Occurrence and Effects of Leader Delegation in Virtual Teams

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Abstract

Virtual teams are an important work structure in software development projects. However, little is known about what constitutes effective virtual team leadership, in particular, what amount of leader delegation is appropriate in a virtual environment? This study investigates virtual team leader delegation and explores the impact of delegation strategies on virtual team performance mediated by team motivation, team flexibility and team satisfaction with the team leader The research is a report of a pilot study run on student teams carried out to refine and test the research constructs and research model.

The study found that virtual team leaders delegate more to competent virtual teams and that delegation is positively correlated with team member satisfaction with their leader and with team member motivation. This work provides important knowledge for software-based organizations interested in developing virtual team leadership skills.

1. Introduction

Virtual teams are composed of geographically distributed coworkers linked though information technologies to achieve an organizational task. In software development, the virtual team is a popular structure for several reasons: it provides access to lower-cost labor as well as to a range of disciplines and technical specialties [5]. While software team leaders and managers are now frequently given virtual teams to manage, they have not been given clear directions on how to effectively manage such teams. One important issue regarding virtual software team management is when and how team leaders should *delegate* authority and responsibility to the team,. Previous studies have yielded conflicting results. This paper aims to answer this question about delegation by investigating the occurrence and effects of leader delegation in virtual teams.

The focus of the paper is on software teams, in part, because it is felt that the global software team phenomenon has several unique characteristics that may not apply to virtual teams in general. Unlike other activities that have been outsourced or offshored, work activities cannot be as easily compartmentalized because of the high integration of the software product. Thus, there is a need for communication and working together in a structured fashion which demands good leadership. In addition, software developers expect to have a high degree of independence in their work, thus, the degree of delegation by a leader may differentially affect these virtual teams.

Collaboration in software development also demands the ability to communicate highly detailed specifications and questions. This requires communication skills that may not be needed in other types of virtual teams, skills which may be influenced by a team member's knowledge of English. Therefore, good management of the communication structure and media is likely to be an important leadership trait. Finally, the new countries that are now being included in global software development have relatively young team members. As such, the distribution of corporate knowledge and skill is uneven. Thus, leadership and delegation in this type of environment is likely to be different for software than for other tasks carried out by virtual teams.

The paper is structured as follows: first, an overview of the research model is presented to give readers a sense of the focus of the paper; Then, based on a review of the literature, conceptualizations of leader delegation are presented and specific research hypotheses regarding virtual team leader delegation are explained; And finally, the pilot study testing the model. A discussion session presents the contributions and limitations of this research and a final section addresses the implications for virtual team management.

2. Research Model

Before beginning a detailed discussion of the variables used in this study, we present the overall research model and briefly describe the relationships

that are hypothesized to exist between the variables. A key focus of the model is the amount of delegation that virtual software teams receive from their leaders. It behooves us therefore to describe the management structures that are being studied.

When we talk about virtual teams, the structure that is typically in place does not constitute virtuality for each and every team member but rather distributed teams in which some subsection of the software development team is co-located and others are virtual. For example, a portion of the team may be located in the U.S. and a second and third portion in India and China. Both teams are working on the same software product, but the work has typically been compartmentalized in some way so that each co-located portion of the team has specific assignments. However, the work is such that there is continued communication between each of the non-co-located portions of the team to resolve integration issues.

Management of these teams comes from several sources. First, there is typically a local manager who handles personnel issues. Then there is a technical manager who oversees the project. Finally, there is a technical head of the particular subsection of the project who is directing the work of both virtual and co-located sub teams. Management of the work is the purview of this leader, and this is where delegation typically occurs. This management is located with one sub team and virtual to the other sub teams. Traditionally, management is in the home of the parent company, but it also may be at a customer site.

Because one part of the software team is distant from the manager, less is likely to be known about the competence of the team, and therefore, the manager is likely to delegate in a manner so that more control of the technical issues rests with that portion of the team that is co-located with the manager. The research model being put forward in this paper suggests that perceived team competence predicts the amount of delegation that will occur but that this delegation will have an effect on key team variables such as satisfaction, motivation and flexibility. It is argued that these three variables are primary in affecting team performance.. Figure 1 presents our research model.

An elemental part of this model is that team competence not only affects the decision of the team leader on whether to delegate or not but also affects the impact of the delegation, that is, teams with less competence, are likely to desire more delegation and to be unhappy and unmotivated with less direction from the leader. This occurs primarily because the team members do not know how to do their tasks, yet wish to succeed in these tasks. However, the only way they can succeed is if they receive tighter direction from the leader. As we shall see with our analysis, we did not necessarily find that less competent teams wanted more delegation. The measure of perceived competence that we used had difficulties with the student teams who all perceived themselves to be highly competent. Rather than treating this as a problem, it is a result that we believe has an impact on virtual team management.

Virtual sub teams are not able to ascertain their competence in comparison to their distant counterparts because they lack the proximity for this comparison. They are therefore likely to perceive themselves as competent and desire more delegation. Culture may also have an impact in that many cultures worry about "face," that is, how they appear to others. These cultures would also perceive themselves as competent, possibly due to advanced education in their country or their membership in a high social class. . Whatever the reason, they are likely to desire more delegation even when it is unwarranted. This issue will be further addressed in the paper's discussion section.

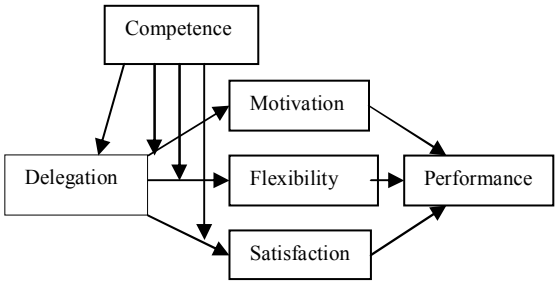

Figure 1. Proposed Model of Delegation Effects on Global Software Teams

The next sections present the prior research and detailed definitions of each of the variables in the model plus support from the literature that suggests the viability of the proposed model.

3. Delegation

Delegation means that one has been empowered by one's superior to take responsibility for certain activities, which were originally reserved for the superior [1] Very few studies, though, have investigated delegation as a distinct management practice [23]. One important limitation of previous delegation studies is that little differentiation has been done as to which aspects or activities the leader delegates. To overcome this limitation, this study delineates four major categories of management functions that can be delegated. The four delegation categories are based on different existing taxonomies

of leader management functions (e.g., [16], [17]). The four categories are as follows:

- Planning related functions (e.g., setting objectives, setting policies)
- People related functions (e.g., hiring team members, firing team members)
- Process related functions (e.g., determining work method)
- Control functions (e.g., monitoring team progress, determining corrective actions)

4. Delegation in Virtual Teams

The degree to which leader delegation occurs is believed to depend on the competence level of a virtual team. Virtual ***team competence*** is the ability of a team to perform their designated tasks efficiently and skillfully. It is related to the knowledge and skills of the members and also to the amount of previous experience with the current team task.

Developing subordinates' skills and confidence is the biggest reason why leaders delegate or consult their followers when followers' skill sets are still being developed [23]. The potential growth of the followers, however, cannot be achieved without cost. First, delegation to less competent followers comes at the expense of a short-term performance loss [18]. Second, in the distributed virtual team environment, close monitoring and timely feedback is difficult because "management by walking around" cannot be used as a managerial strategy [19].

Third, in delegating to less competent followers, unlike line managers who may treat the costs of delegation as an investment to be redeemed later, virtual team managers are faced with the costs of sacrificing team performance, which may affect the manager's own promotion and career growth. Based on this argument, Hypothesis 1 is put forth:

> **Hypothesis 1**: *Virtual team leaders will delegate less when they deem that the team is less competent.*

4. The Effects of Team Leader Delegation

In this section, three variables, motivation, team flexibility and team member satisfaction with their leader are each discussed. An argument is made as to why each of these variables is expected to be affected by team leader delegation and also why each of these variables is a primary determiner of overall team performance.

Motivatoin: According to Hertzberg's [10] motivation theories, recognition fulfills workers' esteem needs and can significantly improve employee's performance. A competent virtual team typically expects the team leader to recognize the team's competency by delegating more responsibility. Leader delegation will then improve the team's sense of self-worth and motivate the team to work more effectively. An empirical study found that the autonomy of virtual team members in determining work objectives and methods improved the intrinsic motivation of the team [15]. Picolli and Ives [20] found that student virtual teams were more motivated and satisfied with less behavior control. Also a team's decision acceptance is greatest when the decision is made by the group [5]. Therefore, delegation to a competent virtual team would increase the team's motivation

On the other hand, delegation to less competent virtual teams will put the team in a difficult situation. Due to their low competence level, they need close monitoring and constant coaching from the leader or other experts, which is difficult and costly to obtain in dispersed virtual teams. The relatively short-term nature of virtual teams, which are often formed dynamically to cope with emerging projects or tasks, also means that the team has less time to learn on the job. Instead of desirin delegation, less competent virtual teams expect detailed directions from the leader. Therefore, delegation to less competent virtual teams may not improve team motivation. Based on this argument, Hypothesis 2 is put forth:

> ***Hypothesis 2****: Delegation to competent virtual teams will improve team motivation more than delegation to less competent virtual teams.*

Team performance, as with individual performance, is a function of ability and motivation [13]. Sridar et al. [22] have shown that team member motivation and trust affect performance in student teams distributed between the U.S. and India.. Significant improvement in team performance is therefore expected from motivated teams. Based on this argument, Hypothesis 2b is put forth:

> ***Hypothesis 2b****: Virtual team leader delegation indirectly improves team performance through improving virtual team motivation.*

Flexibility: To deal with complex dynamic tasks, team leaders can delegate to competent virtual teams to allow them to flexibly adapt to their immediate situations and opportunities. Remote team leaders may

not be able to understand the work context or to appreciate the consequences of the changes occurring in the distributed locations. Delegation, therefore, puts this task in the hands of the competent virtual team members. These members can also make decisions in a more timely matter than the leader. Having appropriate authority delegated to them, they can proactively influence team leaders' decisions or even their own decisions instead of passively waiting for managerial permission before taking actions. Therefore, delegation to competent virtual teams will increase team flexibility. In contrast, delegation to less competent virtual teams may not improve team flexibility since less competent team members may not have the skills to make decisions and form action plans. Based on this argument, Hypothesis 3 is put forth:

> ***Hypothesis 3****: Delegation to competent virtual teams will improve team flexibility more than delegation to less competent virtual teams.*

When a virtual team flexibly adapts to its work situations and is free to respond to situations in at timely manner, the team will take more risks, learn more from its experiences and perform more efficiently [8] Based on this argument, Hypothesis 3b is put forth:

> ***Hypothesis 3****b: Virtual team leader delegation indirectly improves team performance through virtual team flexibility.*

4.3. Satisfaction with Team Leader

Delegation to competent virtual teams represents the leaders' recognition of their competence. Delegation allows the competent team to utilize their capabilities to adapt to the immediate opportunities and changes without waiting for decisions to be made by the distant leader. Therefore, delegation to a competent virtual team should improve the team's satisfaction level with the leader.

On the other hand, delegation to a less competent virtual team may decrease the team's satisfaction with the leader. In a global virtual team study consisting of undergraduates as followers and experienced MBA graduate students as team leaders, Kayworth and Leidner [14] found that the inexperienced undergraduate followers were more satisfied with leaders who gave clear detailed instructions and feedback. As virtual team distance increases, the work context exhibits increased complexities, for example, cultural obstacles, communication difficulties, etc. This makes virtual teamwork more daunting for a less competent team. Under such circumstances, the team needs to attain confidence and a sense of direction from a strong leader. Based on this argument, Hypothesis 4 is put forth:

> ***Hypothesis 4****: Delegation to a competent virtual team will improve the team's satisfaction with their team leader more than delegation to less competent virtual teams will.*

When the virtual team members are satisfied with the team leader, the team leader will be more able to influence the members to work towards team goals and therefore to improve team performance. Based on this argument, Hypothesis 4b is put forth:

> ***Hypothesis 4****b: Virtual team leader delegation indirectly improves team performance through improving virtual team's satisfaction with the team leader.*

5. Research Study

5.1. Study Design and Sample

A full-scale study with industry software development teams is currently underway to explore the research hypotheses. We report here is on the pilot study that was conducted to test the validity and reliability of the constructs that were formed for this research and the research model. Although many of the questions that were used came from studies that had already tested their validity and reliability, there were modifications made to the questions to (a) fit the virtuality nature of the teams being studied and (b) to fit the software development environment. For example, the constructs of team competency and leader delegation were adapted.

Student teams were used to test out the research survey because the diversity of the student teams closely matched the software development team populations that the final survey is intended for. The student teams are part of a computer science and information systems program at sn American East Coast University that has one of the most diverse student bodies in the U.S. The students come primarily from China, India and Pakistan.

Forty-eight students in 30 software-development teams took an online survey that requested information about the variables presented in the hypotheses. Thirty-two males and 16 females; 3 graduate students and 45 undergraduate students participated. All participants were involved in teams that were engaged in developing a single software program for the entire semester. The software teams are part of the accredited Capstone course designed to have students working in

teams on real software projects before they matriculate. This is the last course most students take in their last year of school. Companies are solicited for software projects and present their projects to the class. A team leader volunteers for a software project and then interviews and accepts members for his or her team. Teams normally have 4 members but some teams lose or add a member. Teams then meet with the company representative and develop requirements, a budget, a design and a deliverable tested product. Reports are due, including a management report with assigned team roles, at regular intervals. Thus, the teams are set up to behave as much as possible like typical software development teams. Our interviews with corporate management in software companies indicates that projects rarely last for more than six months and that when new teams form, the membership is also new so our student teams represent this type of project assignment.

The research instrument is designed to work with virtual teams. Thus, it may be asked, how can this student population constitute a virtual team? Almost any team at the university studied is partially virtual because of the nature of the university. All capstone classes are held in the evenings because team members usually are part time students. The university is a commuter university and many classes are online or partially online so that students may come to the university once a month. Thus, many of the teams meet virtually and much of the team work is done by email, instant messaging and teleconferencing. It was felt that the more mature students, the partial virtuality and member multi-culturism were suitable for piloting the research.

The survey was given near the end of the semester so the team members had worked together for about three months.

In a second administration of the survey, 34 graduate students from 14 report-writing teams took the online survey. The team task was to analyze an industry case study and write a team report based on the case study results. The teams consisted of 5 to 6 members with team leaders elected by the team members. The survey was given after the team finished their first case study project. These 14 teams were taking a 2-month summer online management information systems course.

Only two teams reported meeting face-to-face once a week. The other teams did not meet face-to-face during the team project and may never have met each other face to face. This second set of teams was also different from the first set in that they were working on a report rather than developing software. Thus, they met the requirement of being virtual for our pilot study but not of being a software development team. We use this second team to determine if the difference in virtuality might have an influence.

5.2. Survey Measurement

In this section each of the constructs used in the research is described in more detail, in particular, its source for validity and reliability verification are cited along with a sample question that presents the intent of the measure.

Delegation: The four categories of virtual team leader delegation were measured by thirteen Likert-scale items in the survey. Seven of the items were adapted from Janz et al.'s study [12] and six were created by the study panel based on interactions with managers in the companies to be surveyed.. A sample question statement is "how much is your team able to schedule team work."

Team Competence: In the first round of the survey, six questions were used, which are adapted from the situational leadership measurement of follower ability [9] and Hardin et al's instrument of virtual team efficacy [7]. A sample question is "The team has past experience related to the team job." In the second round, six questions were used to assess specific skills important to team tasks. A sample question is "how do you evaluate your team on its critical analysis skills?"

Team Motivation: Four items measuring this construct are adapted from situational leadership theory [9]. A sample questions is "The team is motivated to take on additional responsibilities if needed to finish the project."

Team Flexibility: three Likert-scale items were created to measure this variable. A sample question is "This team quickly responds to new opportunities."

Team's Satisfaction with the Team Leader: Three Likert-scale items were created to measure this variable. A sample question is, "I am dissatisfied with the way the team leader manages this project."

Team Performance: Team performance is measured by five Likert-scale items adapted from Henderson and Lee's [8] study. A sample question is "Compared to other projects you have served on or observed, how do you evaluate your team's performance on adherence to schedules."

: ***Trust*** and ***Task Interdependence***: In addition to the constructs in the research model, the study also captured data on these two variables Trust is measured with four items from Jarvenpaa et al.'s study [13] and Task interdependence is measured by two items adapted from Campion et al. [4]. Finally, team background information such as team member's age, year in school, how often the team met and how they met (remotely or face-to-face) was also gathered.

5.3. Data Analysis

Delegation Construct Structure: A principle component analysis (PCA) was conducted to test if delegation is four-dimensional. However, in the pilot study teams, the student team projects did not have budget constraints and were not allowed to change their membership once the teams had been established. Therefore, the four leadership and management function measurements are not included in the data analysis done with PCA because students answered these questions as not applicable. PCA results show that all the remaining 9 items measuring delegation load on one component instead of three unique components. This means that virtual team leader delegation in the student teams is not multi-dimensional counter to predictions.

Measurement Validity: The numbers in the study were too small to conduct a factor analysis, but wherever possible, the questions used for the constructs were drawn from previously validated surveys. We also checked the constructs for face validity by reviewing the questions with experts from the countries where the virtual teams were located. In addition, we performed a card sorting test on the constructs using 20 respondents. Ninety-five percent of the questions were sorted correctly supporting a case for acceptable construct validity. Finally, external validity is a concern because students were used in the study. We treat this issue in the discussion on this research's limitations.

Measurement Reliability: Except for trust (α=0.409), the Cronbach Alphas of other construct measurements are above the level of 0.8. Trust is therefore not included in further data analyses.

Within-Team Agreement: Due to the small sample size, a simple measure was used to judge within-team agreement level: individual team members' responses were considered to have an adequate level of within-team agreement and were averaged to obtain a team score if the difference between the highest score and the lowest score in a team was less than 2.5 (half the scale range). There was a high level of within-group agreement in more than 85% of the 44 teams on all constructs in the research model. Therefore, individual team member's responses are averaged to get team-level data.

Multiple regression testing was chosen to analyze the data as the data met normality and homogeneity of variance requirements (An arcsine transformation was carried out on the team competence and performance measure to achieve these assumptions. Structured equation modeling was not used because of the small sample size and the intent of the study. Although a PLS model is more likely to have more accurate beta scores, it also has more chance of a Type I error [5]. Since this was a pilot study, we wanted to bias it against possible spurious results.

Hypothesis 1 Test: Hypothesis 1 predicts that virtual team leaders delegate more to competent virtual teams than to less competent virtual teams. A multiple regression analysis was conducted to test this hypothesis. The test results shown in Table 1 support Hypothesis 1. Delegation is positively correlated with Team Competence.

Table 1: Hypothesis 1 test results in both report wrting and software development teams.

Delegation Regressed on Team Competency		
	Software Development Teams	**Report Writing Teams**
Standardized Coefficient	0.508***	0.706***
R-Square	0.258	0.498
F-Overall	8.706***	9.913
**p < 0.10, **p < 0.05, ***p < 0.01*		

Hypotheses 2, 3, & 4 Tests: Hypothesis 2 predicts that leader delegation to competent virtual teams will improve team motivation more than delegation to less competent virtual teams. Hypotheses 3 and 4 predict the effects of virtual team leader delegation on team flexibility and a team's satisfaction with team leader respectively. The three hypotheses were tested by stepwise regression with the outcome variables regressed on delegation, team competency and the interaction term of delegation and team competency.

Table 2: Hypotheses 2, 3, and 4 test results in software-development teams

	Moti-vation	**Flexi bility**	**Satis faction**
Delegation	0.537	0.821	1.502*
Competency	1.536***	1.423***	1.708***
Delegation X Competency	0.11	-0.153	-0.231
R-Square	0.75	0.54	0.65
F-Overall	21.93***	7.91***	9.94***
*p < 0.10, ** p < 0.05, ***p < 0.01			

Table 2 presents the test results in the *software-development teams*. <u>*Hypotheses 2 & 3*</u> are not supported, as no significant interaction effects were found. Therefore, the effects of delegation on team motivation and team flexibility were not found to change as team competence varied. Regarding

Hypothesis 4, the results show that leader delegation improves the team's satisfaction but such effects do not change as team competence varies. In addition, team competence was found to significantly improve team motivation, flexibility and team satisfaction with the leader (p<0.05).

Table 3 shows the Hypotheses 2, 3, & 4 test results in *the report-writing teams*. Regarding *Hypothesis 2*, Team leader delegation significantly improves team motivation (p=0.006). However, the effects of leader delegation on team motivation did not differ as team competence level varied. *Hypotheses 3 and 4* are supported by the regression results. The interaction effects of delegation and team competence are significant such that leader delegation to competent virtual teams improves team flexibility and team satisfaction with the leader more than delegation to less competent virtual teams.

Table 3: Hypotheses 2, 3, & 4 test results in report-writing teams

	Moti-vation	Flexi-bility	Satis faction
Delegation	0.782***	0.216	1.502***
Compe-tency	0.126	0.069	1.708***
Delegation X Compe tency	-0.433	0.102***	-0.231
R-Square	0.531	0.687	0.561
F-Overall	12.263***	21.912***	11.502***
*p < 0.10, ** p < 0.05, *** p < 0.01			

Hypotheses 2b, 3b, & 4b Tests: Hypotheses 2b, 3b and 4b predict leader delegation indirectly improves virtual team performance through improving team motivation, flexibility and satisfaction with leader respectively.

Table 4: Sobel test results on hypothesis 4b in student software-development teams

Sobel Statistic	F Value	Percentage of Total Effects that are Mediated	Ratio of the Indirect Effects to the Direct Effects
2.868	0.004	77.34	3.412

For the ***software development teams***, tests did not find delegation to improve motivation and flexibility. Consequently, the effect of delegation motivation and flexibility improvements on virtual team performance was not testable and therefore, *Hypotheses 2b* and *3b* are rejected. *Hypothesis 4b* is supported by Sobel test results, as shown in Table 4. Therefore, delegation improves team performance partly through improving team satisfaction with the leader.

For the ***report-writing teams***, *Hypothesis 2b* is not supported by regression test results, as shown in Figure 1. Regression tests did not find that motivation had a significant positive impact on performance. Therefore, delegation was not found to improve team performance indirectly through improving team motivation. Previous tests on *Hypotheses 3 & 4* did not find that delegation improved team flexibility and satisfaction with the leader. Consequently, delegation cannot be tested as to whether it improves virtual team performance through improving team flexibility and satisfaction with leader. Therefore, *Hypotheses 3b* and *4b* are not supported either.

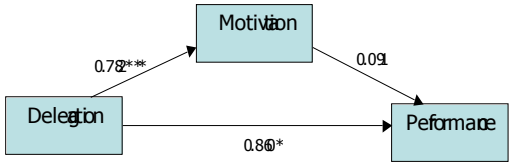

Figure 2: Hypothesis 2b Test in Report-writing Teams

5.4 Discussion of Results.

The study provided mixed support for the hypotheses. First, virtual team competence predicted leader delegation behaviors. This implies that virtual team leaders should carefully evaluate the team's competence before delegating tasks, especially before delegating important tasks. Second, leader delegation improved satisfaction and motivation of team members. The effects of delegation on satisfaction and motivation were more prominent in competent report-writing teams than in less competent report-writing teams. However, none of the intermediate outcome variables mediated the effects of delegation on team performance. Instead, tests results indicated that delegation directly improves virtual team performance. Figure 3 presents the model supported by the data from the study results.

Comparing the results found in the two types of teams, one will observe that first, delegation exerted deeper influence on the report-writing teams than the software-development teams. It is suspected that the differences in delegation effects may arise from the differences in the number of times the teams met face-to-face or, as suspected, the degree of virtuality of the team. In contrast to the software development teams which met face-to-face at least once a week, the report-writing teams barely met. Students in the report-writing teams were in an online summer course and,

throughout the project and only two teams met face-to-face once a week. As collaboration and communication processes suffer from lack of face-to-face contact, the leader's role in team coordination and communication becomes more important. Therefore, leader delegation produced deeper effects in the more virtual report-writing teams.

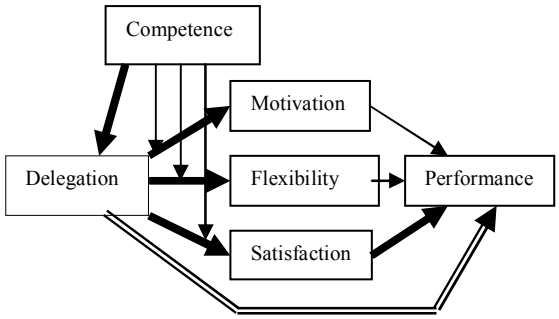

Figure 3. Delegation effects on student teams. Bold lines indicate supported hypotheses. The double line indicates a new result showing a direct link between delegation and team performance.

5.5 Limitations of Study.

One of the major limitations of this study is that the teams were student teams working on class projects. In particular, some of the questions that were designed for corporate virtual teams were not applicable. Student teams do not typically assign salaries, manage finances or hire and fire personnel. Only the planning part of the delegation construct showed differences between teams. The other parts were scored as not applicable (one of the possible answers) so that the results were pooled into one construct called Delegation which mostly consisted of planning.

In addition, the software and report writing teams did not represent the distributed teams that the survey has been prepared for. There were some examples of distributed teams, e.g., one-half of the team lived in the southern part of the state and the other half lived in the northern part, but, by and large, teams consisted of members who were individually virtual but also met face-to-face occasionally. The report writing teams were the most virtual with some team members never having seen each other.

It can also be argued that student teams do not give representative answers that parallel those of individuals working in companies. There is evidence that this is not always so. Hughes and Gibson [11] found that MBAs made decisions comparable to managers in an Executive MBA program, but Ashton and Kramer [1] in their literature review, note that attitude questions are answered differently by individuals in the workforce than by students. Briggs et al. [3] found students to be valid predictors of managerial technology adoption and Remus [21] found graduate students to be more representative of industry than undergraduates. In particular, studies show that students are not representative because of their lack of experience in the workforce and because of their youth. Because most of our students worked and were part time students, because the age of the students in the teams was therefore higher than normal for universities and because the students represented the cultural mix that we wanted to assess, it was felt that this study's population was more representative.

We did find, however, evidence that suggests that students were responding differently than a workforce population might. Student groups uniformly evaluated their team competence and team performance highly with more spread on this evaluation in the report-writing teams (Masters students). We also found that we were not able to obtain any viable reliability on what is considered a highly reliable trust measure that we borrowed from the literature. We therefore did not include trust in our models and remade the competence measure into a formative construct for the survey of the report writing team.

As mentioned earlier, the skewed evaluations of team competence and performance may be an artifact of student teams, but they also might be an artifact of virtual teams in some cultures. Thus, an additional variable to collect and compare to self report of team performance is a team leader's report of team performance in addition to other related variables such as subproject completion times. We are planning to get measures of performance from team leaders, but, from the descriptions of how management scores performance for their distributed teams, it is not clear to us that self-report of perceived performance is any worse a method for obtaining this measure.

The trust measure may have been highly unreliable because team members are likely never to have worked together before the formation of the team. Thus, questions that asked how likely someone trusted the rest of the team to do their tasks well could not be answered accurately. However, this failure of the trust construct could be applicable to virtual teams where their non-co-located counterpart may also be unable to judge how well the distant team will perform because they have not had much experience working with the team members. This is certainly true of teams in China and India where significant new hires are being added to the workforce and high employee turnover rates are happening.

The above discussion notes that the literature demonstrates that student teams can provide reliable

answers that represent industry situations if the groups are appropriately chosen, but it also suggests that the very nature of student teams might be more appropriate for studying virtual teams across cultures in that their responses might represent similar cultural responses.

The small sample size also limits the generalizability of the study findings. We analyzed the teams separately because of inherent differences in their virtuality and task. We also did separate analyses so we could examine the effects of virtuality although confounded with task and a more senior student population. This made the sample size even smaller. Approximately 200 software teams were asked to fill in the survey but only 30 responded. The response rate was extremely low, in particular, because many of the students were in the final year, already had jobs that reduced the importance of the payment incentive we offered and were quite busy with class projects. The response rate was significantly higher on the report writing teams (about 50 percent) but the class size was small. We also choose to analyze all of the teams, even those with only one respondent because the response rate was low. Thus, there were 12 software teams that only had one member. For the report writing teams, only teams with 2 or more respondents were used in the analysis. The problem with a single team member responding constitutes another analysis problem because that single member could have been an outlier generating data unrepresentative of the team. Studies now in progress with a larger number of industry teams will yield more conclusive findings related to virtual team leader delegation.

6. Contributions and Future Work

Our findings suggest that delegation is an important virtual team management strategy and that organizations should train the virtual team leaders on the importance and effects of delegation. In particular, the results from the student teams imply that a team leader will delegate in response to his or her sense of how competent the team is. However, the real world situation affects this delegation with a push and pull effect, that is, management will want to delegate more because the task of managing a global virtual team means more communication, odd hours of work scheduled for communication and care needed to avoid miscommunications. This is the push to delegate. However, the pull effect is that a team leader because of the lack of information on the global virtual team stemming from language difficulties, cultural differences and simply not being able to observe team behavior because of the distance will not want to delegate to the team. The findings suggest that team leaders need to be trained to ignore these effects and perform their delegation based on real information about the team, perhaps by visiting the virtual team or setting up some viable measures for team performance.

The tendency of the student teams to give self-reports of high competence and high performance suggests leadership guidelines for industry. In particular, it would be wise to give team leaders training in the cultures they are interacting with so that they can better judge the self-reports they are obtaining.

The findings also suggest that delegation is a good thing in that it increases a team's satisfaction with its leader, a team's flexibility to adjust the project to local needs and a team's motivation. The findings, however did not find a strong mediating relationship between these values and team performance Earlier discussion on the limitations of the study suggest that the performance measures captured were corrupted by the use of student teams. These measures have been shown to affect performance in face-to-face teams so there is no reason to believe that obtaining better measures of performance would not be moderated by these variables. This is future work that needs to be done.

Overall, more delegation is found to be a good behavior of a team leader, but with the youth and newness of team members joining virtual teams in many of the companies that offshore or outsource, this is likely to be a bad strategy unless measures are taken to bring up the skill sets of the offshore team members.

Because of high team member turnover in some countries, especially with the constantly increasing wages in these countries, companies are reluctant to invest in training its remote team members. However, as we have been told by team managers from India, this training is precisely one of the mechanisms used to reduce turnover. This is another variable that clearly needs evaluating in future work.

Overall, the pilot study findings suggest useful recommendations for virtual team leadership. as to when and what they should delegate to the team based on the team's degree of virtuality and competence. However, future work with real companies and a variety of organizational models needs to be done to verify these findings.

8. References

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