
A dynamic perspective of trust in virtual teams: the role of task, technology and time

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Abstract: The virtual environment differs remarkably from organisational contexts where people meet at the same place and at the same time. Scholars have argued that what makes it possible for teams to effectively function in this lean environment is trust. Surprisingly, while the understanding of trust is gaining importance in the IS literature, little effort has been made to understand the effects of context on trust development in virtual teams. Drawing upon Time Interaction Performance (TIP) theory, this paper develops a theoretical model (referred to as the v-TIP model) along with a set of propositions that address trust development in virtual teams by integrating three key constructs – trust, task and time. Specifically, the v-TIP model suggests that the context defined in terms of the technology and task type will be a strong predictor of trust, thus affecting the performance of virtual teams over time.

Keywords: trust; task; time; virtual teams; Time Interaction Performance (TIP) theory; relational development.

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1 Introduction

Research on virtual teams has consistently reported the importance of trust in enabling effective team performance (*e.g.*, Jarvenpaa and Leidner, 1999; Lipnack and Stamps, 2000; Piccoli and Ives, 2003). When working in virtual teams, members do not share the same physical space, do not (or rarely) see each other, have limited control over others' work habits (Powell *et al.*, 2004), and are likely to work with people with whom they have never worked with (or even met) before (Jarvenpaa *et al.*, 1998). Consequently, in this virtual setting, trust is the key catalyst for effective collaboration and needs to be built quickly and early (Lipnack and Stamps, 2000).

Trust is an interpersonal context-specific concept (Dirks and Ferrin, 2001) that captures "... the set of related conditions or situations in which group interaction takes place ..." (Jarvenpaa *et al.*, 2004). In fact, the critical role of context to the understanding of trust has surfaced in the IS literature (*e.g.*, Kramer, 1999; Rousseau *et al.*, 1998; Kramer and Tyler, 1996). Surprisingly, however, few efforts (*e.g.*, Jarvenpaa *et al.*, 2004) have been made to understand the effects of contextual elements such as the technology and the task on trust developments in virtual teams. This paucity of research is particularly apparent at the theoretical level. This paper seeks to fill this gap in the literature.

A virtual team is a group of people who work on interdependent tasks guided by a common purpose across space, time and organisational boundaries (Lipnack and Stamps, 2000) with technology-supported communication substantially more than face-to-face meetings (Maznevski and Chudoba, 2000). Furthermore, the task is an important component of such group work because it sets up the context for shared goals and a common purpose (McGrath *et al.*, 1993).

This paper develops a theoretical model suggesting that the technology and task type can be seen as strong predictors of trust, thus affecting the performance of virtual teams over time. Specifically, we advance research by examining the following research question: *What are the effects of the interaction of technology and task type (i.e., the context) on the development of trust and performance of virtual teams over time?* In addressing this research question we build the v-TIP model (along with a set of propositions), which draws on research in small group behaviour, communication, and information systems to advance an integrated theory of technology, task and trust in virtual teams.

2 Theoretical background

The v-TIP model is grounded in the Time Interaction and Performance (TIP) theory (McGrath, 1991) model, which offers an analytical tool to examine *how* groups working on different tasks and with different media may experience different processes (*e.g.*, trust) and achieve different outcomes over time (Chidambaram and Bostrom, 1997). TIP proposes that group processes are composed of a complex set of paths, modes, and functions suggesting that groups engage in many activities – some related to the task and others not (McGrath, 1991). Presumably, whenever the group deviates its focus from the task to relational activities, task performance suffers. However, such relational activities are necessary to maintain the group's social needs in addition to accomplishing its task.

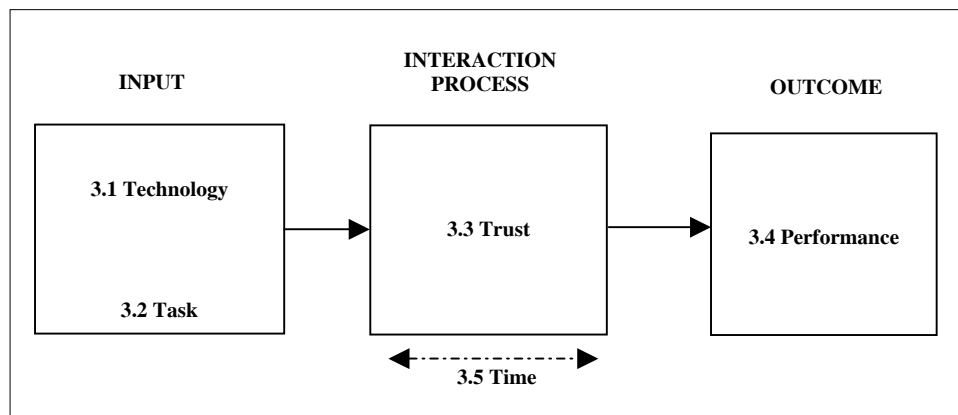
In essence, TIP suggests that temporal processes are a key to understanding group interaction and performance. Many studies (*e.g.*, McGrath *et al.*, 1993; Hollingshead *et al.*, 1993; Gruenfeld and Hollingshead, 1993; O'Connor *et al.*, 1993; Galegher and Kraut, 1994; Qureshi, 1998) have subscribed to this view and applied longitudinal research methodologies in which interaction patterns and outcomes were observed and examined over time. Even though TIP has influenced a great deal of research in group behaviour, its main tenets are to some extent quite general and do not specify many details related to emerging teamwork settings, such as virtual teams.

This paper extends the original TIP model to a new context (*i.e.*, virtual setting) that focuses on virtual team interactions by explicitly examining the effects of technology and task types on the development of trust and performance in virtual settings. The v-TIP model also draws upon several other theoretical lenses: McKnight *et al.*'s (1998) model on initial trust development, McGrath's (1984) Task Circumplex, and Walther's (1992) Relational Development approach. These theoretical lenses and the elements of the v-TIP model are explained below.

3 The v-TIP model: a conceptual overview

The central tenet of the v-TIP model is this: Where members of a virtual team view trust as an essential element for their effective interaction (*i.e.*, collaboration), given enough time, they will develop trust and thereby enhance performance. Furthermore, the development of trust and the achievement of group outcomes will vary based on the combination of technologies and task types and higher levels of trust will eventually lead to better performance. In the following sections we describe each element of the v-TIP model (Figure 1) and its underlying theoretical assumptions.

Figure 1 The v-TIP model (Time Interaction Performance in virtual teams)



3.1 Input: technology

Virtual teams make use of technologies that enable groups to integrate information, make faster decisions, and implement actions around the globe through high levels of flexibility, responsiveness, and resource utilisation. A growing number of studies

(e.g., Carlson and Zmud, 1999; Chidambaram, 1996; Powell, 2000; Wei, 1997), drawing on a relational development perspective, have suggested that over time groups can exhibit socioemotional development even when operating in a lean environment such as the virtual team. For example, Chidambaram (1996) demonstrated that over time group members exhibited relational development in terms of increased cohesiveness and better ability to manage conflict. Wei (1997) also argues that after a shared social construction is built up among the group members, rich information can be conveyed and relational development is possible even in a lean medium. In a similar vein, Carlson and Zmud (1999) proposed Channel Expansion Theory, which suggests that the ‘barriers’ of media can be overcome via different types of knowledge. Taken together, these studies subscribe to a theoretical assumption in which, given enough time for groups to interact, they will adapt existing media including lean electronic media to exchange relational information (Walther, 1992). Therefore, in the virtual team environment where trust is critical for effective work (Lipnack and Stamps, 2000), members will, if given enough time, develop trust, though the paths taken will differ according to the task at hand (Hollingshead *et al.*, 1993; O’Connor *et al.*, 1993; Vician and DeSanctis, 2000).

3.2 Input: task

Given the important role of the task in group work, McGrath (1984) developed an integrated conceptual framework – the Task Circumplex – to classify group tasks. This framework has been used widely in the study of computer-supported groups (e.g., Chidambaram, 1996; Hollingshead *et al.*, 1993; Miranda and Bostrom, 1993; O’Connor *et al.*, 1993; Vician and DeSanctis, 2000).

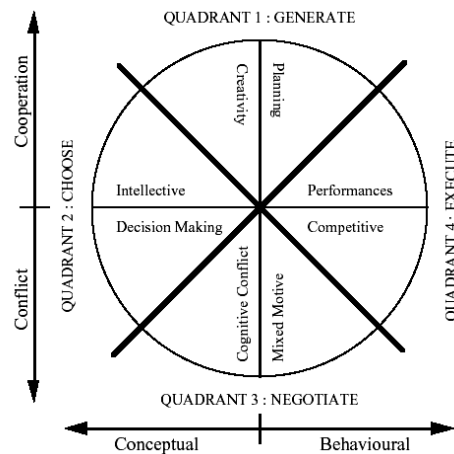
The group task circumplex model (Figure 2) can be viewed by dividing it horizontally into two halves, cooperative and conflictive. The upper half – the cooperative dimension – includes intellectual tasks, creativity tasks, planning tasks, and performance tasks. This dimension reflects situations where members have to combine their efforts without much conflict or trade-off. When performing a cooperative task, group members tend to share their ideas freely and operate in a climate of mutual understanding. On the other hand, the lower half – conflictive tasks – includes tasks in which members strive to resolve conflict in the face of differing preferences, viewpoints, interests, or power. Tasks in this category include decision-making tasks, cognitive conflict tasks, mixed-motive tasks, and competitive tasks. When performing a conflictive task, group members typically need to resolve differences and are likely to exhibit significant task conflict and even experience personal hostility. In other words, the nature of work that groups engage in and the type of task they perform affect group development differently. Thus, the type of task performed will affect how a group develops – a fact that suggests different developmental paths of trust for groups in different task contexts.

3.3 Interaction process: trust

The virtual team literature has consistently reported the impact of the context on trust (e.g., Jarvenpaa *et al.*, 2004; Majchrzak *et al.*, 2000). For example, Jarvenpaa *et al.*’s (2004) findings indicate that trust unfolds and affects group performance differently as a result of the context. In their study trust played a strong role as a predictor of group performance in the early stages of group interaction due to the presence of weak

structural elements because group members had limited amount of information about their partners and there was an absence of powerful mechanisms to control each other. In another study, Majchrzak *et al.* (2000) observed for a period of ten months an inter-organisational virtual team responsible for developing a new product. Their results indicate that both the technology and the task influenced how members interacted in the early stages of the group project. Over time, however, group members revised their initial practices because the emergent task demanded a different set of aligned structures to perform well. Taken together, these studies offer an empirical basis for the v-TIP model in that different combinations of the context in terms of the technology and task type promote different trust development paths, thereby affecting group performance differently over time.

Figure 2 The group task circumplex



Source: McGrath (1984)

3.4 Outcome: performance

A large number of studies on virtual teams (*e.g.*, Jarvenpaa *et al.*, 2004; 1998; Jarvenpaa and Leidner, 1999; Potter and Balthazard, 2000; Ryssen and Godar, 2000) has shown that clear links exist between group processes and group outcomes. More specifically, these studies suggest that both technology and task influence group processes, thereby, affecting performance. For instance, an empirical study by Potter and Balthazard (2000) focused on integrative negotiation using web-based technologies. The subjects were located in China and the USA. To test whether subjects from both cultures would perceive differences between two different technologies, some groups used e-mail while others used web-based threaded discussion, configured to appear very similar to e-mail programmes. Subjects from both cultures reported that both technologies were acceptable for the task and there was no difference in negotiation outcomes due to technology. Results indicate that virtual groups did not perform as well as face-to-face groups and such differences seemed to be related to a lack of understanding about the negotiating partners in the virtual context since group members could not see each other or interact freely. Thus, different technologies affect group development differently, which, in turn, affects performance differently.

Jarvenpaa *et al.* (1998) also found links between trust and performance in virtual teams. In a follow-up study, Jarvenpaa and Leidner (1999) confirmed these links by showing the importance of group process factors in determining group outcomes, particularly in the context of virtual teams. Along similar lines, Ryssen and Godar's (2000) case study examined the role of task in a distance education environment involving American and Belgian students. They found that project effectiveness depended on the instructor's ability to help students overcome problems they encountered in cross-cultural communication, not on their ability to use technology. While Belgian students wanted to develop relationships with their partners before working on the task, the American students preferred to work on the task prior to developing relationships. Finally, students shifted focus from task to communication when they had communication problems such as the lack of responses among group members. However, when trust was established among subjects these issues became easier to manage. These studies provide empirical support for the positive impact of trust on group outcomes in the context of virtual teams.

4 The v-TIP model: research propositions

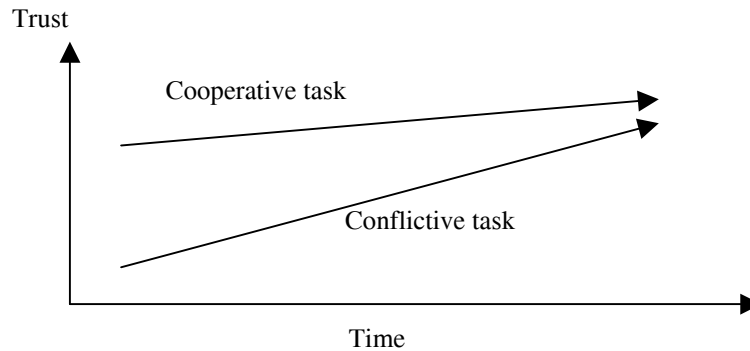
Focusing on group developments over time and understanding that the task both defines the existence of a team and poses different requirements for the group, the v-TIP model suggests that members of virtual teams spend a considerable amount of time in adjusting their group interaction processes in order to get the assigned task done. For instance, groups performing cooperative tasks will engage in different behavioural patterns than those groups performing conflictive tasks (McGrath *et al.*, 1993). More specifically, while members engaged in cooperative tasks are likely to exhibit higher levels of trust because they are expected to work collaboratively with shared goals, members engaged in conflictive tasks are likely to exhibit lower levels of trust because they may encounter hostility as a result of their opposing ideas.

Thus, the v-TIP model suggests that given the requirements of the virtual setting, over time, groups will spend time focusing both on task accomplishments and the development of trust thereby adjusting the technology available at hand. Furthermore, all else being equal, groups working on conflictive tasks are likely to exhibit lower levels of trust compared to groups performing cooperative tasks as a result of the inherent trust levels associated with each type of task (Benbasat and Lim, 1993; McKnight *et al.*, 1998), even though over time, groups will strive to develop trust given the nature of the virtual setting. While Figure 3 illustrates the essence of these arguments, in the following paragraphs we provide more details on how these relationships evolve taking into consideration a group's developmental stages and variations in its task.

As discussed earlier, the nature of work that groups engage in and the type of task they perform affect group processes differently. Research on computer-supported groups also suggests that the task plays a key role in determining group processes and outcomes (*e.g.*, McGrath *et al.*, 1993; Gallupe, 1985; Benbasat and Lim, 1993; Hollingshead *et al.*, 1993). In the initial stages of group work where members do not know each other and have limited knowledge of others' characteristics (since they may have never worked together before), their levels of trust may be more influenced by contextual determinants other than personal information (McKnight *et al.*, 1998). This view implies that

impersonal structures such as contextual conditions enable one to act in anticipation of a future successful interaction. Within this framework, which explicitly focuses on initial trust development in new organisational relationships, we expect that characteristics of the task will exert a great impact on how members of virtual teams develop trust.

Figure 3 Differences in trust development over time based on task type



For instance, cooperative tasks have embedded in them a high level of implicit trust. Such an environment facilitates members sharing their ideas and working towards common goals. It is a context where socioemotional interaction is characterised by the assumption of members being on the same side; hence trust is evident from the start (McKnight *et al.*, 1998). On the other hand, members of groups performing conflictive tasks strive to resolve divergent viewpoints in an environment of negotiations, dispute and, sometimes, hostility. In such a context, usually the interaction is focused on individual interests and members have difficulty developing relational ties. Then, at the early stages of group development, members working on conflictive tasks need a long time to get acquainted with each other before placing high levels of trust on their partners. Thus, it is expected that groups performing cooperative tasks will have higher levels of implicit trust, at least initially (in the absence of personal information) compared to groups working on conflictive tasks. Hence, we offer the following proposition:

P1 During the initial stages of group work, virtual teams performing cooperative tasks will exhibit greater trust than those performing conflictive tasks.

Trust affects outcomes especially in situations where there are weak structural forms (Dirks and Ferrin, 2001) such as in the early stages of virtual teams in which members have not had time to develop strong relationships. Furthermore, a growing body of the literature on virtual teams indicates that teams with high levels of trust outperform those teams with lower levels of trust (*e.g.*, Jarvenpaa and Leidner, 1999; Potter and Balthazard, 2000; Ryssen and Godar, 2000). With this in mind, we elaborate below on how trust affects group outcomes in the early stages of group work.

As implied in the TIP theory, whenever a group deviates its focus from the task to other activities, task performance tends to suffer. Thus, even though such activities (including trust development) are viewed as necessary to maintain the group's social needs in addition to accomplishing its task, the focus on trust development can result

in task performance losses. For example, in groups working in conflictive tasks where trust behaviour is somewhat limited due to the hostility exhibited among partners, members will have to spend a great deal of efforts to overcome such barriers to develop trust. In other words, members performing conflictive tasks need to shift their focus from the task to the development of socioemotional relationships. Logically, the focus on socioemotional issues is done at the expense of task outcomes, thus affecting group performance negatively. On the other hand, members performing cooperative tasks will spend less effort in focusing on trust development given that the task setting promotes a working climate in which members tend to see their partners as engaged in common goals, and thus working on the same side.

In short, group performance is likely to differ across teams performing different tasks. Specifically, in groups performing cooperative tasks, individuals may place trust on their partners from the early stages of group interaction, thus enhancing group performance. On the contrary, in groups performing conflictive tasks, members may display divergent points of view and question each others' ideas from the start. Consequently, members are likely to have difficulties in perceiving their partners as trustworthy, thereby hurting group performance. Hence, we propose that:

P2 During the initial stages of group work, virtual teams engaged in cooperative tasks will perform better than those engaged in conflictive tasks.

A growing body of research (e.g., Iacono and Weisband, 1997; Jarvenpaa *et al.*, 2004; 1998; Jarvenpaa and Leidner, 1999) has been investigating the nature and development of trust in virtual teams. In pioneering work in this area, Jarvenpaa *et al.* (1998) have suggested that virtual teams exhibit swift trust, which is a temporary form of trust that is established at the very early stages of group interaction. This study employed team building exercises as a manipulation tool to foster trust development among team members. While their findings imply that trust is somewhat stable over time, it appears that subjects experienced initial high levels of collaboration due to the nature of the experimental setting in terms of the task and team building exercises that were employed.

In another study, Jarvenpaa *et al.* (2004) empirically supported the existence of two forms of trust: initial trustworthiness and early trust. While initial trustworthiness captured levels of trust perceived among partners before the team interacted, early trust reflected levels of trust exhibited among members during group interaction. In this experiment, trust unfolded and affected group performance differently throughout different stages of group development exhibiting a punctuated equilibrium pattern (Gersick, 1988). Specifically, initially, trust directly affected performance, but as groups went through a transition phase (the group's milestones), by adopting new procedures and strategies, trust played a moderator role between inputs and performance. One way of interpreting such results is that once members develop the necessary levels of trust for the group to perform well, members may have felt confident with each other's participation and assumed the existence of trust.

Taken together, it is likely that in both studies the groups' attention moved from the development of trust to the task at hand, thus reducing the impact of trust on group performance. The fundamental assumption that characteristics of the task affect how trust unfolds over time offers a strong theoretical basis for understanding such intriguing results.

Recall that groups performing cooperative tasks are likely to exhibit higher levels of cooperation from the very early stages of group development in comparison with those groups performing conflictive tasks. This suggests that employing different experimental tasks, trust may unfold differently in virtual teams. However, to the best of our knowledge, no study has employed groups working on conflictive tasks, a context where members should strive to develop trust to effectively reap the benefits of working in virtual teams.

We argue that groups working on cooperative tasks should exhibit high levels of trust at the beginning of their group development and should maintain these levels of trust during the entire group process, affecting performance minimally. Conversely, groups performing conflictive tasks exhibit low levels of initial trust due to inherent characteristics of the task. However, once these groups recognise the need for trust in the virtual setting, their members will eventually work to develop trust, thus improving group performance over time.

In other words, we propose that cooperative tasks will likely engender a higher level of initial trust than conflictive tasks. In addition, in relatively benign environments with a high degree of trust, the need to establish more trust is likely to be less pressing than in comparably less benign environments. Thus, due to the greater absence of trust among individuals working in a conflictive task and their greater need for trust to execute the task at hand, it is expected that such groups will work harder at building trust than their counterparts working on cooperative tasks. Hence, we offer the following proposition:

P3 Over time, trust will increase faster among virtual teams performing conflictive tasks than among groups performing cooperative tasks.

Earlier we articulated that trust will evolve differently according to the task at hand because when performing a task, a group adapts its behaviour to embedded contextual conditions (Arrow *et al.*, 2000). In addition, we have argued that trust serves as the critical behavioural foundation for virtual teams to perform well given the nature of the group interactions in the virtual setting. Members of virtual teams are likely to perceive trust as an important component of group work given that they operate in an environment where they cannot see each other and have limited opportunities to ensure that others are contributing effectively to the team work (Powell *et al.*, 2004). In other words, members of virtual teams should pursue the establishing of trust (even though at various degrees as explained earlier), which will eventually result in improvements of team performance.

Since different types of task require group members to interact differently (McGrath, 1984), earlier we argued that the initial socioemotional tone is different for teams dealing with two contrasting types of tasks (*i.e.*, conflictive and cooperative). For instance, relationships will evolve differently, thereby resulting in different paths (*i.e.*, processes) and consequently different destinations (outcomes). For example, as theorised earlier, when a group is performing a planning task, it is expected that group members will operate in a cooperative mode thereby fostering the development of initial trust. However, when a group is performing a negotiation task, group members will need to resolve different viewpoints. Thus, group members are expected to exhibit greater conflict, thereby slowing down the development of initial trust.

Based on the arguments of group developmental theories and an understanding of technologies, over time, virtual teams engage in a complex set of activities to develop performance norms, enhance well being, and overcome initial media constraints. Such

processes occur as group members adapt to their embedded contextual conditions (Arrow *et al.*, 2000). A byproduct of dealing with media constraints constantly enables virtual teams to find ways of building closer ties (such as using smiley faces to convey emotions). Thus, since groups mediated by technology are able to develop relational links over time (Walther, 1992), trust will eventually emerge (as more positive relational information is conveyed) and consequently have a positive impact on performance. These arguments are in line with developmental notions (Bales, 1950; Bales and Strodtbeck, 1951; McGrath, 1991) suggesting that once relational ties, such as trust, have been established among group members, groups will tend to focus more on the task at hand. Moreover, whenever the group shifts its focus from social needs to task activities, task performance improves (McGrath, 1991). In other words, group performance will be higher later in a virtual group's life (after trust has been established) compared to earlier (before trust has been established). Thus, we present:

P4 Performance at the later stages of a virtual group's life – after trust has been established – will be better than at earlier stages, regardless of the task.

5 Conclusion

The theoretical arguments developed above suggest that trust evolves over time based on characteristics of the technology and task. While in the initial stages of group development trust is likely to be higher in teams performing cooperative tasks compared to those groups working in conflictive tasks, these differences are likely to dissipate over time if during the later stages of group interaction, other contingent factors such as team leadership, reward systems and organisational climate are beneficial. Furthermore, the v-TIP model suggests that levels of trust will be higher later in a group's life regardless of the task. Greater understanding of these relationships could have important implications for both managerial practice and theory development.

The virtual environment differs remarkably from organisational contexts where people meet at the same place and at the same time. What makes it possible for teams to effectively function in this lean environment is trust. While trust is an essential ingredient that enables interaction among group members dispersed geographically, it is affected by the types of tasks that groups perform and the amount of time spent together. The v-TIP model addresses current concerns about variations in trust developments (Jarvenpaa *et al.*, 2004) and group outcomes in virtual teams (Powell *et al.*, 2004) by providing a theoretical integration of three key constructs – trust, task and time – and thereby extending the TIP model to the virtual setting.

Furthermore, the v-TIP model developed in this paper offers an analytical tool to guide empirical work by providing a set of propositions on how the relationship between information technology and task unfolds and promotes differential trust development and outcomes over time. As technological platforms become more sophisticated and flexible and different task types require groups to operate in different behavioural modes, it is critical for researchers to understand the different paths that virtual teams take. Thus, modelling the interaction between technology and task opens a window to visualise how trust may unfold differently across different contextual conditions, thereby affecting group performance differently over time.

From a managerial perspective, it is important to know how we can get virtual teams to develop trust at a faster rate compared to collocated teams. In other words, based on the v-TIP model, how can a manager foster the development of trust based on the task characteristics and available technologies? Viewed differently, the challenge facing managers concerns the effective utilisation of information technologies in specific task contexts, which may change over time. A managerial intervention based on this approach may ultimately stimulate virtual teams to collaborate and rapidly engage in effective interactions, thereby improving performance. Future research can also build on and test the propositions developed here using the v-TIP model so a more complete understanding of trust in the virtual team context can emerge.

References

- Arrow, H., McGrath, J.E. and Berdahl, J.L. (2000) *Small Groups as Complex Systems: Formation, Coordination, Development, and Adaptation*, Thousand Oaks: Sage Publications.
- Bales, R.F. (1950) *Interaction Process Analysis: A Method for the Study of Small Groups*, Cambridge: Addison-Wesley Press.
- Bales, R.F. and Strodtbeck, F.L. (1951) 'Phases in group problem-solving', *Journal of Abnormal & Social Psychology*, Vol. 46, pp.485–495.
- Benbasat, I. and Lim, L-H. (1993) 'The effects of group, task, context, and technology variables on the usefulness of group support systems: a meta-analysis of experimental studies', *Small Group Research*, Vol. 24, No. 4, pp.430–462.
- Carlson, J.R. and Zmud, R.W. (1999) 'Channel expansion theory and the experiential nature of media richness perceptions', *Academy of Management Journal*, Vol. 42, No. 2, pp.153–170.
- Chidambaram, L. (1996) 'Relational development in computer-supported groups', *MIS Quarterly*, Vol. 20, No. 2, pp.143–165.
- Chidambaram, L. and Bostrom, R.P. (1997) 'Group development (I): a review and synthesis of development models', *Group Decision and Negotiation*, Vol. 6, No. 2, pp.159–187.
- Dirks, K.T. and Ferrin, D.L. (2001) 'The role of trust in organizational settings', *Organization Science*, Vol. 12, No. 4, pp.450–467.
- Galegher, J. and Kraut, R.E. (1994) 'Computer-mediated communication for intellectual teamwork: an experiment in group writing', *Information Systems Research*, Vol. 5, No. 2, pp.110–138.
- Gallupe, R.B. (1985) 'The impact of task difficulty on the use of a group decision support system', Unpublished PhD thesis, University of Minnesota.
- Gersick, C.J.G. (1988) 'Time and transition in work teams: toward a new model of group development', *Academy of Management Journal*, Vol. 31, pp.9–41.
- Gruenfeld, D.H. and Hollingshead, A.B. (1993) 'Sociocognition in work groups: the evolution of group integrative complexity and its relation to task performance', *Small Group Research*, Vol. 24, No. 3, pp.383–405.
- Hollingshead, A.B., McGrath, J.E. and Oconnor, K.M. (1993) 'Group task-performance and communication technology – a longitudinal-Study of computer-mediated versus face-to-face work groups', *Small Group Research*, Vol. 24, No. 3, pp.307–333.
- Iacono, C.S. and Weisband, S.P. (1997) 'Developing trust in virtual teams', *Proceedings of the 30th Hawaii International Conference on System Sciences: Information Systems Track-Collaboration Systems and Technology*, Maui, HI, Vol. 2, pp.412–420.
- Jarvenpaa, S.L., Knoll, K.E. and Leidner, D.E. (1998) 'Is anybody out there? Antecedents of trust in global virtual teams', *Journal of Management Information Systems*, Vol. 14, No. 4, pp.29–64.
- Jarvenpaa, S.L. and Leidner, D.E. (1999) 'Communication and trust in global virtual teams', *Organization Science*, Vol. 10, No. 6, pp.791–815.

- Jarvenpaa, S.L., Shaw, T.R. and Staples, D.S. (2004) 'Toward contextualized theories of trust: the role of trust in global virtual teams', *Information Systems Research*, Vol. 15, No. 3, pp.250–267.
- Kramer, R. (1999) 'Trust and distrust in organizations: emerging perspectives, enduring questions', *Annual Review of Psychology*, Vol. 50, pp.569–598.
- Kramer, R.M. and Tyler, T.R. (Eds.) (1996) *Trust in Organizations: Frontiers of Theory and Research*, Thousand Oaks: Sage Publications.
- Lipnack, J. and Stamps, J. (2000) *Virtual Teams: People Working Across Boundaries with Technology*, 2nd ed., New York, NY: John Wiley & Sons.
- Majchrzak, A., Rice, R.E., Malhotra, A., King, N. and Ba, S. (2000) 'Technology adaptation: the case of a computer-supported inter-organizational virtual team', *MIS Quarterly*, Vol. 24, No. 4, pp.569–600.
- Maznevski, M.L. and Chudoba, K.M. (2000) 'Bridging space over time: global virtual team dynamics and effectiveness', *Organization Science*, Vol. 11, No. 5, pp.473–492.
- McGrath, J.E. (1984) *Groups: Interaction and Performance*, Englewood Cliffs, NJ: Prentice-Hall.
- McGrath, J.E. (1991) 'Time, Interaction, and Performance (TIP): a theory of groups', *Small Group Research*, Vol. 22, No. 2, pp.147–174.
- McGrath, J.E., Arrow, H., Gruenfeld, D.H., Hollingshead, A.B. and O'Connor, K.M. (1993) 'Groups, tasks, and technology: the effects of experience and change', *Small Group Research*, Vol. 24, No. 3, pp.406–420.
- McKnight, D.H., Cummings, L.L. and Chervany, N.L. (1998) 'Initial trust formation in new organizational relationships', *Academy of Management Review*, Vol. 23, No. 3, pp.473–490.
- Miranda, S.M. and Bostrom, R.P. (1993) 'The impact of group support systems on group conflict and conflict management', *Journal of Management Information Systems*, Vol. 10, No. 3, pp.63–95.
- O'Connor, K.M., Gruenfeld, D.H. and McGrath, J.E. (1993) 'The experience and effects of conflict in continuing work groups', *Small Group Research*, Vol. 24, No. 3, pp.362–382.
- Piccoli, G. and Ives, B. (2003) 'Trust and the unintended effects of behavior control in virtual teams', *MIS Quarterly*, Vol. 27, No. 3, pp.365–395.
- Potter, R.E. and Balthazard, P.A. (2000) 'Supporting integrative negotiation via computer mediated communication technologies: an empirical example with geographically dispersed Chinese and American negotiators', *Journal of International Consumer Marketing*, Vol. 12, No. 4, pp.7–32.
- Powell, A., Piccoli, G. and Ives, B. (2004) 'Virtual teams: a review of current literature and directions for future research', *The DATA BASE for Advances in Information Systems*, Vol. 35, No. 1, pp.6–31.
- Powell, A.L. (2000) 'Antecedents and outcomes of team commitment in a global, virtual environment', Unpublished Doctor of Philosophy thesis, Indiana University, Bloomington, IN.
- Qureshi, S. (1998) 'Supporting a network way of working in an electronic social space', *Group Decision and Negotiation*, Vol. 7, No. 5, pp.399–416.
- Rousseau, D.M., Sitkin, S.B., Burt, R.S. and Camerer, C. (1998) 'Not so different after all: a cross-discipline of trust', *Academy of Management*, Vol. 23, No. 3, pp.393–404.
- Ryssen, S.V. and Godar, S.H. (2000) 'Going international without going international: multinational virtual teams', *Journal of International Management*, Vol. 6, pp.49–60.
- Vician, C. and DeSanctis, G. (2000) 'The impact of role training in a user-driven group support system environment', *Group Decision and Negotiation*, Vol. 9, No. 4, pp.275–296.
- Walther, J.B. (1992) 'Interpersonal effects in computer-mediated interaction – a relational perspective', *Communication Research*, Vol. 19, No. 1, pp.52–90.
- Wei, H. (1997) 'A re-examination of media richness theory: realizing rich communication in a lean CMC medium', Unpublished Doctor of Philosophy thesis, National University of Singapore, Singapore.

Bibliography

- Burke, K. and Chidambaram, L. (1995) 'Developmental differences between distributed and face-to-face groups in electronically supported meeting environments: an exploratory investigation', *Group Decision & Negotiation*, Vol. 4, No. 3, pp.213–233.
- Connolly, T., Jessup, L.M. and Valacich, J.S. (1990) 'Effects of anonymity and evaluative tone on idea generation in computer-mediated groups', *Management Science*, Vol. 36, No. 6, pp.689–703.
- Dennis, A.R. and Valacich, J.S. (1993) 'Computer brainstorming – more heads are better than one', *Journal of Applied Psychology*, Vol. 78, No. 4, pp.531–537.
- Dennis, A.R., Valacich, J.S., Connolly, T. and Wynne, B.E. (1996) 'Process structuring in electronic brainstorming', *Information Systems Research*, Vol. 7, No. 2, pp.268–277.
- Goodhue, D.L. and Thompson, R.L. (1995) 'Task/Technology fit and individual performance', *MIS Quarterly*, Vol. 19, pp.213–236.
- Lam, S.S.K. (1997) 'The effects of group decision support systems and task structures on group communication and decision quality', *Journal of Management Information Systems*, Vol. 13, No. 4, pp.193–215.
- Perry, J. (1995) 'Group calendaring and scheduling', in D. Coleman and R. Khanna (Eds.) *Groupware: Technology and Applications*, Upper Saddle River, NJ: Prentice Hall, pp.98–119.
- Straus, S.G. and McGrath, J.E. (1994) 'Does the medium matter – the interaction of task type and technology on group-performance and member reactions', *Journal of Applied Psychology*, Vol. 79, No. 1, pp.87–97.
- Zigurs, I. and Buckland, B.K. (1998) 'A theory of task/technology fit and group support systems effectiveness', *MIS Quarterly*, Vol. 22, No. 3, pp.313–334.