

Trust for E-Business Management

Liaquat Hossain¹, Rolf T. Wigand²

¹School of Information Technologies, G82C Madsen Building F09,
The University of Sydney, NSW 2006 Australia

²Information Science and Management, Department of Information Science, CyberCollege
University of Arkansas at Little Rock, Little Rock, AR 72204-1099, USA
lhossain@it.usyd.edu.au, rtwigand@ualr.edu

ABSTRACT

How do we develop and sustain trust? What is the process for building trust between business partners in virtual environments? Is there a significant difference between the development and sustainability of trust online or offline? In this paper, we first introduce the concept of e-business and discuss the importance of trust for ensuring effective collaboration. Secondly, we discuss the relationships between e-collaboration and trust for managing e-business. Thirdly, we suggest a framework, which may help facilitate the development and sustainability of trust in an online environment. Finally, implications for the development and sustainability of trust online, which can be used to understand the interplay among technologies, e-business and collaboration is provided. We suggest that the implications of this study are three-fold: trustworthy relationships among business partners, effective sustainable collaboration, and optimal use of ICT for supporting e-business activities.

Keywords: Trust, Social exchange, Collaboration, e-Business

1. INTRODUCTION

In general, e-business refer to the use of Internet technologies for support activities such as buying, selling products and services, as well as collaboration with business partners. We first highlight that e-business is not a synonym for e-commerce. E-business refers to an organization's capability to electronically connect with their partners for exchanging values such as knowledge, products and services (Venkatraman and Henderson, 1998; Hackbarth and Kettinger, 2000; Fahey, et al., 2001; Flurry and Vicknair, 2001; and Davis and Ritsko, 2001). Exchanging values with business partners requires collaboration. Therefore, collaboration with business partners is increasingly seen as a critical aspect of e-business management (Davis and Ritsko, 2001; Sairamesh et al 2002; Lechner and Hummel, 2002; Alt and Fleisch, 2001). Hackbarth and Kettinger (2000) further highlight that e-business should address issues such as human performance within the organization and also in an inter-organizational network. Therefore, understanding the exchange relationships among buyer, suppliers and trading partners is seen central for e-business management (Markus et al 2000). We argue that the management of e-business requires understanding strategies for building effective collaboration, and ensuring the optimal use of Internet infrastructure for supporting the sharing of knowledge among buyers, suppliers and trading partners. We suggest that for an e-business to be successful, an effective collaboration must exist among different participating business partners. Therefore, the design of the e-business systems should be based on a framework, which facilitates the development and sustainability of collaboration among business partners.

We emphasize that collaboration is essentially a social phenomenon and is regarded as a complex issue. IT is there to support the flow of effective sharing only when the partners have adequate level of trust so that they can start to collaborate with each other. We suggest that a low level of trust may lead to a lower level of IT utilization for supporting collaboration and higher level of trust between business partners would lead to a higher level of collaboration so that the use and utility of IT can be maximized. So, why is collaboration a complex social phenomenon? How do we build an effective collaborative culture so that the use and utility of IT can be maximized? Here, we present a casual model, which can serve as a basis for the management of e-business activities and also to ensure the utilization of ICT for supporting the relationships among business partners. Discussions of the interrelationships of different variables and their dependency are presented in the forthcoming section.

The focus of this study is on understanding the relationships among the use of Internet technologies, the degree of collaboration and its social context for the management of e-business activities. In the next section, we suggest the importance of collaboration in managing e-business activities. We further discuss the complexity of collaboration and in particular, e-collaboration for managing e-business activities. We apply social exchange theory to develop an understanding of the phenomenon referred as social exchange on-line. Here, trust is considered to be the key antecedent and discussed in relation to supporting effective collaboration. We conclude that social exchange theory can be applied to further our understanding of how structure can be used in facilitating the development and sustainability of trust.

Finally, a framework for the development and sustainability of trust on-line is provided.

2. SUPPORTING COLLABORATION THROUGH ICT

Collaboration, in its traditional sense, is the collective interaction between multiple parties. Rapid advances in technology along with globalization provides opportunities and challenges for businesses to establish collaborative relationships with suppliers and customers so that they can enhance competitiveness and lower costs (Karsten, 1999). In e-business terms, collaboration connects all the parties involved in the process, which enables information-sharing. This facilitates structured and controlled interactions through proper channel-connectivity, electronic information and workflow. Connectivity provides the core network for interaction. These network systems not only eliminate regional, inter-departmental and intra-enterprise barriers, but they also bring together a network of people around specific processes. Collaboration tools such as the TeamSCOPE system trail is proven to be effective Team Software for a geographically dispersed collaborative project environment (Steinfeld et al., 1999). TeamSCOPE, a web-based trail system provides each team with a team-shared file repository, which makes it easy to users to store and exchange group-related files.

Once connectivity is established, the next major aspect is sharing information because electronic information acts as the lifeblood of collaboration in organization. For example, previous studies suggest that the collaborative culture is an essential prerequisite successful use of IT for supporting sharing (Orlikowski, 1993; Bowers, 1994; and Gallivan et al., 1993). We suggest that three core elements—connectivity, electronic information and workflow make e-business collaboration a very powerful way of bringing a group of people together to interact and communicate efficiently. In this regard, Vandenbosch and Ginzberg (1997) further suggest that organizations must first meet four basic conditions in order for the implementation of IT to support effective collaboration. The first is the organizational members need to collaborate. The second is the understanding of IT and its use in supporting collaboration. The third is the organizational support for the adoption, implementation, and continued use of the technology. The fourth is the organizational culture that supports collaboration.

The purpose of collaborative workspace is to provide a structure or framework, which allows its user to achieve and understand its purpose (Chin et al., 2002). In addition, it should support the users to adapt and follow conventions for its use. The behavior of a collaborative workspace must be controllable and support the orientation of the members in the workspace and in the cooperation process. We suggest that the development of collaborative workspace requires a high level of attention

to the basic principles of organizational design such as— (i) the connection between the design of e-business and the elements of the social world leads to effective collaboration; (ii) components must be designed in ways that work against the strong tendency towards entropy; and (iii) open access leads to higher collaboration. This can be supported by the case of combustion researchers collaborating over the Internet (see Pancerella et al., 1999) where effective collaboration was achieved through the application of principles of organizational design presented above. We suggest that the effective use of IT for supporting collaboration requires frameworks/models as a guiding principle so that individuals and groups in an organization or inter-organizational network can work effectively and efficiently. We discuss this further by focusing on two popular collaboration models—the *contract* model (Wachter and Reuter, 1992) and the *consortium* model (Kouramajian et al., 1995) and suggest a rich framework called *social exchange* perspective to further understand the social aspect related to effective collaboration for e-business activities.

Collaboration for information sharing and knowledge management is increasingly becoming possible through the introduction of network computing (Kouramajian et al. 1995). Kouramajian et al. (1995) further suggest that the *consortium* provides a flexible framework for defining collaborative transactions. Contrary to this, a *contract* model is designed to provide a programming environment for long-lived transactions between parties concerned (Wachter and Reuter, 1992). Studies suggest that interaction under the *contract* model is rather tightly constrained tightly to collaborative tools and may severely restrict collaboration among users (Wachter and Reuter, 1992; Kouramajian et al., 1995). The *consortium*, on the other hand, consists of both the structural and the behavioral models and provides a new way for collaborative interaction (for example, What You See Is What You Want-WYSIWY). The structural model is based on the assumption that a large collaborative task can involve multiple phases or sessions and different phases may have different participants. In addition, the behavioral model defines mechanisms for specific collaborative actions. Therefore, two main abstractions—sessions and transactions are integral parts of the consortium framework for supporting e-collaboration. Here, a session provides a convenient abstraction for a collective action. Further, an ordered set of sessions where the owner specifies the order is regarded as part of transactions.

However, these models do not provide an adequate background for understanding the implications of trust as a social factor for the effective utilization of IT in an e-collaborative environment. For example, work by Malone et al. (1987) and Clemons et al. (1993) focused primarily on IT as a means for reducing inter-organizational transaction cost, without taking social factors such as trust and its implications in reducing

transaction costs in inter-organizational systems (Kumar et al., 1998). In the information systems literature, the development and sustainability of trust for managing virtual collaborative relationship is increasingly seen important for ensuring the optimal use of IT for supporting e-business activities (Whittaker, 1996; Hoffman et al., 1999; Jones et al., 2000; Ratnasingham and Kumar, 2000; Ono et al., 2001; Nayak et al., 2001; Kasper-Fuehrer et al., 2001). Recent studies on the use of computer-mediated communication tools for supporting trust building in an on-line environment suggest that audio and video technologies have the potential to be as effective as face-to-face communication as long as the design of systems is guided by the social process in place (Bos et al., 2002). In line with these we suggest the following propositions:

Proposition 1:

Higher collaboration relates to optimal use of ICT for supporting e-business.

Proposition 2:

There is no direct relationship between the level of collaboration and level of ICT use for supporting e-business activities.

Proposition 3:

Sessions and transactions are directly related to higher level of collaboration.

3. UNDERSTANDING THE RELATIONSHIPS BETWEEN TRUST AND COLLABORATION

Hosmer (1995) suggests that trust deals with the expectation by one person, group, or firm of ethical behavior which is morally right decisions and actions based upon ethical principles of analysis on the part of the other person or part in an exchange. Therefore, ensuring successful business transactions and cooperative work requires a high level of attention to the development and sustainability of trust (Josang, 1996; Nelson and Coopridge, 1996; Sheppard and Tuchinsky, 1996; Swagerman et al., 2000; Wigand, 1978). Trust can also be based upon the rational appraisal of a partner's reliability and competence, and upon feelings of concern and attraction. These factors may help to reduce awkwardness, complexity and uncertainty in social interactions and therefore, make the collaboration effective.

A study by Ratnasingham and Kumar (2000) suggest that trust and interpersonal relationships are essential elements for understanding the role of communication media in collaborative work. Collaboration is seen as most effective and rewarding when the participants trust each other (Axelrod, 1997). We suggest that two types of activities--*cognitive and emotional* faculties must be established for developing trust. Cognitive-oriented activities may convey competence and reliability, and thereby increase confidence that a task will be

successfully completed. Emotion-oriented activities can create an emotional bond, and help decrease fears of exploitation and increase feelings of mutual support for building trust.

Recent studies on interorganizational networks, virtual organizations and the long-term sustainability of virtual collaboration suggest that trust is critical so that the IT infrastructure can be leveraged optimally to support the exchange among business partners (Josang, 1996; Whittaker, 1996; Bandow, 1998; Staples and Ratnasingham, 1998; Karahannas and Jones, 1999; Ratnasingham and Kumar, 2000; McKinght et al. 2000; Kasper-Fuehrer et al., 2001; Nayak et al., 2001; Ono et al., 2001; Bos et al., 2002; Gefen, 2002). We argue here that the development and sustainability of trust in an on-line or virtual environment requires an understanding of the social exchange systems in which individuals, groups or organizations operate. This is important as effective collaboration is seen to be largely dependent on the trust relations among different interest groups (Abdul-Rahman and Hailes, 1997).

It is therefore suggested that there is a direct relationship between the success of e-business and the embedded social exchange systems under which individuals, groups or organizations operate. We argue that this social exchange system helps building a collaborative and sharing culture in organizations. Chadwick-Jones (1976) also suggests that the level of social exchange is dependent on trust. Blau (1964) highlights that distrust is expected in economic relations but have a negative impact on social behavior. Thibaut and Kelley (1959) and Blau (1964) further suggest that building trust is a gradual process, which requires a cumulative commitment to a relationship. For example, the Prisoner's Dilemma game illustrates the problems associated with building trust. In this game, the participants are given choices between only two alternatives—(i) sharing the outcomes equally with another person or (ii) try to maximize his/her own gains at the expense of the other. On the basis of the aforementioned discussion, we suggest the following propositions related to collaboration and trust:

Proposition 4:

Higher levels of trust lead to higher collaboration among business partners.

Proposition 5:

Lack of trust or, conversely, higher levels of distrust lead to a lower level of collaboration among business partners.

Proposition 6:

High competency and reliability of business partners lead to high degree of trust.

Proposition 7:

There is no direct relationship between the level of competency and reliability of business partner for developing the level of trust.

Therefore, common business goals or a shared vision is considered to be a prerequisite for ensuring the optimal use of IT systems for supporting information exchange and knowledge sharing among business partners in an inter-organizational network (Wigand et al., 1997; Wigand, 1977; Scott and Lane, 2000). We suggest that the social exchange perspective presented below provides a useful mechanism for understanding the complex process of building trust such that higher collaboration among business partners may be achieved. Moreover, embedded in the social exchange perspective is a social control mechanisms that mutually regulates exploitive and opportunistic behavior (such as suggested in the Prisoner's Dilemma discussion above). This may in fact reduce uncertainty by guarding against opportunistic behavior among participating members (Fichman, 1997; Wicks et al., 1999; Grambowski and Roberts, 1999).

It follows then to ask, how do we build and sustain trust through social exchange? It is evident from the previous studies on ICT, trust and collaboration that understanding social exchange systems is a powerful mechanism for developing an understanding of the development and sustainability of trust among the business partners. Bandow (1998) suggests the importance for exploring strategies for developing trust in virtual environment, which is now a reality due to increasing use of IT in the work place. This deserves careful attention as IT may be used to allow or support work in separate locations, the relationships with others in their groups are not the same due to the reduced or non existent of face-to-face contact. A recent empirical study of the effectiveness of computer mediated communication channels of trust development suggest that video and audio conferencing groups are nearly as good as face-to-face (Bos et al., 2002). However, the use of IT such as video and audio for building trust is considered to be a slower progress towards a full cooperation and vulnerable to opportunistic behavior (Das and Teng, 1998).

4. TRUST THROUGH SOCIAL EXCHANGE

Rapoport and Guyer (1966) suggest seventy-eight forms of two-person games where the mixed-motive can be the impediments for building trust. This Prisoner's Dilemma design originated from the anecdote about the two persons arrested on suspicion of committing a crime (Chadwick-Jones, 1976). Here, two suspects are taken into custody and separated with an assumption that they are guilty of a specific crime (Luce and Raiffa, 1957). However, the district attorney does not have enough evidence against the suspects so that they can be convicted at a trial. Therefore, the district attorney suggests two alternatives to each prisoner—(i) to confess to the crime or (ii) not to confess. Table 1 provides an example of the Prisoner's Dilemma game. It is suggested in the dilemma matrix presented below that the first entry in each cell below represents the choice (and payoff) for

Prisoner A and the second entry represents the outcome for Prisoner B.

| | | Prisoner B | |
|-------------|--|--|--|
| Prisoner A | | Not Confess | Confess |
| Not Confess | | C, C 1 year, 1 year (Cooperate, Cooperate) | C, D 9 years, 2 months (Sucker, Temptation) |
| Confess | | D, C 2 months, 9 years (Temptation, Sucker) | D, D 6 years, 6 years (Defect, Defect) |

Table 1. An example of the Prisoner's Dilemma game
(Chadwick-Jones, 1976)

Therefore, both A and B receive one year of imprisonment in the cooperation cell and in the joint defection option both receive several years. However, in the temptation cell, Prisoner A gets off with only two months, whereas Prisoner B refusing to confess, receives the worst type of sentence (the sucker option). In this game, the player A and B may decide to cooperate or may decide to go for 'temptation cell' for gaining more for one. An intention to gain more for one may lead to 'defecting' from the cooperative option to a competitive one. The danger behind moving from cooperation to competition is the loss of trust, which may lead to distrust between A or B. We suggest that the higher the level of distrust between individuals or parties, the lesser the level of collaboration. It is also suggested in the social psychology literature that the higher-level distrust may lead to defensive behavior and both parties may lose sustainable collaboration (Chadwick-Jones, 1976).

We suggest that understanding the dynamics of reciprocity and imbalance is important for the trust building process, which in fact would ensure higher levels of collaboration. Blau (1964) was interested in understanding the complexity of attracting individuals to a relationship and suggested that one may be attracted by intrinsic or by extrinsic benefits. Table 2 below provides an illustration of Blau's (1964) view of relationship formation. Here, a distinction between reciprocal and unilateral transactions is drawn. Blau (1964) further argued that the distinction between reciprocal and unilateral transactions suggest a dynamic force, which transforms a social process simple into an increasingly complex one.

For example, intrinsic rewards such as love in a reciprocal relationship may suggest mutual attraction and the extrinsic rewards such as advice in carrying out a task or a reciprocal relationship may suggest exchange between individuals or parties involved. Blau (1964) further highlights that the exchange of extrinsic benefits helps sustain the major intrinsic rewards when an association is intrinsically rewarding. Similarly, one-sided attachment is established when intrinsic benefits are part of unilateral relationships. However, in the case

of unilateral extrinsic benefits, power is established because those who cannot reciprocate in kind are obligated to comply with the other person's wishes (Chadwick-Jones, 1976). In line with this, we suggest the following proposition:

Proposition 8:

Trust building is dependent on the dynamics of reciprocity and imbalance between business partners.

| | Intrinsic | Extrinsic |
|------------|----------------------|-----------|
| Reciprocal | Mutual attraction | Exchange |
| Unilateral | One-sided attachment | Power |

Table 2. Illustration of a two-dimensional distinction among transactions

From another point of view, norms or agreements are important in trust-building processes as they help avoid uncertainty (Chadwick-Jones, 1976). For example, the study of kingship relations suggest that interpersonal trust reduces one principle source of uncertainty in actual social situations (Anderson, 1971). Anderson (1971) argues that uncertainty in social relationships influences someone to be calculative and also to seek shorter-term returns. The study of kingship relation suggested by Anderson (1971) is based primarily on two assumptions—(i) calculative behavior leads to increased variability in behavior within business partners under the extreme uncertainty in social or kingship relations; and (ii) arrival of calculative orientations in a community may lead to termination of exchange which requires high levels of trust. It is further suggested that the general norms of kingship behavior will be a reality only where communities are highly homogeneous and stable (Anderson, 1971).

Therefore, it may be concluded that social exchange theory is based on the assumption that in order for exchanges of goods and behaviors to take place in an organization, there is a joint activity or transaction, which would involve two or more actors when each of them has something the other would value (Thibault and Kelley, 1959; Homans, 1961; Emerson, 1972). Here, the assumption made is that actors face substantial degrees of uncertainty and ambiguity about what the potential partner value, the utility of different exchanges to them and what exchanges are been made among others in the exchange network (Molm and Cook, 1995). Social exchange theory primarily deals with how actors react to these uncertainties and ambiguities, in which the actors based their expectations of rewards, cost and punishments. Likewise, the actors also use this information to anticipate their future exchanges in terms of the rewards, cost and punishments.

In addition, this theory highlights the importance of cost and rewards in the formation of social relationship. According to Thibault and Kelley (1959), exchange theory is based on the exchange of rewards and costs to quantify the values of outcomes from different situations for an individual. People strive to minimize costs and maximize rewards and then base the likeliness of developing a relationship with someone on the perceived possible outcomes. For example, when a person perceives a greater outcome from another person, he or she intends to disclose or share the knowledge greater and thus develops a closer relationship with that person. Another important aspect of this theory is that people will establish a reciprocal relationship among themselves once these two main elements—cost and rewards are fulfilled. We discuss the implications of this study in the next section.

5. IMPLICATIONS FOR MANAGING E-BUSINESS

The implications of this study are three-fold—trustworthy relationships among business partners, effective sustainable collaboration, and optimal use of ICT for supporting e-business activities.

5.1 Trustworthy relationships among business partners

Here, trustworthy relationships refer to non-symmetrical or unidirectional and conditionally transitive agreements between parties. Trust relations may be divided into two categories (Abdul-Rahman and Hailes, 1997)—*direct trust relationship* and *recommender trust relationship*. For example, there is a *direct trust relation* if person A trusts person B. However, if person B trusts person A to give recommendations about other persons' trustworthiness, then there is a *recommender trust relationship* between person A and person B. For the case of virtual networks, the opportunities for face-to-face interactions to facilitate this is minimal. Therefore, the virtual environment constitutes a special case of network organizations and is characterized by lateral rather than vertical relationships (Snow et al., 1992; Bleecker, 1994; Semich, 1994; Garreth, 1998 and Wigand et al., 1997). Kasper-Fuehrer et al., (2001) suggests that authority is clearly defined by the hierarchical structure in the organizational design, along with organization charts and formalized procedures in vertical relationships. However, this hierarchical coordination and control mechanisms is lacking in a network organization. Therefore, trust may act as a substitute for control in a network or lateral relationship organizations (Sheppard and Tuchinsky, 1996; Handy, 1995; Jones and Bowie, 1998).

5.2 Effective Sustainable Collaboration

The authors emphasize that the arguments for a social exchange perspective presented in the previous section provides valuable insights about the trust building

process for the sustainability of virtual network relationships. We argue that this perspective of e-business management is important in order for exchanges of goods and behaviors to take place in an organization. This would also encourage joint activity or transaction, which would involve two or more actors when each of them has something the other would value (Thibault and Kelley, 1959; Homans, 1961; Emerson, 1972). However, it is important to note that actors face substantial degrees of uncertainty and ambiguity about what the potential partner value, the utility of different exchanges to them and what exchanges are being made between others in the exchange network (Molm and Cook, 1995). We conclude that social exchange theory (Chadwick-Jones, 1976) is a powerful mechanism for understanding the relationship building process as it primarily deals with how actors react to these uncertainties and ambiguities, in which the actors based their expectations of rewards, costs and punishments and also to anticipate their future exchanges.

5.3 ICT Use for Supporting e-Business

How may a higher level of trust help sustain higher levels of collaboration among business partners? We suggest that higher levels of trust among parties may be achieved by the norms or agreements as they help reduce uncertainty (Anderson, 1971; Chadwick-Jones, 1976) and help establish common business goals or shared business vision among parties involved (Wigand et al., 1997; Scott and Lane, 2000). Studies suggest that this shared vision helps in understanding each member's role, identification of groups, determination of critical behaviors such as willingness to cooperate with others, and also willingness to engage in mutual goal setting, so that higher levels of collaboration may be achieved among partners (Albert and Whetton, 1985; Wiesenfeld et al., 1998). Therefore, establishing group identity, awareness of mutual needs and expectations, and clarification of tasks and responsibilities is a necessary prerequisite for building trust and also to promote collaboration (Anderson, 1971; Kasper-Fuehrer et al. 2001). We further suggest that the use and utility of ICT may be optimal for supporting e-business activities once these necessary prerequisites are used to promote collaborative culture during the design phase of business systems (Gallivan et al., 1993; Orlikowski, 1993; Bowers, 1994).

6. CONCLUSION

We utilized social exchange theory to explore the underlying relationships among ICT, trust, and collaboration as a means to advance our understanding of the management of e-business activities. We have argued three important factors so that ICT may be effectively used to support collaboration and suggested sets of propositions. Firstly, we suggest that the successful integration of this architecture for a network organization is largely dependent on the establishment of a shared

business vision. This would help build trust among business partners so that a higher level of e-collaboration may be achieved. Secondly, we suggest that social factors such as trust are a key element for ensuring the optimal use of ICT so that higher levels of collaboration can be achieved among business partners. Thirdly, we introduce the game-theoretic approach of the *Prisoner's Dilemma* to argue that distrust among business partners is the result of the adverse consequences of calculative and opportunistic behavior. We conclude that this distrust among business partners may lead to the termination of exchanges and impede the possibility of e-collaboration.

REFERENCES

- [1] Abdul-Rahman, A., and Hailes, S. (1997). 'A distributed trust model,' *Proceedings of the 1997 Workshop on New Security Paradigms*, Langdale, Cumbria, UK, pp. 48-60.
- [2] Albert, S., and Whetton, D. (1985). 'Organizational identity,' In L. L. Cummings and B. M. Staw (Eds.), *Research in Organizational Behavior*, Vol. 7, Greenwich, CT: JAI Press, pp. 263-295.
- [3] Alt, R., and Fleisch, E. (2001). 'Business networking systems: characteristics and lessons learned,' *International Journal of Electronic Commerce*, Vol. 5, No. 2, pp. 7-27.
- [4] Anderson, M. (1971). *Family structure in the 19th century Lancashire*, Cambridge University Press, Cambridge, UK.
- [5] Axelrod, R. (1997). *The Complexity of Cooperation: Agent-Based Models of Competition and Collaboration*, Princeton University Press, Princeton, New Jersey 08540.
- [6] Bandow, D. (1998). 'Working with the Borg: trust, systems development and dispersed work groups,' *Proceedings of the Conference on Computer Personnel Research*, Boston, Massachusetts, pp. 163-169.
- [7] Blau, P. M. (1964). *Exchange and Power in Social Life*, Wiley and Sons, New York.
- [8] Blecker, S. E. (1994). 'The virtual organization,' *The Futurist*, Vol. 28, No. 2, pp. 9-14.
- [9] Bos, N., Olson, J., Gergle, D., Olson, G., and Wright, Z. (2002). 'Effects of four computer-mediated communications channels on trust development,' *Proceedings of the SIGCHI Conference on Human Factors in computing systems: changing our world, changing ourselves*, Minneapolis, Minnesota, pp. 135-140.
- [10] Bowers, J. (1994). 'The work to make a network work: studying CSCW in action,' in *Proceedings of CSCW'94*, Chapel Hill, NC, New York: ACM, pp. 287-298.
- [11] Chadwick-Jones, J. K. (1976). *Social Exchange Theory: its structure and influence in social psychology*, Academic Press Inc., New York.
- [12] Chin, G., Myers, J., and Hoyt, D. (2002). 'Social networks in the virtual science laboratory,'

Communications of the ACM, August, Vol. 45, No. 8, pp. 87-92.

- [13] Clemons, E. K., Reddi, S. P., and Row, M. C. (1993). 'The impact of information technology on the organization of economic activity: the move of the middle hypothesis,' *Journal of Management Information Systems*, Vol. 10, No. 2, Fall, pp. 9-35.
- [14] Das, T. K., and Teng, B. S. (1998). 'Between trust and control: developing confidence in partner cooperation in alliances,' *Academy of Management Review*, Vol. 23, No. 3, pp. 491-512.
- [15] Davis, A. G., and Ritsko, J. J. (2001). 'Preface,' *IBM Systems Journal*, Vol. 40, No. 1, pp. 2-3.
- [16] Fahey, L., Srivastava, R., and Sharon, J. S. (2001). 'Linking e-business and operating processes: the role of knowledge management,' *IBM Systems Journal*, Vol. 40, No. 4, pp. 889-907.
- [17] Fichman, M. (1997). 'A multilevel analysis of trust in inter-organizational customer-supplier ties,' *Proceedings of the Annual Academy of Management Meeting*, Boston, MA.
- [18] Emerson, R. (1972). Exchange theory, part 1: A psychological basis for social exchange, in J. Berger, M. Zelditch, and B. Anderson (Eds.), *Sociological theories in progress*, 2, Boston: Houghton-Muffin.
- [19] Flurry, G., and Vicknair, W. (2001). 'The IBM application framework for e-business,' *IBM Systems Journal*, Vol. 40, No. 1, pp. 8-24.
- [20] Gallivan, M., Goh, G. H., Hitt, L. M., and Wyner, G. (1993). *Incident tracking at infocorp: case study of a pilot NOTES implementation*, MIT Center for Coordination Science, Working paper No. 149, Cambridge, MA: MIT Sloan School.
- [21] Garreth, M. (1998). 'The origin of virtual corporations,' In H. Nolte (Ed.), *Aspects of resource-oriented corporate governance*, Mering, Germany: Rainer Hampp Verlag, pp. 110-133.
- [22] Gefen, D. (2002). 'Reflections on the dimensions of trust and trustworthiness among online consumers,' *ACM SIGMIS Database*, Vol. 33, No. 3, pp. 38-53.
- [23] Grambowski, M., and Roberts, K. H. (1999). 'Risk mitigation in virtual organizations,' *Organization Science*, Vol. 10, pp. 704-721.
- [24] Hackbarth, G., and Kettinger, W. J. (2000). 'Building an e-business strategy,' *Information Systems Management*, Vol. 17, No. 3, pp. 78-93.
- [25] Handy, C. (1995). 'Trust and virtual organization: how do we manage people whom you do not see,' *Harvard Business Review*, Vol. 73, No. 3, pp. 40-50.
- [26] Hoffman, D. L., Novak, T. P., and Peralta, M. (1999). 'Building consumer trust on-line,' *Communications of the ACM*, Vol. 42, No. 4, April, pp. 80-85.
- [27] Homans, G.L. (1961). *Social behavior: Its elementary forms*. New York: Harcourt Brace
- [28] Jovanovich.
- [29] Hosmer, L. (1995). 'Trust: the connection link between organizational theory and philosophical ethics,' *Academy of Management Review*, Vol. 20, pp. 379-403.
- [30] Jones, T. M., and Bowie, N. E. (1998). 'Moral hazards on the road to the "virtual" corporation,' *Business Ethics Quarterly*, Vol. 8, pp. 273-292.
- [31] Jones, S., Wilikens, M., Morris, P., and Masera, M. (2000). 'Trust requirements in e-business,' *Communications of the ACM*, Vol. 43, No. 12, pp. 81-87.
- [32] Josang, A. (1996). 'The right type of trust for distributed systems,' *Proceedings of the ACM 1996 Workshop on New Security Paradigms*, Lake Arrowhead, California, pp. 119-131.
- [33] Karahannas, M. V., and Jones, M. (1999). 'Interorganizational systems and trust in strategic alliance,' *Proceedings of the 20th International Conference on Information Systems*, Charlotte, North Carolina, pp. 346-357.
- [34] Karsten, H. (1999). 'Collaboration and collaborative information technologies: a review of the evidence,' *ACM SIGMIS Database Special Issue on Information Systems: current issue and future changes*, ACM Press, NY, pp. 44-65.
- [35] Kasper-Fuehrer, E. C., Ashkanasy, N. M., and Neal, M. (2001). 'Communicating trustworthiness and building trust in interorganizational virtual organizations,' *Journal of Management*, Vol. 27, No. 3, pp. 235-254.
- [36] Kouramajian, V., Dargahi, R., Fowler, J., and Baker, D. (1995). 'Consortium: a framework for transactions in collaborative environments,' *Proceedings of the 4th International Conference on Information and Knowledge Management*, Baltimore, Maryland, pp. 260-265.
- [37] Kumar, K., van Dissel, H. G., and Bielli, P. (1998). 'The merchant of prato-revisited: toward a third rationality of information systems,' *MIS Quarterly*, Vol. 22, No. 2, June, pp. 199-226.
- [38] Lechner, U., and Hummel, J. (2002). 'Business models and system architectures of virtual communities: from a sociological phenomenon to peer-to-peer architectures,' *International Journal of Electronic Commerce*, Vol. 6, No. 3, pp. 41-53.
- [39] Luce, R. D., and Raiffa, H. (1957). *Games and Decisions*, Wiley and Sons, New York.
- [40] Malone, T. W., Yates, J., and Benjamin, R. I. (1987). 'Electronic markets and electronic hierarchies,' *Communications of the ACM*, Vol. 36, No. 6, pp. 484-497.
- [41] Markus, M. L., Manville, B., and Agres, C. E. (2000). 'What makes a virtual organization work?' *Sloan Management Review*, Vol. 42, No. 1, pp. 13-26.
- [42] McKnight, H. D., Choudhury, V., and Kacmar, C. (2000). 'Trust in e-commerce vendors: a two-stage model,' *Proceedings of the 21st International Conference on Information Systems*, Brisbane, Queensland, pp. 532-536.
- [43] Menon, N. M., Konana, P., Browne, G. J., and Balasubramanian, B. (1999). 'Understanding trustworthiness beliefs in electronic brokerage usage,'

Proceedings of the 20th International Conference on Information Systems, Charlotte, North Carolina, pp. 552-555.

[45] Molm, L., & Cook, K. (1995). Social exchange and exchange networks, in K.S. Cook,

[46] G.A. Fine, and J.S. House (Eds.), *Sociological perspectives on social psychology*, p.209-

[47] 235, Boston: Allyn & Bacon.

[48] Nayak, N., Bhaskaran, K., and Das, R. (2001). 'Virtual enterprises: building blocks for dynamic e-business,' *Proceedings of the workshop on Information Technology for virtual enterprises*, Queensland, Australia, pp. 80-87.

[49] Nelson, K. M., and Coopridge, J. G. (1996). 'The contribution of shared knowledge to IS group performance,' *MIS Quarterly*, Vol. 51, pp. 123-140.

[50] Ono, C., Paulson, B. C., Kanetomo, D., Cutkosky, M., Kim, K., and Petrie, C. J. (2001). 'Trust-based facilitator for e-partnerships,' *Proceedings of the 5th International Conference on Autonomous Agents*, Montreal, Canada, pp. 108-109.

[51] Orlikowski, W. (1993). 'Learning from Notes: Organizational Issues in Groupware Implementation', *The Information Society*, Vol. 9, No. 3, pp. 237-250.

[52] Pancerella, C. M., Rahn, L. A., and Yang, C. L. (1999). 'The diesel combustion collaboratory: combustion researchers collaborating over the Internet,' *Proceedings of the 1999 ACM/IEEE Conference on Supercomputing (CDROM)*, Portland, Oregon, USA.

[53] Rapoport, A., and Guyer, M. (1966). A taxonomy of 2 X 2 games, *General Systems*, Vol. 2, pp. 203-214.

[54] Ratnasingham, P., and Kumar, K. (2000). 'Trading partner trust in electronic commerce participation,' *Proceedings of the 21st International Conference on Information Systems*, Brisbane, Queensland, Australia, pp. 544-552.

[55] Sairamesh, J., Mohan, R., Hason, C., and Bender, J. (2002). 'A platform for business-to-business sell-side, private exchanges and marketplaces,' *IBM Systems Journal*, Vol. 41, No. 2, pp. 242-254.

[56] Scott, S. C., and Lane, V. R. (2000). 'A stakeholder approach to organizational identity,' *Academy of Management Review*, Vol. 25, pp. 43-62.

[57] Semich, J. (1994). 'Information replaces inventory at the virtual corporation,' *Datamation*, Vol. 40, No. 14, pp. 37-40.

[58] Sheppard, B. H., and Tuchinsky, M. (1996). 'Micro-OB and the network organization,' In R. M. Kramer and T. R. Tyles (Eds.), *Trust in organizations: frontiers of theory and research*, Thousand Oaks, CA: Sage, pp. 140-165.

[59] Snow, C., Miles, R., and Coleman, Jr. H. (1992). 'Managing the 21st century network organizations,' *Organizational Dynamics*, Vol. 20, Winter, pp. 5-19.

[60] Staples, S. D., and Ratnasingham, P. (1998). 'Trust: the panacea of virtual management?' *Proceedings of the International Conference on Information Systems*, Helsinki, Finland, pp. 128-144.

[61] Steinfield, C., Jang, C. Y., and Pfaff, B. (1999). 'Supporting virtual team collaboration: the TeamSCOPE System,' *Proceedings of the International ACM SIGGROUP Conference on Supporting group work*, Phoenix, Arizona, pp. 81-90.

[62] Swagerman, D. M., Dogger, N., and Maatman, S. (2000). 'Electronic markets from a semiotic perspective,' *Electronic Journal of Organizational Virtualness*, Vol. 2, No. 2, pp. 22-42. <http://www.virtual-organization.net>.

[63] Thibaut, J., and Kelley, H. H. (1959). *The Social Psychology of Groups*, Wiley and Sons, New York.

[64] Vandenbosch, B., and Ginzberg, M. (1997). 'Lotus Notes and Collaboration: Le Plus Ca Change...', *Journal of Management Information Systems*, Vol. 13, No. 3, pp. 65-81.

[65] Venkatraman, N., and Henderson, J. C. (1998). 'Real strategies for virtual organizing,' *Sloan Management Review*, Fall, pp. 33-48.

[66] Wachter, H., and Reuter, H. (1992). 'The ConTract Model,' In *Database Transaction Models for Advanced Applications*, edited by A. Almagramid, Morgan Kaufmann.

[67] Whittaker, S. (1996). 'Talking to strangers: an evaluation of the factors affecting electronic collaboration,' *Proceedings of the ACM Conference on Computer Supported Cooperative Work*, Boston, Massachusetts, pp. 409-418.

[68] Wicks, A. C., Berman, S. L., and Jones, T. M. (1999). 'The structure of optimal trust: moral and strategic implications,' *Academy of Management Review*, Vol. 29, pp. 99-116.

[69] Wiesenfeld, B. M., Raghuram, S., and Garud, R. (1998). 'Communication patterns as determinants of organizational identification in a virtual organization,' *Journal of Computer Mediated Communication*, Vol. 3, No. 4, pp. 1-22.

[70] Wigand, R. T. (1977). 'A Cybernetic Model of Communication and Interorganizational Relationships among Complex Organizations,' *Proceedings of the Eighth International Congress on Cybernetics*, 8, 463-480.

[71] Wigand, R. T. (1978). 'A Dynamic Model of Interactions among Complex Organizations within an Organization-set,' In R. Trappl et al., (eds.), *Progress in Cybernetics and Systems Research*. Washington, DC: Hemisphere Publishing, Vol. 5, 32-37.

[72] Wigand, R. T., Picot, A., and Reichwald, R. (1997). *Information, organization, and management: Expanding markets and corporate boundaries*, Chichester, UK: Wiley