The Influence of Network Structure on Trust: Addressing the Interconnectedness of Network Principles and Trust in Communities of Practice

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Abstract: In this paper we explore the emergence of trusting relationships within Communities of Practice. It has been argued that trust can be viewed as an organizing principle (McEvily, Perrone, and Zaheer, 2003). However, we focus on the view that trust is an essential pre-condition for the sharing of knowledge. The goal of the paper is to discuss possible connections between social networking principles, network structure, and trust within Communities of Practice.

In the paper we define and subsequently analyze the concept of trust and develop arguments relating to the existence and strength of trusting relationships within Communities of Practice. The theoretical arguments propose relationships between the characteristics of trusting relationships and two network characteristics: homophily and closure. The general research question that underpins this paper is:

To what extent do network principles determine the level of trust among members within a Community of Practice?

It is important to note that in our analysis we focus on a specific type of social network which has been termed a Community of Practice. Communities of Practice have been argued to be critical elements in the creation, refinement and sharing of knowledge (Dugid, 2005; Wenger, 1998; Wenger, McDermott, and Snyder, 2002).

Keywords:

1. Introduction

The goal of this paper is to develop theoretical arguments addressing possible relationships between social networking principles, network structure, and trust within a special type of social network. In this paper we consider trust to be an emergent property, which is likely to be contingent on a social network's structure and management. The paper defines and examines the concept of trust and develops arguments concerning the development of trusting relationships within a specific type of social network called a Community of Practice. Arguments addressing the interconnectedness of trust and Communities of Practice will be derived from two network principles: homophily, and closure. Using these network principles, this paper will propose that the strength of trusting relationships can be predicted by looking at network structure and agent characteristics. The principal research question posed by this paper is:

Can network structure or network principles be used to determine levels of trust among members within and around a Community of Practice?

2. Social network

Following Wasserman and Faust (1995), we define a social network as consisting of "a finite set or sets of actors and the relation or relations defined on them" (p.20). The target or sample social network used to develop our arguments in this paper is called a Community of Practice. Relationships examined within this social network will span Community of Practice members as well as their respective organizational units (for a network representation see Figure 5). The paper maintains a structural network view as opposed to a dyadic view, which exclusively examines networks from a dual actor/node perspective.

3. Communities of practice

Wenger, McDermott, and Snyder (2002), define a Community of Practice (COP) as "groups of people who share a concern, a set of problems, or a passion about a topic, and who deepen their knowledge and expertise in this area by interacting on an ongoing basis" (p.4). COPs are based on a social theory of learning where social practices and group interaction results in collective learning. Practices reflect the pursuit of the community's enterprises and the attendant social relations (Wenger, 1998).

A community of practice is initiated through the collective development of a mutually negotiated shared practice (Wenger, 1998). For example, this might be a set of employees gathering to share information, giving and receiving advice, or trying to solve a job or industry related problem (Wenger, McDermott, and Snyder, 2002; Wenger 1998, Orr, 1996). Through continuous interactions the COP develops its own practices, routines, rituals, artifacts, symbols, conventions, stories and histories (Wenger, 1998). The community also acts as, "a context in which the meaning of objects, problems, events and artifacts gets constructed and negotiated, and in which people live, work, communicate, and understand the environment and themselves" (Choo, 2006, p. 166).

COPs usually self organize and tend to originate on their own[1] (Choo, 2006). A person might be inclined to join because they might have something valuable to contribute, have something to learn, or both. As opposed to other 'project teams' or workgroups, COPs do not work together on a daily basis. Instead they meet only when they find value in doing so (Wenger, McDermott, and Snyder, 2002). COPs are not self contained entities (Choo, 2006) and are not static.

Communities of Practice are valuable to their participants and their corresponding organizations because over time a common meaning and shared repository for their work is developed (Choo, 2006; Gherardi, 2001). An example of this may be seen by reviewing Orr's work with copier technicians (Orr, 1996). This socially developed 'common meaning' represents, "a unique perspective of their topic, common knowledge, practices, and approaches" (Wenger, McDermott, and Snyder, 2002, p. 5). Membership in the COP provides form, content, and context to this knowledge. Many times this is referred to as collective, accumulated or situated knowledge. It is this type of knowledge which is said to be produced, and resides in the group community. Therefore, the first stated benefit of studying a COP is that they create and facilitate the dissemination of knowledge (Duguid, 2005; Seely Brown & Duguid, 1998; Nonaka, 2002; Tsoukas, 2005a; Van De Ven & Johnson, 2006; Boer, van Baalen, & Kumar, 2002; Gherardi, 2001; Wenger, McDermott, and Snyder, 2002; Wenger, 1998; Choo, 2006).

Another similar benefit to acquiring or sharing new knowledge associated with COPs is the creation of a learning environment. Some organizational theorists (Blackler, 2002; Leonard & Sensiper, 2002; Wenger, McDermott, and Snyder 2002; Wenger, 1998) have argued that COPs are conducive of learning and the acquisition of new skills. Wenger (1998) refers to Communities of Practice as "shared histories of learning" (p. 73). The learning that takes place within the COP is closely related to actually becoming a practitioner; this includes associating contextual meaning, understanding the social structure of the practice, negotiating power relations, as well as finding implicit ways of working together. In return, the community becomes informally bounded by the value participants create through learning from each other (Wenger, McDermott, and Snyder 2002). From an organizational perspective, facilitating and sustaining such communities, "creates a learning environment which raises the effectiveness and value of the organization (Wenger, 1998 p.45).

Other benefits of Communities of Practice include the development of personal relationships, a common sense of identity, and accepted ways of interacting (Wenger, McDermott, and Snyder 2002). What makes COPs unique and interesting to study is that the relationships and work practices are not reflected by nor are reflected in formal policies, methodologies, organizational charts, and job descriptions; instead the actual practice and learning is informal, socially constructed, and quite impromptu (Wenger, 1998; Choo, 2006). Unlike organizationally structured project teams, COPs have no formal authoritative control measures. Instead, members of the community govern their interactions through self constructed and agreed upon norms and sanctions. Acts relating to information hoarding, falsification of data, or any other malicious actions toward the community are primarily dealt with within the community. Sanctions for such actions may include the development of a bad reputation, exclusion from accessing information, or even expulsion from the community. For this reason, trust is formative to the success of a COP, especially when knowledge is created and disseminated.

4. Trust

The emergence of self-directed teams and a reliance on empowered workers greatly increase the importance of the concept of trust (Golembiewski & McConkie, 1975; Larson & LaFasto, 1989) as control mechanisms are reduced or removed and interaction increases.

[1] Without the intervention of a governing or authoritative body such as an organization

> *In the use of self-directed teams, trust must take the place of supervision because direct observation of employees becomes impractical. (Mayer, Davis, and Schoorman, 1998 p.709)*

Having trust in any workgroup, especially one without authoritative control, is vital to the groups' success. When trust exists among members in a Community of Practice, efforts needed for information search and processing are minimized since the receiving party does not have to scrutinize the quality or veracity of the information (Zaheer, McEvily & Perrone, 1998). In turn, the existence of trusting relationships reassures the sender that the receiver will not misappropriate the information entrusted to them (Zaheer, McEvily & Perrone &, 1998). In this example, trust reduces monitoring and safeguarding behaviors (or transaction costs) and conserves cognitive resources (Uzzi, 1997), leading to more 'openness' in the exchange (Zaheer, McEvily & Perrone, 1998). Additional benefits of trust include timely access to information and referrals (Burt, 1992) as well as enhancing the ability to draw distinctions and come to decisions which are essential activities in constructing knowledge (Tsoukas 2005ab).

> *A group within which there is extensive trustworthiness and extensive trust is able to accomplish more than a comparable group without the trustworthiness and trust. (Coleman, 1988 p. S101)*

To explore the above relationships further it is important to understand the factors underlying why a trustor would trust a trustee. To do this Mayer, Davis, and Schoorman's (1995) model of organizational trust will be used (See Figure 1). Mayer et al. (1995) define trust as,

> *the willingness of a party to be vulnerable[2] 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)*

Mayer et al. (1995) further argue that it is individual traits or characteristics of the trusting parties which determine the level of trust that may be achieved between them. For instance, in order for a trustor to exhibit trust toward a trustee, the trustor must first have the 'propensity to trust[3]' (p.715) that particular trustee. In return the trustee must have *ability[4], benevolence[5], and integrity[6]* which together help the trustor determine the trustee's *trustworthiness*. Ability, benevolence, and integrity are all important factors for trust, yet each can vary independently. If all three are perceived as high by the trustor then the trustee is deemed trustworthy. It is also important to note that trustworthiness is a continuous variable. As the three characteristics vary, the level of trustworthiness can be said to move along a continuum. The extent to which one person is willing to trust another is determined by both the trustor's 'propensity to trust' as well as the trustor's overall judgment of the trustee's ability, benevolence, and integrity.

Mayer et al.'s (1995) model is appropriate for use in this paper because it is specifically formulated for use within an organizational setting. The only significant concern with this model is that it only considers an interpersonal dyadic (trustor/trustee) relationship and does not allow for an actor to treat a collective entity such as an organization as an object of trust[7]. To correct for this, a secondary model developed by Zaheer, McEvily & Perrone (1998) will be added (See Figure 2). The latter model allows for an actor to have interpersonal trust for another actor and inter-organizational trust for a collective entity (the supplier organization in Figure 2). In the case of inter-organizational trust, trust created by the actor is unidirectional since the collective entity may not exhibit trusting behavior. In the case of two agents (interpersonal trust), the perceived trust of one agent on the other may be reciprocated.

[2] Making oneself vulnerable implies something important may be lost. Trust is the willingness to take a risk. The level of trust directly relates to the level of perceived risk (Mayer, Davis & Schoorman, 1995; Zaheer, McEvily & Perrone, 1998)
[3] Propensity is defined as "the general willingness to trust others" (Mayer, Davis & Schoorman, 1995, p. 715)
[4] Ability is defined as the skills, competencies, and characteristics necessary to have influence in a specific domain. (Mayer, Davis & Schoorman, 1995, p. 717)
[5] Benevolence is defined as the extent to which a trustor believes the trustee wants to do good to the trustor. Act in a way that is not egocentric. (Mayer, Davis & Schoorman, 1995, p. 718)
[6] Integrity is determined by the trustor by making an assessment as to whether or not the trustee will adhere to an acceptable (to the trustor) set of principles. (Mayer, Davis & Schoorman, 1995, p. 719)

[7] Though a collective entity may be an object of trust it may not be the source of trust (McEvily, Perrone & Zaheer, 1998; McEvily, 2007)

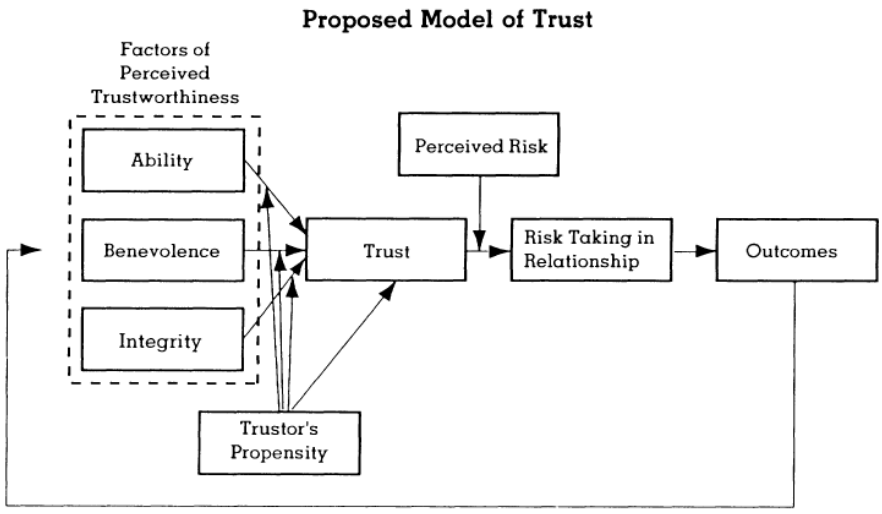

Figure 1: Proposed model of trust (Mayer, Davis & Schoorman 1995)

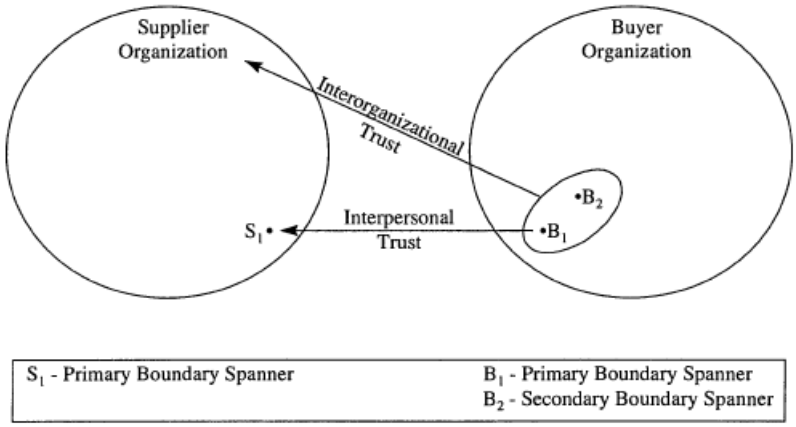

Figure 2: Inter-organizational and interpersonal trust model (McEvily, Perrone & Zaheer's 1998)

5. Predicting trust

The most relevant benefit of trust to any organization is the enhancement of knowledge sharing and innovation. Faced with a reduction in its ability to share knowledge and innovate an organization loses its competitive advantage and becomes vulnerable to competitors. Since trust can act as both a motivating and inhibiting factor for knowledge sharing, organizations should work toward building a better understanding of the levels of trust between their workgroup members. One method by which to determine these trust levels is by using one of many empirical instruments to measure trust relationships. In their intensive review, McEvily and Tortoriello (2007) identify a total of 156 such measures and subsequently narrow them down to five based on an extensive review of their construct validity. McEvily and Tortoriello (2007) provide an explanation for their approach as follows:

The five measures share a common emphasis on confirmatory factor analysis involving the testing of a theoretically derived measurement model and the estimation and evaluation of competing measurement models (p.20)

Of the five (See Figure 3) only three (McAllister, 1995; Cummings and Bromiley, 1996; and Mayer and Davis, 1999) were found to be replicated by other researchers/studies.

Authors	*Measurement Instrument*
McAllister (1995)	Managerial Interpersonal Trust
Currall & Judge (1995)	Boundary Role Persons' Trust
Cummings & Bromiley (1996)	Organizational Trust Inventory
Mayer & Davis (1999)	Organizational Trust
Gillespie (2003)	Behavioral Trust Inventory

Figure 3: Noteworthy measures of trust (McEvily and Tortoriello, 2007 p.20)

From the organization's perspective, administering these instruments and conducting such studies is quite tedious and expensive. Organizational research can alearly assist firms in trying to determine if there are more effective ways to predict levels of trust among group members without the use of such complicated and costly instruments. One possible method of gaining insight into these trusting relationships is by looking at agent characteristics, group composition and network structure. These types of data are readily available to the organization or at the very least, relatively inexpensive to attain.

In an approach to discover a method for predicting trust in organizations, the following sections summarize two network principles; constructing arguments linking network structure and agent characteristics to trust among members within and around a Community of Practice.

The network principles discussed in relation to trust are summarized in Table 1:

Table 1: Summary of network principles discussed in the paper

Homophily	Closure
* Similarity Principle	* Obligations and Expectations
	* Norms and Sanctions

6. Homophily / similarity principle

McPherson, Smith-Lovin and Cook, (2001, p.416) define homophily as, "the principle that contact between similar people occurs at a higher rate than among dissimilar people. ([i.e.] …cultural, behavioral, genetic, or material information that flows through networks will tend to be localized)." According to the authors, there are two distinct types of homophily: *status homophily*[8] and *value homophily*[9]. Noted causes of homophily include geography[10], family ties[11], organizational foci[12], isomorphic sources[13], and cognitive processes[14] (McPherson, Smith-Lovin and Cook, 2001). The authors found that race creates the largest divide though sex, age, religion, and education also 'strongly' structure relationships.

In network terms, homophily implies that there is a positive relationship between the degree of similarity of two nodes and the strength of the tie between them. In other words, social characteristics determine network distance. Research also found that patterns of homophily get stronger as more types of relationships exist between two agents and that ties of one characteristic may influence homophily on other characteristics (McPherson, Smith-Lovin and Cook, 2001). Another notable network effect of homophily is 'selective tie dissolution' which argues for a negative correlation between homophily and the likelihood a tie will dissolve or decay. For example, low homophily within a group will result in a high probability for the group dissolving or decaying over time.

[8] Status Homophily is based on informal, formal and ascribed status. Includes ascribed characteristics (race, ethnicity, sex, age) and acquired characteristics (religion, education, occupation, behavior patterns)
[9] Value Homophily is based on values, attitudes, and beliefs
[10] Geography relates to geographic distance. More likely to have contact with those that are closer
[11] Family Ties refers to a family relation (biological tie). Likely to be the same race, ethnicity, and religion
[12] Organizational Foci relates to a focused activity which fosters the relationship (ex. school, work or voluntary organizations)
[13] Isomorphic Sources relates to occupied positions or roles (ex. workplace roles (status, seniority, functional division), family roles (wives), or political roles (senators))
[14] Cognitive Processes refers to perceived similarity. E.g.. People who share similar knowledge domains

Though strength of attachment does not directly relate to trust or trustworthiness it can be argued that there is a connection between homophily and a trustor's 'propensity to trust' a trustee. Another possible connection exists between homophily and perceived trustworthiness of a trustee by a trustor. In his work, Burt (1992) establishes a direct connection between homophily and trust, arguing that similar[15] agents are more likely to trust each other than those that are dissimilar. In Burt's (1992, p. 16) words, "the operational guide to the formation of close, trusting relations seems to be that a person more like me is less likely to betray me."

Using the previous findings on homophily, network structure, and trust, certain arguments may be made in relation to Communities of Practice. First, it may be argued that higher levels of trust will be exhibited *between*[16] members of a Community of Practice if they share status and/or value homophily. Since higher levels of trust within the Communities benefits the organization (knowledge dissemination, learning environment, etc) it is in their best interest to asses it. To make this assessment an organization would need to identify the members of the Community and gather certain information on them through observation, archival records, and short surveys. Identifying and gathering ascribed and acquired characteristics for status homophily should be quick and inexpensive. Value homophily is more challenging, requiring a judgment to be made on perceived vs. actual values, attitudes, and beliefs.

From a structural network view it may be argued that Communities of Practice whose members share status and perceived value homophily will have a higher measure of overall trust[17] then Communities of Practice whose members do not. This argument is different from the previous because it focuses on a measure of overall trust within a subgroup as opposed to interpersonal trust between two members. Nevertheless, assessments of status and perceived homophily may be gathered in similar fashion.

Previously, this paper argued that trust is necessary for effective information seeking/retrieving behaviors. Assuming the former is true the principle of homophily may also be extended to information and knowledge dissemination. From this perspective, it may be argued that Communities of Practice whose members share status homophily or perceived value homophily will be more effective in their information seeking/retrieving behavior than Communities of Practice whose members do not share such characteristics. If these members are more effective in their information seeking and retrieving behavior than it may be further argued that Communities of Practice whose members share status homophily or perceived value homophily will be more effective at knowledge dissemination than Communities of Practice whose members do not share such characteristics. If this is true then there is a direct connection between homophily and knowledge dissemination.

Before completing the discussion on homophily, it is worthwhile to note two complications that arise with the homophily principle. First, homophily varies in transparency, meaning that certain types of characteristics are easier to spot than others. For example, it is much easier to determine someone's sex than their religion. Even more difficult to determine are value homophily items; that require one to guess at values and beliefs. A second notable difficulty with the homophily principle is that similarity is often associated with redundant information (Burt, 1992; Granovetter, 1973); Groupthink; and lack of creative abrasion and hence creativity (Leonard, 1995; Leonard and Swap, 1999).

7. Social network closure

The second network principle discussed in this paper was introduced by James Coleman (1988) at the University of Chicago and is based on observations of activity within a closed network structure. Network closure may be viewed as the degree to which everyone knows everyone else in a network. In a closed network all the agents will know each other. A simplistic example of a network with and without closure is presented in Figure 4:

[15] Similar agents is defined as two agents who display high homophily
[16] Where the modeling unit is a dyad
[17] Assumes a non-dyadic view where the modeling unit is a subgroup (i.e. one COP vs. another)

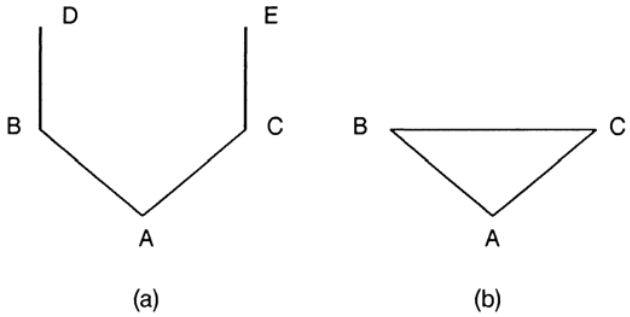

Figure 4: Coleman's (1988) network without (a) and with (b) closure (p.S106)

Coleman (1988) argued that agents in a closed network structure were more likely to trust one another than agents in an open structure. He also claimed that in cases where trust is violated, a closed network structure provides the ideal environment for instituting sanctions and having effective norms.

Coleman (1988) believed that trustworthiness could be judged by whether or not obligations were reciprocated. He argued that in a closed structure, obligations and expectations would be repaid because a high number of outstanding obligations by one member could easily be transparent to the rest of the group. If the rest of the group felt as if that member was not reciprocating they would become less likely to trust them or continue to extend favors. The closed network structure creates an environment where reciprocity is encouraged and to some extent enforced. Since all the actors in a closed network can see and judge the actions of their colleagues, members can develop reputations and accounts of trustworthiness over time.

> *"Closure of a social structure…is important [for] the trustworthiness of social structures that allows the proliferation of obligations and expectations" (Coleman, 1988 p. S107)*

Another network benefit of a closed structure discussed by Coleman (1988) is the ability to institute effective norms and sanctions. Norms are set in place as an attempt to encourage positive behavior and/or limit negative behavior. Sanctions are implemented to monitor or guide behavior or actions. Effective norms can only exist because agents know that sanctions may be instituted if the norms are violated (consequences). Therefore, effective norms may not exist in anything but a closed structure because in a closed structure group members can combine to enforce a collective sanction against the violating member (Coleman, 1988). "The consequence of closure is…a set of effective sanctions that can monitor and guide behavior." (Coleman, 1988, p. S107)

Extending Coleman's (1988) theoretical framework and findings on network closure and trust onto Communities of Practice adds a number of other interesting arguments. First of all, from a structural network perspective[18] one could argue that overall levels of trust will be greater in a closed social structure than in an open one, since obligations and expectations may be created and enforced. Looking at the Community of Practice Example Network (see Figure 5) this means that the sum of the overall trust of (A,B,C,D) should greater than the overall sum trust of (F,B,A,G).

With respect to sanctions it may be argued that there is an inverse relationship between trust and the number of sanctions imposed; whereas the trustworthiness of a member decreases as the number of sanctions imposed on that member increases. This would seem logical as trusted members of a Community would not be exposed to consequential behaviors (sanctions) unless they violated the trust of the group by breaking effective norms.

In addition to an inverse relationship between trust and the number of sanctions imposed there is also an inverse relationship between network closure and the number of sanctions imposed. As discussed earlier, sanctions and effective norms may not be maintained effectively in an open network because they can only be effectively imposed in closed networks since members' actions are transparent to the whole group. If one member takes advantage of the group (hoards information, doesn't reciprocate, etc.) it would not take too long before the group becomes aware of the member's actions and, as a result, takes appropriate negative actions (in the form of sanctions) against the member.

[18] Where the modeling unit is a subgroup not a dyad

An additional argument may be made with regards to reciprocity in a closed network. Reciprocity is one of the key ways to build human capital within a closed network. A closed network both encourages and enforces reciprocity since members can see and judge the action of their colleagues. Since these actions, over time, result in the development of reputations it may be argued that low levels of perceived or actual reciprocity by members of a closed network will correspond with low levels of trust between those members and the non-reciprocating member(s). Extended periods of low level perceived or actual reciprocity in a closed network may even lead to its destruction or 'opening'.

Expanding on Coleman's (1988) idea of network closure to information and knowledge sharing allows us to argue a couple last interesting points. If, as mentioned earlier, low levels of reciprocity lead to low levels of trust, which is necessary for information and knowledge sharing than it would follow that low levels of perceived or actual reciprocity will correspond to high levels of information hoarding. Additionally, if the number of sanctions imposed on a group is high, then it would follow that levels of trust within the group are low. If trust is low than knowledge dissemination is unlikely, therefore a high number of sanctions would correspond with a low amount of knowledge sharing. In other words, the number of sanctions imposed on a group and knowledge sharing within the group are inversely related.

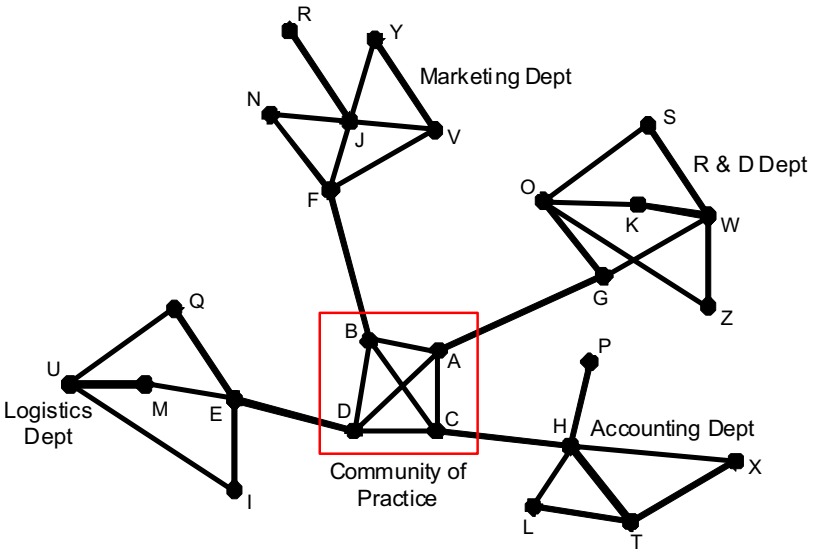

Figure 5: Community of practice example network

Prior to completing the discussion on closure it is noteworthy to mention that information within a closed structure tends to be redundant (Burt, 1992; Granovetter, 1973). Using redundant information can lead to the same types of problems as those mentioned in the closing section of homophily (i.e. lack of innovation, lack of knowledge creation, lack of exposure to opportunities, and lack of exposure to referrals).

8. Conclusion

This paper applied two network principles (*homophily and closure*) in an effort to make theoretic connections between trust relationships in and across a particular type of social network called a Community of Practice. With respect to trust, Communities of Practice are particularly interesting because their lack of authoritative control (from the organization) creates an environment that is heavily dependent on trust to survive. From a network perspective, Communities of Practice are ideal case studies because their members fill structural holes and operate in both closed (within the COP) and open (across the COP to the functional unit) social structures. This allows for a high benefits per contact as well as a high total network benefits. This type of network is also an ideal environment to test both network principles in a single case study/setting.

Testing the arguments discussed in this paper can create feasible[19] ways for organizations to reach conclusions about the trust relationships of their employees. If, for example, looking at network

[19] Feasibility is determined in comparison to conducting trust measurement surveys on all network members

structure and individual actor characteristics can shed some light on the level of trust within and across the network, then organizations can use this information to make sure their employees trust each other, share information and knowledge and better position themselves for the organization to have a competitive advantage.

Below is a summary of the thirteen arguments made throughout the paper with respect to: Homophily and Trust; Homophily and Information/Knowledge Sharing; Closure and Trust; and Closure and Information/Knowledge Sharing.

9. Summary of arguments

Homophily and Trust

- Higher levels of trust will be exhibited between members of a Community of Practice if they share status homophily than if they do not.
- Higher levels of trust will be exhibited between members of a Community of Practice that perceive themselves as sharing value homophily than if they do not.
- Communities of Practice whose members share status homophily will have a higher measure of overall trust then Communities of Practice whose members do not.
- Communities of Practice whose members perceive themselves as sharing value homophily will have a higher measure of overall trust then Communities of Practice whose members do not.

Homophily and Information/Knowledge Sharing

- Communities of Practice whose members share status homophily or perceived value homophily will be more effective in their information seeking/retrieving behavior than Communities of Practice whose members do not share such characteristics.
- Communities of Practice whose members share status homophily or perceived value homophily will be more effective at knowledge dissemination than Communities of Practice whose members do not share such characteristics.

Closure and Trust

- Overall levels of trust will be greater in a closed social structure than in an open one
- See Figure 5: Overall trust of (A,B,C,D) > Overall trust of (F,B,A,G)
- There is an inverse relationship between trust and the number of sanctions imposed
- Trustworthiness of a member decreases as the number of sanctions imposed increases
- There is an inverse relationship between network closure and the number of sanctions imposed
- Low levels of perceived or actual reciprocity by members of a closed network will correspond with low levels of trust between those members and the non-reciprocating member(s)
- Low levels of perceived or actual reciprocity in a closed network will lead to its destruction or ‘opening’

Closure and Information/Knowledge Sharing

- Low levels of perceived or actual reciprocity will correspond to high levels of information hoarding
- There is an inverse relationship between number of sanctions imposed and knowledge sharing

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