positively affected trustworthiness directly ($\beta = 0.13$, $p < 0.01$). It appeared that old-timers consider a knowledge contributor who had been at the center of the social network in CFD Online automatically more trustworthy. They draw such a conclusion even without referring to the knowledge contributor's ability and benevolence. This interaction between the knowledge contributor's centrality and the knowledge seeker's tenure could be an interesting area of future research.

Taken together, the significant findings for both the information quality of the current message and the knowledge contributor's centrality lend strong support for cognition-based trust in eNoPs. They also suggest that cognition based on current message exchanges with the knowledge contributor was the most important base for trust in eNoPs. Of course, this remains to be seen more conclusively in future studies.

To detect the existence of affection-based trust, I used the number of hours a knowledge seeker spent in CFD Online every week to measure her identification with the community. The result did show – albeit only moderately – that a knowledge seeker who spent more time in CFD Online had a more favorable opinion of the knowledge contributor's ability. Extending research on swift trust in temporary groups, I argue that trust in eNoPs is also situational, and the data showed strong support for a situation-based assessment of knowledge contributors' ability: The strength of wishing for knowledge and a knowledge seeker's tenure with CFD Online predicted the knowledge contributor's ability, as predicted. While future studies are certainly needed to overcome the use of surrogate measures in this study, the results, nevertheless, are consistent with the theoretical arguments for affection-based and situation-based trust.

While cognition-based trust stems from a knowledge seeker's direct or indirect experience with a knowledge contributor, whether current or historical, affection-based trust stems from the knowledge seeker's identification with the community (including, but beyond the knowledge contributor) and situation-based trust from the unique, constantly changing, knowledge-seeking situation in which the knowledge seeker finds herself. Both affection-based trust and situation-based trust, as defined and operationalized in the reported study, are less trustee-specific and in a certain sense less factual than cognition-based trust. One may even argue that affection-based trust and situation-based trust are *blind* trust compared with cognition-based trust. Under certain circumstances, affection-based trust or situation-based trust may suppress necessary cognitions and lead the knowledge seeker to misplace trust. For example, when the knowledge seeker was under time-pressure and could not process the current reply message fully, category-driven processing may take over and induce affection-based trust (Williams 2001), which could further bias how the knowledge seeker viewed the received message (Chaiken and Maheswaran 1994). Such a “dark side” of trust (Szulanski et al. 2004) might be an interesting topic for future research on trust in eNoPs, and knowledge seekers should be aware of it.

ENoPs inherently rely on software that uses information and communication technologies to support interactions among community members. To the extent that trust facilitates knowledge sharing in eNoPs, the software that supports eNoPs should be designed in a way that promotes trust-development. This study could offer a few suggestions for doing so. In particular, given the importance of cognition-based trust, software should help knowledge seekers learn about knowledge contributors. For example, some communities offer a profile page for each of contributor that contains information about his or her past involvements within the community (Zhang and Watts 2002). These pages provide a central place where a knowledge seeker can learn about a knowledge contributor, which can positively affect trust development in an eNoP.

The software also can display graphically the social network weaved in the community through message exchanging, thus explicating the position a knowledge contributor holds in an eNoP and allowing a knowledge seeker to draw inferences on the knowledge contributor in a more informed way. Software can even make affection-based or situation-based trust less blind or provide alternatives to reduce the knowledge seekers' dependence on them. For example, commercial communities, such as eBay, have used a feedback system to provide its members a straightforward way to evaluate and assess sellers' trustworthiness (Melnik and Alm 2002). Similar systems may be deployed in eNoPs to offer a simple, easy-to-use trustworthiness index of knowledge contributors. The model presented in this paper can be used to help determine the effectiveness of such feedback systems.

6. Conclusion

In conclusion, the reported study explores trust development in eNoPs by investigating how a knowledge seeker forms trust toward a knowledge contributor. An integrative model was proposed and preliminarily tested with data collected from another study. Despite all the limitations of the preliminary test, the overall results were encouraging. The research model appeared plausible, and a future survey study using better measurements looks promising. The preliminary test also suggested a few new research directions that are worth pursuing in future studies.

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Appendix I. Measures and Indicators

Information Quality: from (Bailey and Pearson 1983)

You think the information in the message was:

Ambiguous	1	2	3	4	5	6	7	Definite	
Incomplete	1	2	3	4	5	6	7	Complete	
Uninformative		1	2	3	4	5	6	7	Informative
Inaccurate	1	2	3	4	5	6	7	Accurate	
Insufficient	1	2	3	4	5	6	7	Sufficient	

Knowledge contributor trustworthiness: Adapted from (Sussman and Siegal 2003)

How trustworthy was the author of the message?

Not trustworthy	1	2	3	4	5	6	7	Trustworthy
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How reliable was the author?

Not reliable	1	2	3	4	5	6	7	Reliable
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Knowledge contributor ability: Adapted from (Sussman and Siegal 2003)

How knowledgeable was the author of the reply in CFD?

Not knowledgeable	1	2	3	4	5	6	7	Knowledgeable
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How knowledgeable was the author in the specific area of your question?

Not knowledgeable	1	2	3	4	5	6	7	Knowledgeable
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To what extent was the author an expert in CFD?

Not expert	1	2	3	4	5	6	7	Expert
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To what extent was the author an expert in the specific area of your question?

Not expert	1	2	3	4	5	6	7	Expert
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Knowledge contributor benevolence: *From (Chaiken 1980)*

The author was:

Arrogant	1	2	3	4	5	6	7	Modest
Unlikable	1	2	3	4	5	6	7	Likeable
Biased	1	2	3	4	5	6	7	Unbiased
Insincere	1	2	3	4	5	6	7	Sincere

Strength of wishing for knowledge (*self-developed*):

I wished replies to my message would close some specific gaps in my solution to my question.

Strongly Disagree	1	2	3	4	5	6	7	Strongly Agree
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I hoped replies to my message would have the information I was searching for.

Strongly Disagree	1	2	3	4	5	6	7	Strongly Agree
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