Trust as an Antecedent to Knowledge Sharing in Virtual Communities of Practice

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Abstract. This study focuses on the role of trust in knowledge sharing in the context of virtual communities of practice. Trust is widely accepted as an important enabler of knowledge management (KM) processes. We conceptualise trust across three dimensions, namely: competence, integrity, and benevolence; we test hypotheses as to the effect of these facets of trust on knowledge sharing by surveying an intra-organisational global virtual community of practitioners. The results indicate that all three dimensions of trust are positively related to knowledge sharing behaviour. Trust based on the perceived integrity of the community was found to be the strongest predictor of knowledge sharing behaviour. Our findings suggest that the dimensions of trust buttress each other; although they are theoretically distinct, they appear to be empirically inseparable. We propose that in order for knowledge sharing to be enabled, trust must concurrently exist in all three dimensions. The implication to organisations in their recruitment policy is to include competence, integrity and benevolence in their sought-for

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attributes of new employees. KM practitioners also have to encourage these attributes in existing employees, who are potential members of on-line communities of practice.

Knowledge sharing itself was conceptualised with three components – quantity (frequency), quality (usefulness or value), and focus (the degree to which an individual feels that they engage in knowledge sharing). Of the three components, focus exhibits the most significant relationship with trust factors. This finding makes knowledge sharing less tangible than perhaps would be expected. It suggests that establishing whether knowledge has been shared is more than counting the frequency or trying to evaluate the usefulness of the shared knowledge. These aspects are important especially to management, but to the individual who shares knowledge, his feelings of having shared knowledge appear to be more important. With the current understanding that knowledge sharing is more of a human activity than technology, it is important that any information systems should be assistive to boosting users' confidence that they are indeed sharing knowledge. If the systems do not re-enforce the users' knowledge sharing orientation, knowledge sharing may be discouraged.

Notwithstanding the point made about knowledge sharing focus, it is necessary to take into consideration all the components of knowledge sharing to fully capture the concept. This was well indicated when the combined variable of all (rather than individual) knowledge sharing items had the strongest correlation with trust factors.

Keywords: knowledge sharing, trust, communities of practice, knowledge management, on-line communities

1 Introduction

The management of the knowledge base of organisations is becoming an area of strategic focus for many knowledge-intensive organisations (Ruggles 1998; Beaumont and Hunter 2002). Indeed, knowledge is unique as an organisational resource in that most other resources tend to diminish with use; the potential for growth in knowledge resources increases with use, as "ideas breed new ideas, and shared knowledge stays with the giver while it enriches the receiver" (Davenport and Prusak 1998: p. 16-17). Hence, understanding key knowledge management (KM) processes is a growing area of organizational research efforts (cf Shariq, 1997; Nielsen, 2006).

Within the KM field, there is a widespread acceptance of the role of communities of practice as a key KM enabler (Wenger, 1998; Wenger, McDermott and Snyder, 2002; Scholl, Konig, Meyer and Heisig, 2004; Choi, 2006). CoPs have been described as groups of people "informally bound together by shared expertise and passion for a joint enterprise" (Wenger and Snyder 2000: 139), "playing in a field defined by the domain of skills and techniques over which the members of the group interact" (Lesser and Storck 2001: 831). Such communities provide a rich locus for the creation and sharing of knowledge both within and between organisations (Brown and Duguid 1991; Lesser and Everest 2001). Information and communication technologies are now extending the boundaries of traditional face-to-face communities by creating virtual communities that enable global asynchronous and real-time collaboration

(Hildreth and Kimble 2000). These communities may exist primarily, or solely, online and become largely dependent on computer-mediated communication to connect members.

However, the availability of information systems does not automatically induce a willingness to share information and develop new knowledge (Nahapiet and Ghoshal 1998). Indeed, research has found that social interaction that is mediated by online technologies can be less effective than face to face meetings (Preece 2000). Despite such limitations of technology, research has shown that emotional attachments can develop online, despite a lack of face-to-face contact (Rheingold 1993; Preece 2000). The building of trust is an important social process that is widely accepted as a prerequisite to cooperation (for example: Gambetta 1988; Ring and Van de Ven 1994; Mayer, Davis, and Schoorman, 1995; Nahapiet and Ghoshal 1998; Wang and Ahmed 2003). Research has shown that levels of trust influence the exchange of resources between intra-organisational business units (Tsai and Ghoshal 1998) and research investigating knowledge sharing has found trust to be important in the receipt of useful knowledge (Levin, Cross, and Abrams, 2002). It logically follows that virtual communities that fail to develop trusting relations will restrict the development of knowledge-sharing activities. As cited by Bakker, Leenders, Gabbay, Kratzer, and Engelen (2006, p 597), Dietz and den Hartog (2005) concluded their thorough review of trust definitions with the three ways trust can be expressed, viz. a belief, a decision and an action. This study examines the tendency that trust leads to action (knowledge sharing). Therefore, like Bakker *et al.,* we use definitions of trust that encompass belief. Our definition of trust is dealt with in section 2.3. Meanwhile, let us return to Levin *et al.*'s research.

While Levin *et al.*'s research focused on the receipt of knowledge, there appears to be little current understanding as to the importance of trust in the *provision* of knowledge in general, and specifically within the context of virtual communities of practitioners. Ardichvili, Page and Wentling (2003) conducted an exploratory study into the factors that affect knowledge sharing within intra-organisational virtual communities of practice. Their findings identify a lack of understanding of the role of trust in the provision of knowledge. Our paper takes up this challenge by investigating the role of trust, in its many guises, in the provision of knowledge within a virtual community of practitioners.

The following section sets out our operational definitions of knowledge sharing and trust. This leads to the development of a number of hypotheses as to the relationship between three facets of trust and knowledge sharing. We discuss the design of the empirical research, and test the hypothesised relationships. Findings are then presented and reflected upon. We conclude the paper with future research directions and discuss the limitations of this study.

2 Operational definitions

Knowledge is an intangible resource and is thus difficult to measure. Indeed, a review of the literature has established that knowledge sharing in not well defined for the purposes of empirical research. In order to understand knowledge sharing, it is necessary to define what we mean by knowledge, and how this relates to information and data.

2.1 Knowledge, Information and Data

Knowledge can only exist in the mind of the individual (Van Beveren 2002). It is through knowledge that we perceive the world around us; knowledge largely determines how we interpret and respond to external stimuli. Hence, knowledge often determines action. Knowledge is acquired through a process of action and reflection (Argyris and Schon 1978). Within this process, the interaction and communication of two or more individuals can lead to the exchange and sharing of knowledge. Here, information facilitates this process and acts as a communicatory representation of knowledge.

Data is the raw component of information. Intrinsically, data contains no meaning, data becomes information when framed within a meaningful context. On their own, the numbers 56 and 1648 are just items of data. Framed within a context, such data may provide information, for example, the number 56 bus is due at 16:48 hours. Hence data is transformed into information. It is knowledge which provides the context that creates information from data and it is through the interpretation of such information that new knowledge may be acquired. Hence, information and knowledge intrinsically facilitate the knowledge-sharing process.

2.2 Knowledge Sharing

As we have described, knowledge *per se* cannot exist outside the mind of the individual. Knowledge sharing involves a process of communication whereby two or more parties are involved in the transfer of knowledge. This is a process that involves the provision of knowledge by a source, followed by the interpretation of the communication by one or more recipients. The output of the process is the creation of new knowledge. Hence, knowledge sharing is defined as a process of communication between two or more participants involving the provision and acquisition of knowledge. Indeed, the communication can take many forms, using both verbal and non-verbal mechanisms, with or without the use of technology. Even with the existence of information systems, knowledge sharing is a difficult challenge for organisations (Argote *et al.*, 2000; Szulanski, 1996; Bakker *et al*., 2006). Most studies that endeavour to address this challenge have finger-pointed trust as a major determinant of knowledge sharing. For

instance, Andrews and Delahaye (2000) found that "perceived trustworthiness – based on perceptions of what colleagues were likely to do with sensitive information - was the factor that influenced knowledge-sharing decisions." (p797). Similarly, Corritore *et al.* (2003) found trust to be a key element of success in an on-line environment. Also, Chowdhury (2005) used his study to demonstrate that the presence of trust facilitates complex knowledge sharing.

2.3 Trust

As a concept, trust is much debated with no consensus other than that it is both complex and multifaceted (Kramer and Tyler, 1996; Fisman and Khanna 1999; Adler 2001; Simons 2002). Fukuyama (1995) views trust as "the expectation that arises within a community of regular, honest, and cooperative behaviour, based on commonly shared norms, on the part of the members of the community" (p. x). This view of trust based on the expectation of honest and cooperative actions is shared by many (for example, Gambetta 1988; Mishra 1996; Bhattacherjee 2002). Mayer *et al.* (1995) define trust as "the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party" (p. 712). Both definitions above relate to a confidence in others' future actions, with Mayer *et al.* extending their definition by arguing that in order to be vulnerable, one must be willing to take a risk based on the trusting relationship. An important distinction is that Fukuyama views trust as based on shared norms within a group; Mayer *et al.* approach their definition from a dyadic level, analysing the existence of trust between two individuals.

Simons (2002) notes that Mayer *et al.'s* (1995) definition of trust is often cited in the literature. Mayer *et al*. identify three attributes of another party in which perceptions of trust can be based, namely, benevolence, integrity and ability.

This can be seen to extend Fukuyama's definition of trust by incorporating ability as a specific antecedent to trust. Mishra (1996) goes further by defining four dimensions of trust: concern, reliability, competence and openness. The meaning of "concern", ie "a feeling of sympathy for someone or something" as defined by American Psychological Association (APA)†, resonates‡ with the term "benevolence" which is defined by the same source as "an inclination to do kind or charitable acts". "Integrity" is about honesty and truthfulness". So is "reliability" thus making the two words synonymous (APA). "Ability" is directly defined as "*competence* [italics mine] in an activity or occupation because of one's skill, training, or other qualification" (APA). We can therefore conclude that concern, reliability and competence can be seen to mirror benevolence, integrity and ability, respectively. We are now left with the extra trust dimension

† Full details are in the reference list.

‡ Both "concern" and b"benevolence" share a common synomym: "care" (APA)

– openness – as defined by Mishra. Mayer *et al.* (1995) highlight the overlap of the openness dimension with their benevolence and integrity dimensions, arguing that "Mishra's openness is measured through questions about both the trustee's general openness with others and openness with the trustor, which could be expected to be related to either integrity or benevolence, respectively" (p. 722). Figure 1 presents the overlap (mapping) of the two definitions of trust. Bakker *et al.* (2006) as well as Deitz and den Hartog (2005) agree that although the different dimensioning of trust by several authors bear different labels, they are broadly the same. Although Mayer *et al*'s definition of trust was dyadic, it mirrors non-dyadic definitions, for example Mishra's as explained in this paragraph. Besides, Mayer *et al.*'s definition is perhaps the most cited and used even for non-dyadic studies such as communities of practice. For instance, Bakker *et al.* (2006) recently used Mayer *et al.*'s definition in their study of knowledge sharing in product development projects. Given the discussion in this section, and in the interests of parsimony, we adopt Mayer's conceptualisation of the three characteristics of another party in which trust may be held.

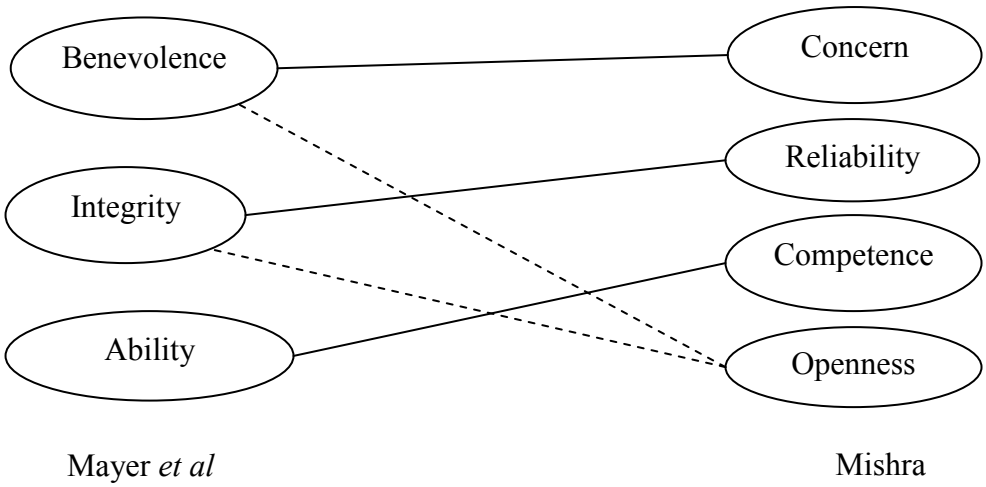

Figure 1: Mapping between Mayer *et al.* (1995) and Mishra's (1996) definitional components of Trust

3 Conceptual Model: Trust as an Antecedent to Knowledge Sharing

In virtual communities, trusting relations can emerge without any direct social interaction due, in part, to the transparency of online communications. A newcomer typically has access to an electronic record of previous discussions and access to knowledge-based assets held in the community's common repositories. Perceptions of trustworthiness based on competence, honesty, benevolence and

behavioural reliability provide confidence in future actions, and can be fostered by the high degree of openness and visibility surrounding online communications within virtual communities. This in turn fosters greater levels of cooperation, and discourages opportunistic behaviour (Fishman and Khanna, 1999).

3.1 Competence

Ability- or competence-based trust exists when an individual believes that another party has knowledge and expertise in relation to a specific domain (Jarvenpaa, Knoll and Leidner 1998). This facet of trust can be related to the *fear of losing face* that Ardichvili *et al*. (2003) identified as one of the main barriers to knowledge sharing in online communities of practice. For example, if a member's perception of her own competence is significantly lower than the level of competence that she associates with the virtual community, then the motivation to publicly share her knowledge may be affected due to the fear of criticism or ridicule. This suggests a causal link between one's perceptions of the community's ability and engagement in knowledge sharing, whereby high levels of competence-based trust could restrict the knowledge shared with a community. However, whereas this argument appears to make logical sense, the converse does not logically hold. Where a member perceives a community to be of low competence, such a perception is unlikely to encourage knowledge sharing. In fact, such perceptions are more likely to discourage any form of voluntary participation in the community.

Another dynamic emerges when we consider the perspective of competence-based trust in motivating community participation. According to Lave and Wenger's (1991) theory of situated learning, a newcomer to a community of practice becomes involved in a transition, over time, from peripheral participation in the practice towards becoming a masterful practitioner. This process involves a member learning by becoming situated within the field of the community's practice. Within virtual CoPs, the process of situating in the community's practice involves members creating and sharing knowledge by engaging in intellectual exchange through their participation in the community's computer-mediated communications. By sharing and developing ideas, by testing and validating assumptions, by discussing, problem solving and generally striving to become more competent practitioners, the community members are able to engage in the mutual development of both their own knowledge and the community's pool of expertise. With this ongoing process, members engage in the development of cooperative and trusting relations whilst simultaneously developing knowledge of what it means to be a competent and masterful practitioner (Nahapiet and Ghoshal 1998). Within this process, we define a member's *passion for the practice*, as the desire to become a more competent practitioner and to engage in the community's practice. Where a member's

passion for the practice is high, the member will be more likely to seek engagement and interaction with a community of competent practitioners.

From this perspective, the role of competence-based trust can be seen both as a potential enabler and barrier to community participation. When motivated by a passion for the practice, sharing knowledge with a community one perceives as highly competent becomes an intrinsically rewarding experience. The rewards derived from the consensual validation received from a community held in high regard can act as a motivator to members to share their ideas, thoughts, and insights.

McMillan and Chavis (1986) discuss the process of consensual validation, describing how "people will perform a variety of psychological gymnastics to obtain feedback and reassurance that ... what they see is real and that it is seen in the same way by others" (p. 11). In communities of practice, consensual validation may go further, acting as a mechanism that represents a member's transition from peripherality to central participation; in effect validating a member's standing within the community. Thus, the community's consensual validation may act as a form of recognition, establishing and confirming one's status as a knowledgeable practitioner.

Conversely, sharing knowledge with a community one perceives to be of low competence will be an inherently less rewarding experience. Not only is the value derived from the community's validation reduced, but member's perception of their self worth is also diminished when identifying and participating within a community perceived to be of limited competence.

From the above discussion, we have identified a different dynamic that the role of competence-based trust may play in terms of enabling and disabling community participation in general, and knowledge sharing specifically. It is possible that the motivating effect driven by the opportunity to become a competent practitioner could potentially overcome the fear of losing face identified by Ardichvili *et al*. (2003). Likewise, it is equally possible that fear of losing face will be the dominant force. In other words, we can consider fear of losing face as a moderating variable such that if it exists at intense levels could change from positive to negative the relationship between competence and knowledge sharing. Based on this uncertainty, we propose the following hypothesis.

> H_1: One's degree of trust in the competence of a community *is positively related to* one's engagement in knowledge sharing with the community.

3.2 Benevolence

A shared interest in the community's practice can foster the development of a sense of community amongst members through a process of identification

between members. The process of identifying with a community enhances the individual's concern with collective processes and group outcomes (Kramer, 1996, in Nahapiet and Ghoshal, 1998), and has been found to relate to expectations of benevolent behaviour and community participation (Chavis and Wandersman, 1990). Where the sense of community is strong and benevolence is high, community members are more likely to perceive knowledge as a public good, owned and maintained by the community. Wasko and Faraj (2000) note:

> "With a public good, the economically rational action is to free-ride. [However,] the motivation to exchange knowledge as a public good goes beyond the maximisation of self-interest and personal gain. People do not act only out of self-interest, but forego the tendency to free-ride out of a sense of fairness, public duty, and concern for their community … People often behave altruistically and pro-socially, contributing to the welfare of others without apparent compensation" (Wasko and Faraj, 2000: 161-2).

From the public good perspective, knowledge sharing can be viewed as self-motivated through a sense of moral obligation and a general desire to be part of something larger. Such pro-social behaviours lead to the emergence of trust based on the perceived benevolence of the community, whereby members expect that help will be reciprocated should it be requested.

Conversely, if one's sense of a community's benevolence is low, expectations of future reciprocity may likewise be low, and knowledge sharing is unlikely to be fostered. Furthermore, if low perceptions of a community's benevolence are combined with high perceptions of the community's competence, this may exacerbate the fear of losing face barrier discussed above. Benevolence-based trust will contribute to overcoming the fear of losing face by creating the confidence that one will not be criticised or made to look foolish when engaging publicly in sharing one's knowledge.

Further to this, knowledge sharing can be viewed from the perspective of Bar-Tal's (1976) theory of Generalised Reciprocity. From this perspective, the beneficiaries of knowledge-contributions are likely to seek to reciprocate benevolent actions with the collective, where direct reciprocation is not possible. Hence, we put forward the following proposition:

> H_2: One's degree of trust in the benevolence of a community *is positively related* to one's engagement in knowledge sharing with the community.

3.3 Integrity

Integrity is a much debated concept within the trust literature. Sitkin and Roth (1993) discuss how perceptions of integrity-based trust are engendered within organisations by the perception of congruence between an individual's values and the core cultural values of the organisation; the authors' premise being that perceptions of value incongruence will foster feelings of distrust. This

perspective sits close to Mayer's *et al*.'s definition of integrity-based trust based on "perceptions that the trustee adheres to a set of principles that the trustor finds acceptable" (p. 719). Mayer *et al*. elaborate on this understanding by defining a number of factors that influence the creation of integrity-based trust, such as: the independent verification of the trustee's integrity from reputable third parties; perceptions that the trustee holds an acceptable level of moral standards; and demonstration of consistent behaviour including congruence between a trustee's actions and words. The focus on the alignment between an actor's actions and words is what Simon's (2002) has defined as *behavioral integrity*; he describes this as the extent an individual is perceived to "walk her talk", adding that, conversely, it reflects the extent to which she is seen to be "talking her walk" (p. 19). Hence, trust in the integrity of a virtual CoP might be thought of as based in part on the compatibility of the community's cultural values with those of the trusting member, the credibility of the community's reputation, and the consistency of community members' past behaviour such as the extent to which actions are congruent with words.

What can be derived from this understanding of integrity is that such perceptions are rooted in past behaviour. Consistent and reliable past behaviour creates confidence in future actions. If a member expects that other members' future behaviour may lack integrity, for example, by acting dishonestly, unreliably or in a manner that is otherwise incongruent with her personal values, she is not likely to readily engage in sharing knowledge with the community. Conversely, she is likely to be more willing to engage in cooperative interaction where perceptions of honesty and expectations of behavioural reliability are high. Hence,

> H_3: One's degree of trust in the integrity of a community *is positively related* to one's engagement in knowledge sharing with the community.

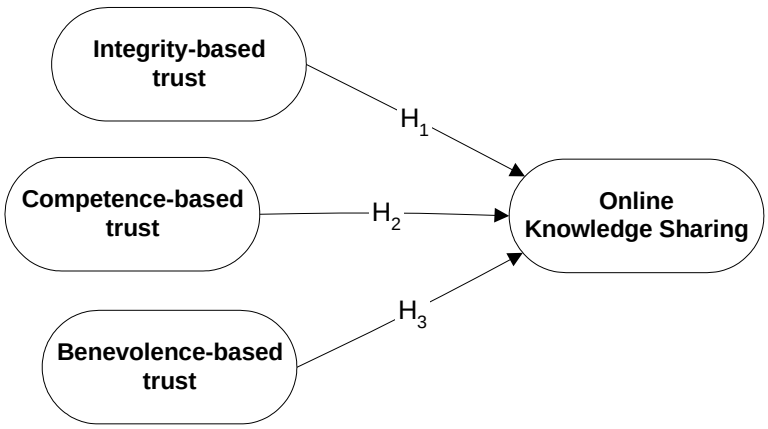

Figure 2: The Antecedence of Trust to Knowledge Sharing

4 Methodology

4.1 Data Collection

For the fieldwork, CSC, a Fortune 500 global IT services organisation provided access to a suitable virtual community of practitioners. CSC employs over 79,000 people worldwide specializing in business process and information systems outsourcing, systems integration and consultancy services. The company have been focussed on knowledge management, and have been operating multiple online 'knowledge communities', for a number of years.

Interviews with a number of community leaders were held to develop an understanding of the role of the communities and the mechanisms used to share knowledge. Access was granted to survey the organisation's Systems Thinking Community, a global online competence-based group of over 400 members that had been in existence for over 4 years. The community's main purpose is to improve the organisation's business performance by applying the tools of systems thinking. The community develops decision simulation models by running online systems thinking courses via the Portal, with online workshops using Lotus SameTime. Membership and participation is entirely voluntary, and when the survey was conducted, 120 of the members were actively engaged in the current course. Members received a link to the survey sent out by email.

4.2 Measurement Development

4.2.1 Knowledge sharing

As knowledge sharing involves two or more participants engaged in the provision and acquisition of knowledge, it can therefore be measured from the perspective of both the source and the recipient of the exchange. However, this research addresses the role of trust in the provision of knowledge. Given that in the context of online communities there may be multiple recipients of shared knowledge, some of whom the provider may be unaware of, a logical approach to measuring knowledge sharing would be to understand how to tap into the construct from the source's perspective. Hence a number of metrics were devised to measure the provision of knowledge from the perspective of the knowledge *source*[§].

When measuring specific behaviour, frequency of engagement in that behaviour is often used as an indicant (for example, Yoo *et al.* 2002). However, we argue that in relation to knowledge sharing, such an approach in itself is deficient. Knowledge is intangible; therefore it cannot be easily quantified. The frequency of engagement in knowledge sharing behaviour does not indicate the

[§] See Appendix – Section A

quality, usefulness or value of the knowledge provided or acquired. For example, a single contribution could have more value than ten contributions combined. Hence, measures that tap into both the *quality* (A5-A8) and *quantity* (A1-A2) of an individual's provision of knowledge were developed. For example, A5 seeks to measure usefulness of shared knowledge by the statement "Other community members find my knowledge-sharing contributions to be useful"; and A1 seeks to measure frequency of knowledge sharing with the statement "I frequently share my knowledge with others in the community." Finally, the degree to which an individual feels that they engage in knowledge sharing will provide an indication of the individual's knowledge sharing *orientation*. Hence, knowledge sharing focus was measured as a third dimension of knowledge sharing behaviour; two measures were developed to tap into this dimension (A3-A4). To illustrate, A4 that targets orientation states "I try to share my knowledge with the community."

4.2.2 Trust

McKnight *et al.* (2002) developed the Trusting Beliefs Scale, which measures the degree to which an individual believes another party to be trustworthy. The original scales were designed for examining levels of trust held in online vendors and have been adapted to fit the context of this study**. C1-C3 measure the degree to which one perceives a community to be highly benevolent, C4-C7 measure the degree to which one perceives a community to behave with high integrity, and C8-C11 measures the trusting belief in the competence of the community.

4.2.3 Likert scale

Each of the appendix statements, numbered A1 to A9 for knowledge sharing items and C1 to C12 for trust items, were accompanied with a likert scale that allowed respondents select from seven points which ranged from strongly disagree (point 1) to strongly agree (point 7).

5 Data Analysis

After partially completed and spoiled questionnaires were removed, this exercise yielded 75 usable responses††, representing a response rate of 18%. This response was appreciated given that only 27% of the community members were actively engaged in the current course. Furthermore, Saunders *et al.* (2000) have pointed out how time poor modern organizations can be with regards to research, and this is emphasized with multi-national organizations such as this study was based. The responses were received from members primarily based in the US

** See Appendix – Section C

†† 75 individual respondents who were sources of knowledge sharing.

(45%), UK (34%) and Australia (11%). Members based in Switzerland, Spain, Denmark and India made up the remaining 10%. The respondents were predominantly male (81%), with the average length of tenure being 5 years, 10 months.

5.1 Validity and Reliability of Measures

Kirk and Miller (1986, p 21) rightly make the point that "no experiment can be perfectly controlled, and no measuring instrument can be perfectly caliberated. All measurement, therefore, is to some degree suspect." Notwithstanding, it is important and well accepted in research that significant attempts have to be made to assess the validity and reliability of measures to increase the credibility of conclusions drawn from them.

5.1.1 Validity

Simply put, validity refers to how well items or a scale measures what it purports to measure (Litwin, 1995, p 33). Validity gives the researchers, their peers and the society at large the confidence that methods selected are relevant to the quest for scientific truth‡‡ (Nunnaly, 1978; Straub *et al,* 2004, p 383). Content, construct and criterion validities were considered in this study.

5.1.1.1 Content Validity

The measures were adapted from previously validated scales developed by McKnight *et al.* (2002) as explained in 4.2.2. McKnight *et al*'s scales measured not only the criterion variable (trust) but also the predictors (benevolence, integrity and competence). The adaptation of these scales to reflect the context of this study required further validation of content and indirectly constructs (Litwin, 1995). This was achieved by asking two of the community leaders and two senior academics for feedback on the validity of the scales. Following this feedback, a number of the measures were reworded to aid clarity. A negatively loaded question was incorporated into the survey as a reliability check.

5.1.1.2 Construct Validity

Litwin (1995, p 43) states the *caveat* that while construct validity is the most valuable, it is the most difficult to understand, measure and report because it measures how meaningful a scale or survey instrument is when in *practical* use which often is determined not by quantifiable statistic but my experience from

‡‡ "Scientific truth" is the quest of positivist research; the desirability of validity in research is also common with phenomenological or qualitative researchers. For example Kirk and Miller(1986) writing on qualitative research, address the issue of validity.

years of use. Notwithstanding, this study used factorial validity which is favoured in IS research (Straub et al, 2004, p 385).

A principal components analysis was conducted. As we hypothesised a relationship between the trust and knowledge sharing constructs, an oblique rotation was used (McKnight et al., 2002; Pallant, 2005). Following theory and specifying 1 knowledge sharing and 3 trust factors we have the results in Table 1.

Considering Table 2, the 3 items generally cluster at their expected factor grouping except the integrity item 6 T_INT which rather loads on the benevolence factor. The fact that there is some cross loading of the factors suggests that though the factors are theoretically distinct, they buttress each other hence suggesting that each of the factors need to be encouraged.

Table 1: 4 Factor Extraction - Oblimin

	1	2	3	4
K-SHR7	0.92			
K-SHR9	0.91			
K-SHR6	0.90			
K-SHR1	0.88			
K-SHR2	0.82			
K-SHR3	0.82			
K-SHR4	0.81			
K-SHR5	0.79			
K-SHR8	0.79			
11 T_CMP		0.90		
8 T_CMP		0.89		
10 T_CMP		0.86		
9 T_CMP		0.82		
1 T_BEN			0.85	
2 T_BEN			0.73	0.45
6 T_INT			0.70	
3 T_BEN			0.67	
5 T_INT		0.38		0.57
4 T_INT	0.33	0.37		0.50
7 T_INT			0.40	0.47

Rotation Method: Oblimin with Kaiser Normalization.

a Rotation converged in 11 iterations.

Legend: K-SHR is used to mark the knowledge sharing questionnaire items, T_CMP for competence trust, T_BEN for benevolence trust and T_INT for integrity trust.

5.1.2 Reliability

Whereas construct validity is concerned with measurements *between* constructs, reliability addresses the consistency *within* a construct or scale (Straub *et al*, 2004, p 399). Internal consistency of items reflects the reliability of a measuring instrument because internal consistently assures that the items within

each scale are achieving their measurement purposes with relative absence of error. The focus here is on the extent to which respondents are consistent in how they answer questions that are related to each other. The procedure to test the internal consistency involves correlating ratings of subsets of items with each other. The most common statistical methods for this type of reliability investigation is Cronbach's alpha[8] model which is used by 79% of the 63% of information systems researchers when developing their instrument (Straub *et al*, 2004, p 400).

Tests with high reliability, i.e. those with high internal consistency, would achieve an alpha coefficient of 0.70 or more on a scale of 0 to 1 where a high score indicates high reliability (Hair *et al*, 1995) and our test met this standard for each of the 4 constructs as shown on tables 2 to 5. Each of the table is divided into (a) that summarises the result of the test and (b) the item-total statistics. The reliability of all the scales is high: Cronbach's alpha of knowledge sharing scale is 0.955; benevolence based trust scale, 0.807; integrity based trust scale, 0.867; and competence based trust scale, 0.920. The item total statistics show that in the case of benevolence based trust, the reliability alphas can be improved if item C2 is dropped. Likewise for integrity based trust: the alpha value improves of item C6 is dropped.

Table 2: Reliability of the 'knowledge sharing' scale

(a) Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.954	.955	9

(b) Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
A1	29.29	120.210	.863	.765	.946
A2	28.44	124.196	.766	.699	.952
A3	29.53	120.604	.830	.728	.948
A4	30.29	126.534	.811	.704	.949
A5	29.60	133.838	.760	.646	.952
A6	29.77	123.637	.837	.804	.948
A7	29.27	122.658	.849	.766	.947
A8	29.91	128.545	.790	.747	.950
A9	29.39	120.997	.860	.764	.946

[8]For more details on Cronbach's' Alpha, See: Carmines E. and Zeller R., 1979; SPSS library: My Coefficient Alpha is Negative.

Table 3 – Reliability of the 'benevolence based trust' scale

(a) Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.805	.807	3

(b) Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
C1	5.24	3.644	.726	.540	.661
C2	5.56	3.979	.571	.335	.814
C3	4.75	3.354	.670	.496	.717

Table 4 – Reliability of the 'integrity based trust' scale

(a) Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.863	.867	4

(b) Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
C4	6.57	5.491	.721	.602	.822
C5	6.87	5.847	.789	.636	.797
C6	6.37	6.048	.598	.399	.873
C7	6.67	5.847	.757	.578	.808

Table 5 – Reliability of the 'competence based trust' scale

(a) Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.917	.920	4

(b) Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
C8	6.60	6.108	.852	.731	.879
C9	6.39	5.565	.788	.630	.905
C10	6.63	6.102	.827	.686	.887
C11	6.63	6.291	.791	.647	.899

5.2 Bivariate correlations – for hypothesis testing

Pearson bivariate correlations analysis was conducted for hypothesis testing. The correlations of all the independent variables with the dependent variable are significant. The level of significance and the strength of correlations are given in table 6.

Table 6 – Bivariate correlations and Pearson tests

Variable		T_BEN	T_INT	T_CMP	KS_QUAN	KS_FOCUS	KS_QUAL	(A9) Overall KS_VALUE	KS
T_BEN	Pearson Correlation	1	.712(**)	.610(**)	.366(**)	.370(**)	.291(*)	.232(*)	.339(**)
	Sig. (2-tailed)	.	.000	.000	.001	.001	.011	.045	.003
	N	75	75	75	75	75	75	75	75
T_INT	Pearson Correlation	.712(**)	1	.827(**)	.368(**)	.471(**)	.448(**)	.340(**)	.434(**)
	Sig. (2-tailed)	.000	.	.000	.001	.000	.000	.003	.000
	N	75	75	75	75	75	75	75	75

T_CMP	Pearson Correlation	.610(**)	.827(**)	1	.302(**)	.438(**)	.362(**)	.283(*)	.371(**)
	Sig. (2-tailed)	.000	.000	.	.008	.000	.001	.014	.001
	N	75	75	75	75	75	75	75	75
KS_QUAN	Pearson Correlation	.366(**)	.368(**)	.302(**)	1	.796(**)	.807(**)	.798(**)	.920(**)
	Sig. (2-tailed)	.001	.001	.008	.	.000	.000	.000	.000
	N	75	75	75	75	75	75	75	75
KS_FOCUS	Pearson Correlation	.370(**)	.471(**)	.438(**)	.796(**)	1	.841(**)	.824(**)	.932(**)
	Sig. (2-tailed)	.001	.000	.000	.000	.	.000	.000	.000
	N	75	75	75	75	75	75	75	75
KS_QUAL	Pearson Correlation	.291(*)	.448(**)	.362(**)	.807(**)	.841(**)	1	.805(**)	.924(**)
	Sig. (2-tailed)	.011	.000	.001	.000	.000	.	.000	.000
	N	75	75	75	75	75	75	75	75
(A9) Overall KS_VALUE	Pearson Correlation	.232(*)	.340(**)	.283(*)	.798(**)	.824(**)	.805(**)	1	.930(**)
	Sig. (2-tailed)	.045	.003	.014	.000	.000	.000	.	.000
	N	75	75	75	75	75	75	75	75
KS	Pearson Correlation	.339(**)	.434(**)	.371(**)	.920(**)	.932(**)	.924(**)	.930(**)	1
	Sig. (2-tailed)	.003	.000	.001	.000	.000	.000	.000	.
	N	75	75	75	75	75	75	75	75

Legend: KS is used for a consolidated scale for knowledge sharing, T_CMP for competence trust, T_BEN for benevolence trust, T_INT for integrity trust, KS_QUAN for knowledge sharing quantity, KS_FOCUS for knowledge sharing focus, KS_QUAL for knowledge sharing quality, and KS_VALUE for overall knowledge sharing which corresponds to questionnaire item A9.

Item A9 was used as an overall knowledge sharing indicator. However, during the analysis, a consolidated scale (called KS on table 6), based on a combination of all the 9 items that measure the criterion variable (knowledge sharing), was added. As can be seen on Table 6, the correlation of the independent constructs with this consolidated scale (last column) is much stronger (< 0.001 level of significance) compared to the correlation with only item 9 (KS-overall). The implication is that each of the knowledge sharing sub-constructs (quality, quantity and focus) has to be included in the measure of knowledge sharing to produce as

complete a measure as possible of the construct. This way, each of the hypothesis is strongly accepted, ie that there is a positive relationship between knowledge sharing and each of the trust factors.

5.2 Bivariate correlations – for examination of relationship with individual KS dimensions

The results in table 6 show that all the independent variables are positively and significantly correlated to each of the dimensions of knowledge sharing at a significance level of < 0.01. It is interesting to note that all the independent variables show the strongest correlation to KS focus. The important managerial implications are discussed on Section 6.

5.3 Multiple regression

All the independent variables have been entered into the regression model. As shown in table 7, the model is significant at the 0.01 level (F = 0.002).

Table 7 – Multiple regression

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.437(a)	.191	.157	1.33114	.191	5.582	3	71	.002

a Predictors: (Constant), T_CMP, T_BEN, T_INT
b Dependent Variable: KS

A further confirmation of the significance of the regression model was carried out by the using the stepwise method which indicated a very high significance level of less than 0.001 as shown in table 8.

Table 8 – Stepwise multiple regression

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.434(a)	.189	.178	1.31448	.189	16.985	1	73	.000

Itemwise coefficients show that the beta coefficient for ks-int (integrity based trust) is significant. Table 9 displays the coefficient and significance level of the integrity based trust.

Table 9 – Coefficients of Significant Predictor

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations		
		B	Std. Error	Beta			Zero-order	Partial	Part
1	(Constant)	1.907	.469		4.067	.000			
	T_INT	.835	.203	.434	4.121	.000	.434	.434	.434

a Dependent Variable: KS

Benevolence- and competence-based trusts had the significance level of 0.692 and 0.849 and therefore were rejected as predictors. See table 10 for details.

Table 10 – Coefficients of Excluded Variables

Model		Beta In	t	Sig.	Partial Correlation
1	T_BEN	.060(a)	.397	.692	.047
	T_CMP	.036(a)	.191	.849	.023

a Predictors in the Model: (Constant), T_INT
b Dependent Variable: KS

The stepwise regression therefore reveals that of the 3 variables, integrity based trust is the significant predictor of knowledge sharing.

6 Discussion, limitations and future research directions

As shown in the correlation tests, all the three trust factors significantly and positively relate to knowledge sharing in on-line communities of practice thus upholding all the 3 hypotheses of this study. Apart from the study by Bakker *et al.* (2006), all the other relevant studies that the authors of this paper have come across support this view of a strong relationship between trust and knowledge sharing (cf Corritore *et al.,* 2003; Andrews and Delahaye, 2000; Tsai and Ghoshal, 1998; Ardichvili *et al.*, 2003; Choi, 2006). An added value of this study is contributing to the investigation of each of the components of trust. Although the dimensions of trust are theoretically distinct, they appear to be empirically inseparable (considering some cross-loading on the factor analysis on table 1). However, as indicated by the multiple regression tests, the factor that significantly predicts knowledge sharing is integrity based trust. Another interesting contribution of this study is that the *focus* dimension of knowledge sharing

correlates the strongest with the predictor variables. Each of the predictor factors as well as their significant correlation with the focus dimension of knowledge sharing will now be discussed. However, before then, the limitations of this study will be considered. Future research directions are included in the subsections.

6.1 Limitations

Knowledge sharing was measured from the sharer's (giver's) perspective but the receiver's point of view can be complementarily interesting. A future research could endeavour to tackle this and perhaps compare and contrast the two perspectives.

This study also inherits the usual survey limitation, namely, reliance on the honesty of free-willed respondents. Besides, it could be argued that the sampling frame was to some extent predisposed to exhibit positive values of trust in knowledge sharing bearing in mind that they voluntarily joined the virtual community for the purpose of sharing knowledge. Though difficult, it perhaps would be interesting to include in the sample dropout members of the community. Nonetheless, we cannot dismiss the findings of this study since it primarily examined the subcomponents of trust rather than the causes of low or high trust levels.

Moreover, this study centred on a single community of practice. If may be instructive and complementary to repeat the study in other communities of practice.

6.2 Knowledge sharing and its components

As discussed in 4.2.1, knowledge sharing was conceptualised with three components – quantity (frequency), quality (usefulness or value), and focus (the degree to which an individual feels that they engage in knowledge sharing). Of the three components, focus exhibits the most significant relationship with trust factors. This finding makes knowledge sharing less tangible than perhaps would be expected. It suggests that establishing whether knowledge has been shared is more than counting the frequency or trying to evaluate the usefulness of the shared knowledge. These aspects are important especially to management, but to the individual who shares knowledge, his feelings of having shared knowledge appear to be more important. With the current understanding that knowledge sharing is more of a human activity than technology, it is important that any information systems should be assistive to boosting users' confidence that they are indeed sharing knowledge. If the systems do not re-enforce the users' knowledge sharing orientation, knowledge sharing may be discouraged.

Notwithstanding the point made about knowledge sharing focus, it is necessary to take into consideration all the components of knowledge sharing to fully capture the concept. This was well indicated when the combined variable of all

(rather than individual) knowledge sharing items had the strongest correlation with trust factors.

6.3 Competence-based Trust

The positive hypothesis tests true that competent-based trust positively relates to knowledge sharing in virtual communities. This finding is in line with recent organisational research that regards integrity (and competence) as paramount to trust (Adler, 2001). As pointed out by Ardichvili et al (2003, p 73) there was need to verify that competence (and integrity) are major components of trust in virtual communities of practice. This verification is what this finding of the study has done. Of the three trust factors, competence is the one that has all its original items clearly clustered together. The more a virtual community is competent (knowledgeable, capable and effective), the more its members will be inclined to share knowledge.

At least from the sample used, it can be said that the passion for knowledge had a greater effect than fear of losing face. It is however suggested that a future study takes a closer look at the moderating influences of these two variables. Figure 3 outlines how their influences could be conceptualised.

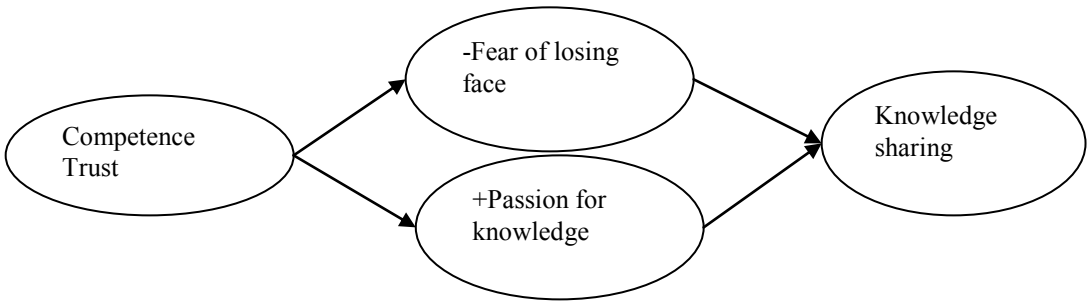

Figure 3: Moderating influences of fear of losing face and passion for knowledge

Fear of losing face should dampen the positive influence of competence trust on knowledge sharing whereas passion for knowledge should do the opposite (cf Ardichvili et al. 2003; Nahapiet and Ghoshal 1998). For arguments supporting the existence of these moderating variables, please refer to section 3.

6.4 Benevolence-based Trust

The correlation significance level of 0.003 overwhelmingly suggests that benevolence stands out as a component of trust that relates to knowledge sharing in on-line communities of practice. This finding is in consonant with earlier research that include benevolence as a component of trust (cf Tschannen-Moran, 2000, pp 314, 318)

6.5 Integrity-based trust

Again, the correlation significance level of 0.000 indicates that integrity based trust significantly relates to knowledge sharing in on-line communities of practice. This conclusion agrees with earlier researches that recognise integrity as a trust component (cf Tschannen-Moran, 2000, pp 314, 318).

Moreover, of all the trust factors, integrity is the one with predictive power as evidenced in the stepwise multiple regression analysis (see tables 9 and 10). While managers should encourage other levels of trust, integrity-based trust should be given priority consideration.

7 Conclusions

The research has upheld the three trust factors as positively relating to knowledge sharing in online communities. When it comes to predictive powers, integrity based trust emerges as significant Another interesting finding is that while the trust factors relate significantly to the three knowledge sharing components, ie quantity, quality and focus, it is the last component that relates most significantly with trust.

7.1 Implications for Knowledge Management Professionals

Current KM research and practice has recognised that the informal and trusting nature of communities of practice is the bedrock of knowledge sharing. The implication is that KM practitioners need not be pro-active in forming and running communities of practice. Nonetheless, an understanding of the trust components would guide practitioners on how to create and support a knowledge sharing environment. This study has confirmed that trust is composed of the three components of competence, benevolence and integrity which are positively related to knowledge sharing in on-line communities of practice. The implication is that practitioners should support the three values if they are to encourage trust and knowledge sharing. In terms of priority, the integrity based trust should be highly encouraged because it appears to be more predictive of knowledge sharing behaviour.

It also came out of the study that while quantitative measures of knowledge sharing may be important to management, it is rather the feeling or the less quantitative aspects of knowledge sharing that is crucial to organisational members. So, management should promote a knowledge sharing feeling and environment in the work place. This research did not investigate how to achieve this nor how to support the three facets of trust but a priori, organisations should look for these three qualities in their would-be recruits. Also, KM practitioners can lead by example: exhibit these qualities in their dealing with other members of the organisation. They can also take advantage of every opportunity to encourage these attributes in existing employees, who are potential members of on-line communities of practice.

From an information systems point of view, systems designers and developers should ensure high transparency and visibility of discussions and KM assets of virtual communities of practice. The high transparency and visibility can enhance the perceived trust level especially by newcomers and this can consequently result in greater knowledge sharing. Moreover, information systems should be assistive in empowering knowledge sharers in such a way that they could feel the impact of their knowledge sharing since this feeling appears to be very important to their knowledge sharing orientation.

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Appendix. Questionnaire

SECTION A: KNOWLEDGE SHARING

A1 I frequently share my knowledge with others in the community.
A2 I am one of the more active contributors within the community.
A3 I make a conscious effort to spend time engaged in activities that contribute knowledge to the community.
A4 I try to share my knowledge with the community.
A5 Other community members find my knowledge-sharing contributions to be useful.
A6 My contributions to the community enable others to develop new knowledge.
A7 I am a knowledgeable contributor to the virtual community.
A8 The knowledge I share with the community has a positive impact on the business.
A9 Overall, I feel the frequency and quality of my knowledge-sharing efforts are of great value to the community.

SECTION C: TRUST

C1 I believe that the competency group's virtual community would act in my best interest.
C2 If I required help, the community would do its best to help me.
C3 The community is interested in my well-being, not just its own.
C4 The community is truthful in its dealings with me.
C5 I would characterise the community as honest.
C6 The community would keep its commitments.
C7 The community is genuine and sincere.
C8 The community is a competent and effective source of expertise.
C9 The community performs its role of sharing knowledge very well.
C10 Overall, the community is a capable and proficient source of expertise and knowledge.
C11 In general, the community is very knowledgeable.
C12 I trust the community when I ask them not to forward or share any CSC or client sensitive material.

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