

## ANALYZING FACTORS THAT AFFECT PERFORMANCE OF GLOBAL VIRTUAL TEAMS

V. Sridhar

Management Development Institute,  
Gurgaon, India  
sridhar@mdi.ac.in

Ravi Paul

East Carolina University, USA  
paulr@ecu.edu

Dhruv Nath

Management Development Institute,  
Gurgaon, India  
Dhruv@mdi.ac.in

Kavita Kapur

Management Development Institute,  
Gurgaon, India  
fpm06kavita\_k@mdi.ac.in

Globalization of operations, reduced time to market, increased need to respond quickly to customers' needs worldwide and reduced cost of operations have encouraged many business organizations to adopt global virtual teams for their business activities. In this study, we explore a comprehensive model consisting of different variables that impact performance of such global virtual teams and validate it through an exploratory experiment conducted in an academic setting. Preliminary analysis indicates that trust between team members and communication effectiveness of the teams has significant positive correlation with the success of virtual team projects. Moreover, the participants perceived the virtual team project success positively. They also were positively oriented about their learning from participating in such virtual team projects. Motivation of team members is highly correlated with team members' learning effectiveness. Implications of these findings for businesses and curriculum development are discussed.

### **Key Words:**

collaborative work, Customer Relationship Management, collocated teams, computer mediated communication, academic experiments, virtual team projects

## **1. INTRODUCTION**

Global competition, reengineered product life cycles, mass customization, and the increased need to respond quickly to customers' needs are some of the pronounced trends currently driving organizational change. Successful companies in this environment use Information Technology as a primary enabler and are organized as dynamic networks with globally distributed operations which allow them to adapt more quickly to ever-changing competitive landscapes and customer requirements (Jarvenpaa & Ives, 1994). These organizations often adopt models of global virtual teams to collaboratively work, often exemplified in global software development (Edwards & Sridhar, 2005; Edwards & Sridhar, 2006).

A global virtual team is an example of organizational form, where a temporary team is formed on an as-needed basis, for the duration of a task and staffed by members from far corners of the world (Jarvenpaa, et al., 1998). Such virtual teams rarely meet face to face and are primarily linked through computer and telecommunication technologies often across national boundaries. With globalization partially spurred by improved telecommunications infrastructures, virtual teams are becoming the norm in most corporate environments such as consulting firms, technology products, and e-commerce (Lurey & Raisinghani, 2001) and are being increasingly examined in academic literature (see Powell, et al, 2004, for a comprehensive survey of virtual teams).

Since the virtual teams rarely meet in a face-to-face context, they face numerous problems not associated with traditional collocated teams. Dube & Pare (2001) outline several of the problems and challenges faced by virtual teams. Time difference across sites leads to co-ordination issues (Sarker & Sahay, 2002). Communication and language barriers, discrepancies in technological proficiency among team participants are also factors that influence the effectiveness of virtual teams. Co-located teams are often able to convey more information as compared to virtual teams due to richness of media.

With the new forms of communication and project management technologies, the above disadvantages of working in

virtual environment seem to be fading. Often, implementation of these technologies cost organizations a very small fraction of the cost of travel budget if the employees are flown in from different geographical locations. Apart from savings on travel cost, there is also time savings as aptly pointed out by an executive, “Virtual meeting can be planned and completed before one has even had time for booking a ticket.” Virtual teams are smarter than traditional collocated teams since most of the communication and information is digitally encoded. Therefore, there is a large repository of shared knowledge and information, which can be very useful for future communications.

Our objective in this exploratory study is to analyze factors that affect the performance of such virtual teams in an academic setting.

## **2. FACTORS IDENTIFIED IN OUR STUDY AND THE RESEARCH MODEL**

There are different factors that affect the performance of such virtual teams as pointed out by previous researchers. It is our endeavor to build a comprehensive model of factors in the context of virtual teams and study the interactions between these factors and subsequently their effects on team performance. We describe these factors below.

### **2.1 PREDICTOR VARIABLES**

#### **Trust:**

Trust has been defined as the “willingness of a party to be vulnerable to the actions of another party, based on the expectation that the other will perform a particular action important to the person in whom trust is placed, irrespective of the ability to monitor or control that other party” (Mayerson, et al. 1996). The issue of trust is very important particularly in the context of virtual teams because virtual team members are “geographically dispersed” and lack “shared social-context” and “face-to-face encounter” that are considered by many researchers as irreplaceable for building trust and repairing shattered trust (Jarvenpaa & Leidner, 1999). Trust development in virtual teams also presents significant challenges because it is difficult to assess teammates’ trustworthiness without ever having met them (McDonough et al., 2001). Moreover, as the life of many virtual teams is relatively limited, trust must quickly develop (Jarvenpaa & Leidner, 1999). Jarvenpaa, et al (1998) measured the antecedents of trust using experiments conducted in an academic setting and proposed a preliminary model of trust in the context of global virtual teams. Sarker, et al (2003) developed a comprehensive instrument for measuring different types of trust.

#### **Comfort:**

Comfort for this study has been defined as ease of working in virtual space. It also encapsulates the comfort level with remote team members. Comfort is assumed to be one of the first things to happen when remote team members actually start interacting with each other. Lurey & Raisinghani (2001) built a comprehensive model for measuring the effectiveness of virtual teams in which the comfort level of the participants is also mentioned.

#### **Motivation**

Motivation is defined as the excitement level and the drive to work in a virtual team project. If the virtual team members feel challenged by the project work, the performance will show improvement (Lurey & Raisinghani, 2001). It also encapsulates the purpose and the direction of behavior of team members to work with remote team members.

#### **Cohesion**

Cohesion is an important aspect of the virtual team. Cohen and Bailey (1997) suggest that cohesion is a critical factor influencing the effectiveness of groups/teams. They also concluded that a primary factor leading to team cohesion is the degree of trust among team members. Several studies have focused on cohesion by comparing virtual teams with traditional teams. However, results have been mixed. Warkentin et al. (1997) found that collaborative technologies hindered the development of cohesion in virtual teams and, hence had lesser levels of cohesion compared to traditional collocated teams. However, other studies have found that while virtual teams begin with lower cohesion, over time, virtual team members exchange enough social information to develop stronger cohesion (Chidambaram, 1996). Guinan, et al. (1998) examined cohesion in teams engaged in software requirements analysis. Balthazard, et al (2004) constructed items for measuring team cohesion and used it as a measure of virtual team performance.

### **Communication Effectiveness:**

At the core of any virtual team process is communication. Numerous articles in the practitioner press discuss the importance of communication focusing on the need to create a team of excellent communicators, and on the selection of the right technology for most effective communication in virtual teams. As noted by Hulnick, "if technology is the foundation of the virtual business relationship, communication is the cement" (Hulnick, 2000, p. 33). The virtual environment presents considerable challenges to effective communication including time delays in sending feedback, lack of a common frame of reference for all members, differences in salience and interpretation of written text, and assurance of participation from remote team members (Crampton, 2001). Moreover, nonverbal communication, an important component of team communication, is usually missing in virtual teams.

Sproull & Kiesler (1986) point out that technology tends to restrict the communication process because electronic media are intrinsically leaner than face-to-face communication and convey a limited set of communication cues. Thus, teams operating in the virtual environment face greater obstacles to orderly and efficient information exchange than their counterparts in the traditional context, a difficulty that is compounded when the virtual team is global in nature. Paul, et al. (2005) defined items for perceived participation and communication in the context of collaborative conflict management exercises. Piccoli, et al (2004) analyzed team member communication on the effectiveness of virtual teams and indicated that the most satisfied team members were in virtual teams with effective coordination and communication.

## **2.2 OUTCOME VARIABLES**

### **Project Success**

Although several researchers have compared the performance of traditional co-located teams and virtual teams, the conclusions of these efforts have been mixed. Generally, computer-mediated teams exhibit lower frequency of communication than face-to-face teams although they tend to exchange more task-oriented messages as a proportion of total communication (Chidambaram, 1996). This enhanced communication leads to comparable or even higher performance of virtual teams as compared to co-located teams (Burke & Chidambaram, 1999). Consistent with these findings, Schmidt, et al (2001) report that virtual teams are more effective in new product development decisions as compared to face-to-face teams. However, majority of the early work has detected no difference between the two types of teams (Burke & Aytes, 1998). Similar to the more generic "performance" measure, most researchers have found no significant differences between traditional teams and virtual teams when examining decision quality (Chidambaram & Bostrom, 1993) and the number of ideas generated by decision making teams (Sharda et al., 1988). Walther (2005) further suggested that complex human processes such as negotiation are actually improved when individuals are physically separated and communicate through less rich communication media. In this study we measure the performance of virtual teams by the team members' perception on project success. Recently Mahaney & Lederer (2006) developed a comprehensive instrument for measuring Information Systems project success and we refer to the instrument developed in this study in our work.

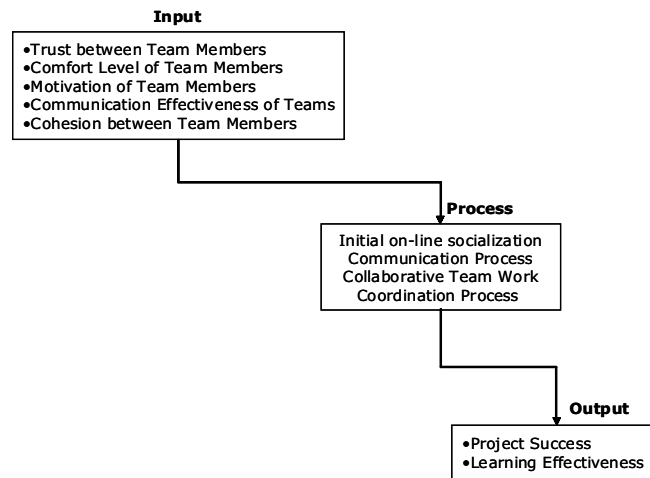
### **Learning Effectiveness**

In the academic setting in which the experiments were conducted, we were interested in exposing the students to the pertinent issues in globally distributed work. We also expect student teams to learn from each other. In this study, we evaluate the "effectiveness of the learning process" as one of the outcome variables. Edwards & Sridhar (2006) reported that the teams perceived learning to be one of the important outcomes of such academic experiments.

## **2.3 COMPOSITE MODEL**

It is our objective to understand the interrelationship between the above predictor and outcome variables and their effect on team performance. The model we have used in this study is presented in Figure 1.

Figure 1: Research Model



The model is a further refinement of the one presented in Edwards & Sridhar (2005). While study by Nath, et al (2005) and Edwards & Sridhar (2006) are related to a particular phase of software development projects, our study and model are more general to be applicable for any distributed virtual team project. Based on the above model, a series of hypotheses can be constructed and are shown in Table 1a and 1b.

Table 1a: Proposed Hypotheses Related to the Success of Virtual Team Projects

H1: Increased trust between remote team members lead to better project success
H2: Increased comfort level of the virtual team exercise participants lead to better project success
H3: Increased motivation lever of participants lead to better project success
H4: Improved communication effectiveness between remote teams lead to better project success
H5: Increased cohesion between remote team members lead to better project success

Table 1b: Proposed Hypotheses Related to Learning Effectiveness

H1: Increased trust between remote team members lead to better Learning
H2: Increased comfort level of the virtual team exercise participants lead to better Learning
H3: Increased motivation lever of participants lead to better Learning
H4: Improved communication effectiveness between remote teams lead to better Learning
H5: Increased cohesion between remote team members lead to better Learning

The model presented in this paper is comprehensive and takes in to account the relevant important variables that impact the success of virtual team projects.

### 3. EXPERIMENT DESIGN

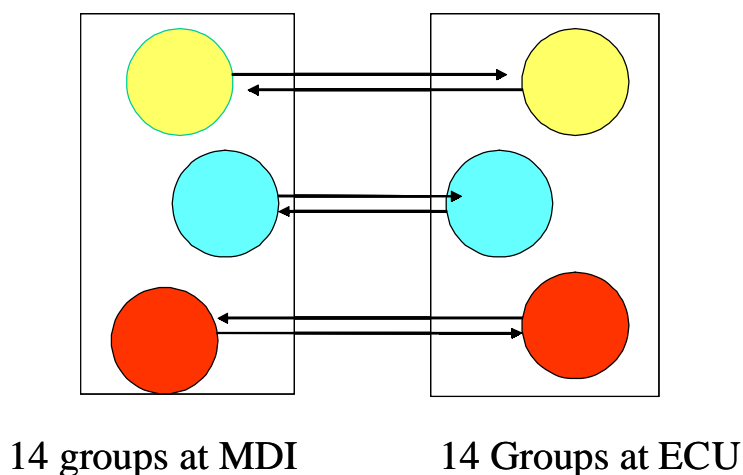
To test and validate the research model, we conducted an experiment involving students at East Carolina University

(ECU), USA and Management Development Institute (MDI), India in controlled settings. Such a setting has been actively used in distributed software engineering laboratories and business schools to conduct virtual team exercises in their courses (Favela & Pena-Mora (2001); Edwards & Sridhar (2005); Nath, et al. (2005); Nath, et al. (2006)). A controlled approach provides three benefits. Firstly, it makes available several teams that work in parallel thereby generating rich data for validating developed theoretical models. Secondly, an academic setting permits researchers to experiment with newer approaches which may not yet have been explored in practice. Finally, it equips and trains students, especially in business schools, to understand and to handle the challenges of working in global virtual teams.

There are criticisms for the use of students in academic experiments as surrogates. MBA students have been used as surrogate users in experiments conducted by Hazari (2005) and Briggs, et al (1996). Remus (1986) argued that graduate students could be used as surrogates for managers in experiments on business decision making. Dipboye & Flanagan (1979) suggested that students often represent a typical working professional and organizational member due to the variety of backgrounds and goals. In studies related to industrial organization psychology and organization behavior, results obtained from students were similar to those from managers (see for example, Locke, 1986). Given these arguments, it can be concluded that the use of student subjects is fairly relevant for our study.

There were 57 students at ECU and 55 at MDI who participated in the experiment. Students at both ECU and MDI were divided into 14 groups and paired with each other. The experimental set-up is illustrated in Figure 2.

Figure 2: The Experimental Set-up



Hence a virtual team comprises of 3-5 students at ECU paired with 3-5 corresponding students at MDI. Each Virtual Team was required to identify one multi-national, consumer-oriented organization that operated in both the USA and India. The students at both ECU and MDI had to collaboratively settle on this choice. No two paired teams were allowed to select the same organization. In the event of a conflict, organizations were allotted on a First-Come First-Serve basis. Each virtual team was to then accomplish the following for its chosen organization:

1. The MDI students were to examine the Customer Relationship Management (CRM) practices of this organization in India while the ECU students did the same in the USA. The teams were required to interact with the chosen organization as customers, and evaluate how customer – oriented the organization was in its operations. The teams were presented with the following typical issues as potential starting points:
  - How does the organization respond to complaints?
  - How easy is it to become a customer?
  - How are customers treated in a typical outlet?

- How “customer friendly” are these processes?
  - What is the responsiveness of the call centre, if one existed?
  - What is the responsiveness over other channels such as e-mail?
2. Each ECU/MDI team was to study the CRM practices in competing organizations in their respective countries and do a strengths / weaknesses analysis of the chosen organization
  3. Based on the above analysis, each team had to recommend base level global CRM practices for their organization to be followed in both countries.

The entire experiment was divided broadly into the following two phases:

- **Socialization Phase**

It is increasingly common practice in virtual teams to engage in formal face-to-face socialization before embarking on virtual team projects in order to understand each others' work styles and expectations, negotiate communications strategies and protocols, as well as build trust for sustained relationships. In our experiment, this was not feasible due to resource limitations and other restrictions. Therefore we encouraged the ECU and MDI teams to communicate and socialize with each other on-line before initiating the actual work on the project. At this stage, the details of the project were not given to the participants of the project so as to ensure that communication was more personalized and oriented towards relationship-building rather than information exchange. Members of paired teams were encouraged to communicate and socialize with each other using on-line media such as email, Internet chat, bulletin boards, and e-groups, for a period of about two weeks. Nath, et al. (2006) conducted experiments with such initial phases of on-line socialization in their experiments.

- **Project Execution Phase**

At the conclusion of the initial socialization phase, the project was formally announced. All the teams were told about their roles in the experiment. Deadlines were also specified for the submission of the various deliverables. The teams were given about 7 weeks for the completion of their virtual team projects.

The deliverables and the timeline of the experiment is shown in Table 2.

Table 2: Deliverable and timeline for submission of different artifacts

<b>Deliverables</b>	<b>Due Date (at the end of)</b>
Name of the Transnational Organization to be Studied	2 weeks
Study of CRM practices of the selected organization and its comparison with competitors; Analysis of Strengths and Weaknesses	5 weeks
Recommendation on Global base level CRM practices	7 weeks

#### **4. DATA ANALYSIS**

A survey instrument was designed to capture the constructs mentioned above using a Likert type scale of 1-7. Most of the items were picked up from previous research on virtual teams. Table 3 indicates the construct and the source from where items corresponding to the construct were adopted.

Table 3: Constructs Measured and the Corresponding Sources

Constructs Measured	Source
Trust Between Team Members	Sarker, et al (2003); Jarvenpaa, et al., (1998)
Comfort of Team Members	Lurey & Raisinghani (2001)
Motivation of Team Members	Lurey & Raisinghani (2001)
Team Member Cohesion	Balthazard, et al. (2004); Guinan, et al. (1998)
Communication Effectiveness of the Teams	Paul, et al (2005); Piccoli, et al.(2004)
Project Success	Mahaney & Lederer (2006)
Learning Effectiveness	Edwards & Sridhar (2005)

Construct validity was evaluated through principal component and reliability analysis. Internal validity was established through reliability tests. Table 4 shows that the reliability of each construct is higher than 0.70 (except for comfort which is 0.66) thereby indicating high internal construct validity.

Table 4: Reliability Coefficients (Cronbach Alpha) of Constructs

Constructs (No. of Items)	Cronbach Alpha
Trust (6)	0.84
Comfort (4)	0.66
Motivation (4)	0.77
Cohesion (5)	0.71
Communication Effectiveness (5)	0.73
Project Success (5)	0.74
Learning Effectiveness (6)	0.81

## 5. DISCUSSIONS

The pair-wise correlation between different input variable and outcome variables are presented in Table 5 here.

**Table 5: Pair-wise Correlation between Input and Output Variables (N = 112)**

Variables	Project Success	Learning Effectiveness
Trust	0.556**	0.536**
Comfort	0.511**	0.553**
Motivation	0.470**	0.703**
Communication Effectiveness	0.531**	0.435**
Cohesion	0.450**	0.378**

\*\* Correlation is significant at the 0.01 level (2-tailed)

A quick look at the table indicates that all the predictor variables have significant positive correlations with the two outcome variables as propounded in our hypotheses. As indicated by previous researchers, increase in trust, comfort level and communication effectiveness lead to better project success. Motivation is highly correlated with learning effectiveness compared to other predictor variables.

One-way ANOVA was performed across responses from the participants in ECU and MDI and the results are shown in Table 6. A quick look at table 6 indicates that there are no significant differences in perception of the different predictor and outcome variables between the ECU and MDI teams, except for one. MDI team members perceived that they had more cohesion with ECU team members, than what was perceived by ECU team members about MDI teams. Exact cause for this difference has to be explored further. Both the teams were positively poised regarding the virtual team project success and the team members' learning effectiveness. It can be generally concluded that most of these findings support the hypotheses constructed in tables 1a and 1b.

**Table 5: ANOVA Results between ECU and MDI student teams**

Variable	Mean ECU (N=57)	Mean MDI (N=55)	F (p)
Trust	3.49	3.59	0.257 (0.613)
Comfort	4.70	4.94	1.886 (0.172)
Motivation	4.43	4.57	0.567 (0.453)
Communication Effectiveness	3.93	4.15	1.125 (0.291)
Cohesion	4.20	4.62	4.676 (0.033)
Project Success	4.94	5.17	1.879(0.173)
Learning Effectiveness	4.25	4.37	0.425 (0.516)

## 6. CONCLUSIONS

In this paper we have described an exploratory experimental study, which examines the performance of globally distributed virtual teams. We constructed items for measuring various predictor and output variables relating to performance of such virtual teams. The model was validated using a study conducted in an academic setting consisting of students at the East Carolina University (ECU), USA and Management Development Institute (MDI), Gurgaon, India.

### 6.1 Lessons for Practice

The use of virtual teams in organizations is becoming more and more commonplace as corporations seek to take advantage of the talent available in geographically dispersed locations for their multi-location operations. In this research, we sought to examine the factors that impact the performance of such globally distributed virtual teams. The study yields several interesting conclusions that can assist organizations in creating and managing their global virtual team projects more effectively. Our experiment indicates that trust between peer teams, and the effectiveness of communication between the teams, significantly influence the success of such projects. It has been observed that in global software teams, trust level is lower at the start of the project leading to reluctance to share information (Herbsleb & Grinter, 2001). This may be due to insecurity and the possibility that teams did not see themselves as partners working towards a common goal. As Herbsleb & Grinter (1999) pointed out, businesses engaged in virtual team projects should arrange face-to-face meetings of team members at regular intervals to build the trust level of the team members. In our experiment this was achieved possibly due to the initial on-line socialization that took place between the teams. Further analysis is required to assess whether on-line socialization can act as substitute or complement to face-to-face meetings to improve trust level between teams.

The use of Global Virtual Teams in organizations is becoming more and more commonplace as corporations seek to take advantage of the talent available in geographically dispersed locations for their multi-location operations.

Creation of a flexible environment that can help organizations mitigate communication, coordination and control related risks inherent in virtual teams are being actively researched (Yadav, et al., 2007). Yadav, et al. (2007). These also point out that in such a flexible environment, effective communication between teams has significant influence on project success. Hence organizations engaged in such virtual team projects should make sure that the teams use appropriate technologies and protocols to communicate effectively with each other.

Apart from team related factors such as trust, communication effectiveness and cohesion, our research indicates that the organizations also should provide a conducive environment for improving the comfort and motivation level of participants involved in virtual team projects.

## **6.2 Lessons for Classroom**

This research work built a platform similar to Adya, et al (2007), Edwards & Sridhar (2005), Favela & Pena-Mora (2001), Nath, et al (2005), Nath, et al (2006), to help students better understand the nature of working in a globally distributed environment. Adya, et al. (2007) demonstrate various student, faculty and institution related factors that impact success of such virtual team projects in IT curricula.

The results of the study indicate that students showed interest in working on virtual team projects. It is important for instructors of corresponding courses to keep the students motivated; this has significant positive correlation with learning effectiveness. Hence we recommend that such exercises be given to the students in various courses offered in the business curriculum. These projects will enrich students' learning of the subject and also provide them the experience of working in a simulated real-world global virtual team projects.

As the IT workforce reflects new skill needs, international collaborative projects provide opportunities to impart these skills while exposing IT students to virtual team projects. From an organizational perspective, companies can expect to hire employees who are better prepared for global initiatives, have greater understanding work ethics and time zones, and are culturally sensitive. Greater involvement from organizations in the design and implementation of such international collaborations may further enrich the classroom environment while yielding a workforce whose skills are customized to organizational needs.

## **6.3 Limitations of the Study**

Literature available in the area of virtual teams has mainly followed three research methodologies – case studies, industry survey and experiments. There were 28 academic exercises, 13 industry case studies and only 1 case where input was taken from academic as well as practical environment (Powell et al., 2004). Experimental methods make possible the careful observation and precise manipulation of independent variables, allowing for greater certainty with respect to cause and effect, while holding constant other variables that would normally be associated with it in field settings (Damian et al., 2000). They also encourage the investigator to try out novel conditions and strategies in a safe and exploratory environment before implementing them in the real world (McGrath, 1984).

Though the experiment was carefully designed to address the controversial issue of using students as surrogates, the projects done were limited in scope and size compared to large scale industrial projects. However, no formal measures of complexity were used in the study. Our objective was to study the research questions on comparable relatively well-defined small projects, the results of which may be applicable to projects of similar complexity. Further research is needed to assess the impact of these findings on large scale industrial projects.

A preliminary look at the correlations of our predictor variables show the potential presence of multicollinearity between the different predictor variables. Further investigation is needed to analyze the direct and indirect effects of these predictor variables on the project success and learning effectiveness. Methodology such as Structured Equation Modeling should be utilized to build a comprehensive model for assessing the performance of virtual teams.

## **6.4 Future Research Directions**

One way of dealing with the lack of realism in laboratory experiments is to use multiple methods so that strengths of some compensate the weaknesses of others. To truly test the predictive ability of the research results, the studies must also involve a multiplicity of research methodologies in order to avoid biases due to the methods used (Jarvenpaa, et al., 1988). Simulated laboratory negotiations could be complemented by field studies or validations, if

the lack of realism is an issue. In our research therefore, we plan to complement the findings of our laboratory experiment with field validation. Internal validity of results was established through conducting experiments in controlled environment. We expect to conduct external validity through industry survey and case studies.

Finally a comprehensive model taking in to account the causal relationship between different predictor variables is required to assess the direct and indirect effects of these on outcome variables.

## REFERENCES

- Adya, M., Nath, D., Sridhar, V. & Malik, A. (2007). Bringing Global Sourcing into the Classroom: Experiential Learning via Software Development Project. In *Proceedings of the ACM SIGMIS-Computer Personnel Research Conference*, St. Louis, Missouri USA, April 19-21, 20-27.
- Balthazard, P., Potter, R., and Warren, J. (2004). "Expertise, Extraversion and Group Interaction Styles as Performance Indicators in Virtual Teams". The *DATABASE for Advances in Information Systems*, 35(1), 41-64.
- Briggs, R.O, Balthazard, P.A, Dennis, & A.R. (1996). "Graduate business students as surrogates in the evaluation of technology", *Journal of End User Computing*, 8 (4), pp. 11-17.
- Burke, K. and Chidambaram, L. (1999). "How much bandwidth is enough? A longitudinal examination of media characteristics and media outcomes", *MIS Quarterly*, 23(4), pp. 557-580.
- Burke, K. and Aytes, K. (1998). "A Longitudinal Analysis of the Effects of Media Richness on Cohesion Development and Process Satisfaction in Computer-supported Workgroups," *Proceedings of the Thirty-First Hawaii International Conference on Systems Sciences*, Hawaii, pp. 135-144.
- Chidambaram, L. and Bostrom, R. (1993). "Evolution of Group Performance Over Time: A Repeated Measures Study of GDSS Effects," *Journal of Organizational Computing*, 3(4), pp. 443-469.
- Chidambaram, L. (1996). "Relational Development in Computer-supported Groups," *MIS Quarterly*, 20(2), pp. 143-163.
- Cohen, S.G. and Bailey, D.E. (1997). "What Makes the Shop Floor to the Executive Suite," *Journal of Management*, Vol. 23, No.3, pp. 239-290.
- Crampton, C. (2001). "The Mutual Knowledge Problem and its Consequences for Dispersed Collaboration," *Organization Science*, Vol. 12, No.3, pp. 346-371.
- Damian, D.E, Eberlein, A., Shaw, M.L.G. and Gaines, B.R. (2000). "Using different communication media in requirements negotiation", *IEEE Software*, May/June, pp. 28-36.
- Dipboye, R.L., & Flanagan, M.F. (1979). "Research setting in industrial and organization psychology: Are findings in the field more generalizable than in laboratory," *American Psychologist*, 32, pp. 141-150.
- Dube, L., & Pare, G. (2001). "Global Virtual Teams". *Communications of the ACM*. 44(12), 71-73.
- Edwards, K., and Sridhar, V. (2005). "Analysis of Software Requirements Engineering Exercises in a Global Virtual Team Setup", *Journal of Global Information Management*, 13(2), April-June, pp. 21-41.
- Edwards, K., & Sridhar, V. (2006). "Collaborative Software Requirements Engineering Exercises in a Distributed Virtual Team Environment". In Hunter, G., and Tan, F. (Eds.) *Advanced Topics of Global Information Management*, Volume 5. Hershey, PA, U.S.A.: Idea Publishing, 178-197.
- Favela, J., and Pena-Mora, F. (2001). "An Experience in Collaborative Software Engineering Education", *IEEE Software*, March/April, pp. 47-53.
- Guinan, P., Coopridge, J., and Farej, S. (1998). "Enabling Software Development Team Performance During Requirements Definition: A Behavioral versus Technical Approach". *Information Systems Research*, 9(2), 101-125.
- Hazari, S.I. (2005). "Perceptions of end-users on the requirements in personal firewall software: An exploratory study", *Journal of Organizational and End User Computing*, 17(3), pp. 47-65.
- Herbsleb, J., & Grinter, R. (1999). Architecture, Coordination and Distance: Conway's Law and Beyond". *IEEE Software*. September/October, 63-70.
- Hulnick, G. (2000). "Doing Business Virtually," *Communication World*, Vol. 17, No.3, pp. 33-36.
- Jarvenpaa, S. and Ives, B. (1994). "The Global Network Organization of the Future: Information Management Opportunities and Challenges," *Journal of Management Information Systems*, Vol. 10, No.4, pp. 25-57.
- Jarvenpaa, S., Knoll, K. and Leidner, D. (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. and Leidner, D. (1999). "Communication and Trust in Global Virtual Teams," *Organization Science*, Vol. 10, No.6, pp. 791- 815.
- Lurey, J. and Raisinighani, M. (2001). "An Empirical Study of Best Practices in Virtual Teams," *Information & Management*, 38(8), pp. 523-544.
- Locke, E.A. (1986). *Generalizing from laboratory to field setting: Research finding from industrial organization, organization behavior, and human resource management*. Lexington, MA: Lexington Books.

- McDonough, E., Kahn, K., and Barczak, G. (2001). "An Investigation of the Use of Global, Virtual, and Collocated New Product Development Teams," *The Journal of Product Innovation Management*, Vol. 18, No.2, pp. 110-120.
- McGrath, J. (1984). *Groups: Interaction and Performance*. New Jersey: Prentice-Hall.
- Meyerson, D., Weick, K.E. and Kramer, R.M. (1996). "Swift Trust and Temporary Groups," in Kramer, R.M. and Tyler, T.R. (Eds), *Trust in Organizations: Frontiers of Theory and Research*, Thousand Oaks, CA: Sage Publications, pp. 166-195.
- Mahaney, R., Lederer, A. (September, 2006). "The Effect of Intrinsic and Extrinsic Rewards for Developers on Information Systems Project Success". *Project Management Journal*, 42-54.
- Nath, D., Sridhar, V. & Malik, A. (2005). "Effectiveness of the Two-Phase Software Off-Shoring Model". In *Proceedings of the First International Conference on Management of Globally Distributed Work*, Indian Institute of Management, Bangalore, India, December 28-30, 159-170.
- Nath, D., Sridhar, V. Adya, M., & Malik, A. (2006). "The Effect of User Project Monitoring on the Performance of Virtual Teams in the Requirements Analysis Phase of Off-Shored Software Projects". *INFORMS Conference on Information Systems and Technology (CIST) 2006*, November 4-5, 2006, Pittsburgh, PA, USA.
- Paul, Souren, Samarah, Imad M. Seetharaman, Priya and Mykytyn Jr., Peter P. (2005). "An Empirical Investigation of Collaborative Conflict Management Style in Group Support System-Based Global Virtual Teams." *Journal of Management Information Systems*, 21 (3), pp. 185-222.
- Piccoli, G., Powell, A., and Ives, B. (2004). Virtual Teams: Team Control Structure, Work Processes and Team Effectiveness". *Information Technology & People*, 17(4), 359-379.
- Powell, A., Piccoli, G., and Ives, B. (2004). "Virtual Teams: A Review of Current Literature and Directions for Future Research", *The DATABASE for Advances in Information Systems*, 35(1), pp. 6-36.
- Remus, W.E. (1986). "An empirical test of the use of graduate students as surrogates for managers in experiments on business decision making", *Journal of Business Research*, 14(1), 1986, pp. 19-25.
- Sarker, S. and Sahay, S. (2002). "Information Systems Development by US-Norwegian Virtual Teams: Implications of Time and Space," *Proceedings of the Thirty-Fifth Annual Hawaii International Conference on System Sciences*, Hawaii, pp. 1-10.
- Sarker, S., Valacich, J., and Sarker, S. (2003). "Virtual Team Trust: Instrument Development and Validation in IS Educational Environment". *Information Resources Management Journal*, 16(2), 35-5.
- Schimdt, J.B., Montoya-Weiss, M.M., and Massey, A.P. (2001). "New product development decision-making effectiveness: Comparing individuals, face-to-face teams and virtual teams", *Decision Sciences*, 32(4), pp. 575-600.
- Sharda, R. Barr, S.H., and McDonnell, J.C. (1988). "Decision Support System Effectiveness: A Review and an Empirical Test," *Management Science*, 34(2), pp. 139-157.
- Sproull, L. and Kiesler, S. (1986). "Reducing Social Context Cues: Electronic Mail in Organizational Communication," *Management Science*, Vol. 32, No.11, pp. 1492-1512.
- Yadav, V., Nath, D., Adya, M., and Sridhar, V. (2007). Investigating an Agile-Rigid Approach in Globally Distributed Requirements Analysis. To be presented in the *11<sup>th</sup> Pacific Asia International Conference on Information Systems (PACIS) 2007*. July 3-6, Auckland, New Zealand.
- Warkentin, M.E., Sayeed, L. and Hightower, R. (1997). "Virtual Teams versus Face-to-face Teams: An Exploratory Study of a Web-based Conference System," *Decision Sciences*, Vol. 28, No.4, pp. 975-996.
- Walther, J. (1995). "Relational Aspects of Computer mediated Communication: Experimental Observations over Time," *Organization Science*, Vol.6, No.2, pp. 186-203.

