

Improving Value Returns from Virtual Teams

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Abstract:

Information technology has had a significant influence on individual, group and organisational work patterns and promoted virtual work environments. However, the performance and satisfaction of virtual teams (VT) is considered to be lower than that of traditional Face-To-Face teams (FTF). This study compares and builds best-fit models for both types of team to explore what factors influence performance and satisfaction. The results of a longitudinal study reveal a number of factors impacting on performance and highlight solutions which can be used to improve value returns from virtual teams.

1. Introduction

Geyskens et al. (1996) define “virtual team” as a temporary gathering of individuals who are connected through information technologies working across time and space to finish a goal. The members are typically “geographically dispersed”, “lack shared social context” and “lack face-to-face encounters” (Sarker et al., 2003). Studies into the evaluation of performance and satisfaction of VT and traditional FTF teams show a variety of findings. Most find that the performance and satisfaction of VT is lower than that of traditional FTF teams (Warkentin et al., 1997; Galegher & Kraut, 1994; Straus, 1997; Valacich & Sarker, 2002), but a few report the contrary (Sharda et al., 1988) or find no difference between the two teams (Burke & Chidambaram, 1996).

Various factors have been considered in the exploration of relationships between performance and satisfaction of VT. For example, Driskell et al. (2003) studied the relationships between constructs (cohesiveness, status processes, counter-normative behaviour and communication) and performance of CMC based teams. Ancona and Caldwell (1992) explored the relationships between diversity and performance. The majority, however, have just focused on task dimensions (Bradley et al., 2003; Kirkman et al., 2004; Janz et a., 1997), and few have focused on the social dimensions (Matveev & Nelson, 2004; Chin et al., 1999). This paper reports on a study using both

social and task dimensions to build best-fit models and to compare the performance and satisfaction of FTF and VT. It further explores ways to improve the performance and satisfaction of VT and hence return greater value within a virtual work environment.

2. Objectives Research Questions and Hypotheses

The study objective is to examine the performance and satisfaction level of virtual teams compared to face-to-face teams in a learning environment. In particular, the study aims to identify the factors that may influence performance and satisfaction, builds frameworks for both teams and identifies approaches to improve performance and satisfaction of virtual teams.

Three research questions are considered:

- (1) Is there any difference in performance and satisfaction between virtual teams and face-to-face teams?
- (2) What factors affect on the performance and satisfaction of virtual and face-to-face teams and how do these factors affect each other?
- (3) How can we improve the performance and satisfaction of virtual teams?

Is face-to-face interaction a critical factor influencing performance and satisfaction of teams? In FTF interaction, group members can see, hear, receive messages and give feedback in “real time”. They can see facial expressions or gestures make eye contact; hear different tones of speech and dialect and be aware of who responds to whom. Obviously, the social cues in FTF meetings are richer. According to Social Presence Theory (Short et al., 1976) and Media Richness Theory (Daft et al., 1987), the less information available within a medium, the less attention is paid by other participants. Accordingly, this leads to hypothesis one:

1a: The perception of the performance of VT is lower than FT; 1b: The perception of the satisfaction of VT is lower than FTF

According to the studies by Maznevski and Chudoba (2000) and Robey et al. (2000), CMC has been found to promote interpersonal relationships between team members in the early development of teams. Relationship building can strengthen feelings of inclusiveness or a sense of belonging to teams and further foster cohesion (Powell et al., 2004). Cohesion has been considered to be the most important small group variable (Lott & Lott, 1965) and has been associated with better performance and satisfaction (Lurey & Raisinghani, 2001; Maznevski et al., 2000). Sawyer and Guinan (1998) found that social skills account for more than 25 percent of variation in product quality and is superior to task skills in project quality and team performance

in a virtual environment. Figure 1 summarizes the results of these studies, showing the connections between relationship building, cohesion, communication, collaboration and performance and satisfaction.

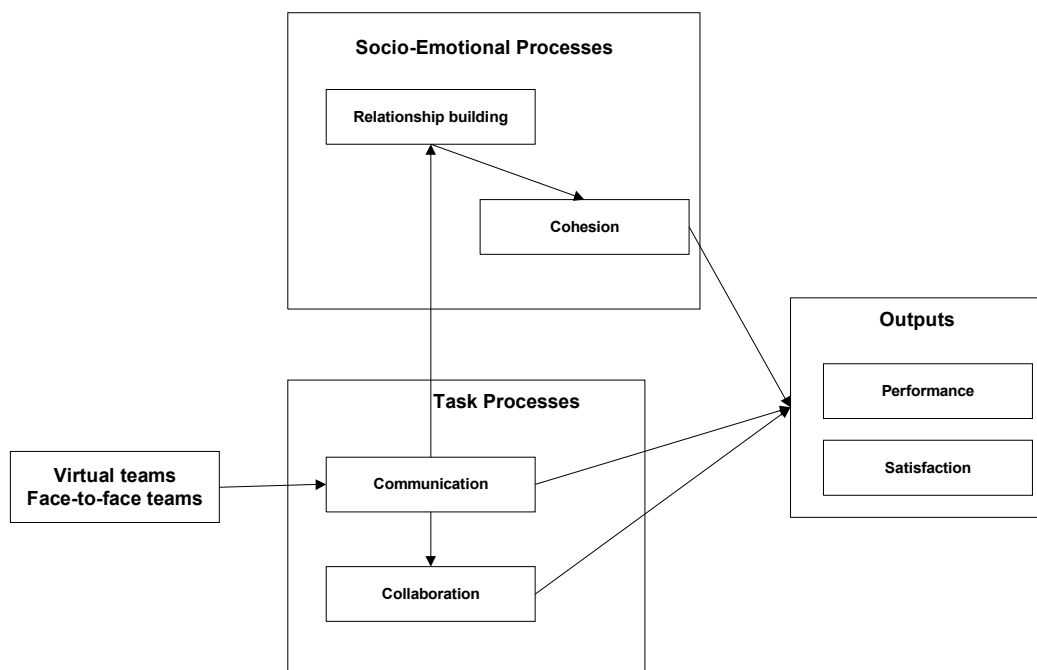


Figure 1: The framework of this study

From Figure 1, this study establishes the hypotheses:

2a: Cohesion is related to performance; 2b: Cohesion is related to satisfaction

3a: Communication is related to performance; 3b: Communication is related to satisfaction

4a: Collaboration is related to performance; 4b: Collaboration is related to satisfaction

5a: Communication is related to relationship building; 5b: Relationship building is related to cohesion

6: Communication is related to collaboration

Due to the constraints of CMC and the frustration of using it in a virtual environment, VT group members “use more task-oriented and fewer social-emotional remarks” (Bordia, 1997, p. 113; Grohowski et al., 1990). Lipnack et al. (2000) also regard VT as task-oriented teams. It is possible that VT tend to focus more on the task processes whereas FTF teams tend to focus on the socio-emotional processes. The different routes between VT and FTF are shown in Figure 2. From Figure 2, the seventh hypothesis is derived:

7a: The route of VT is “communication → Collaboration → output”, which tends to task dimension; 7b: The route of FTF is “communication → relationships building → cohesion → output”, which tend to social dimension.

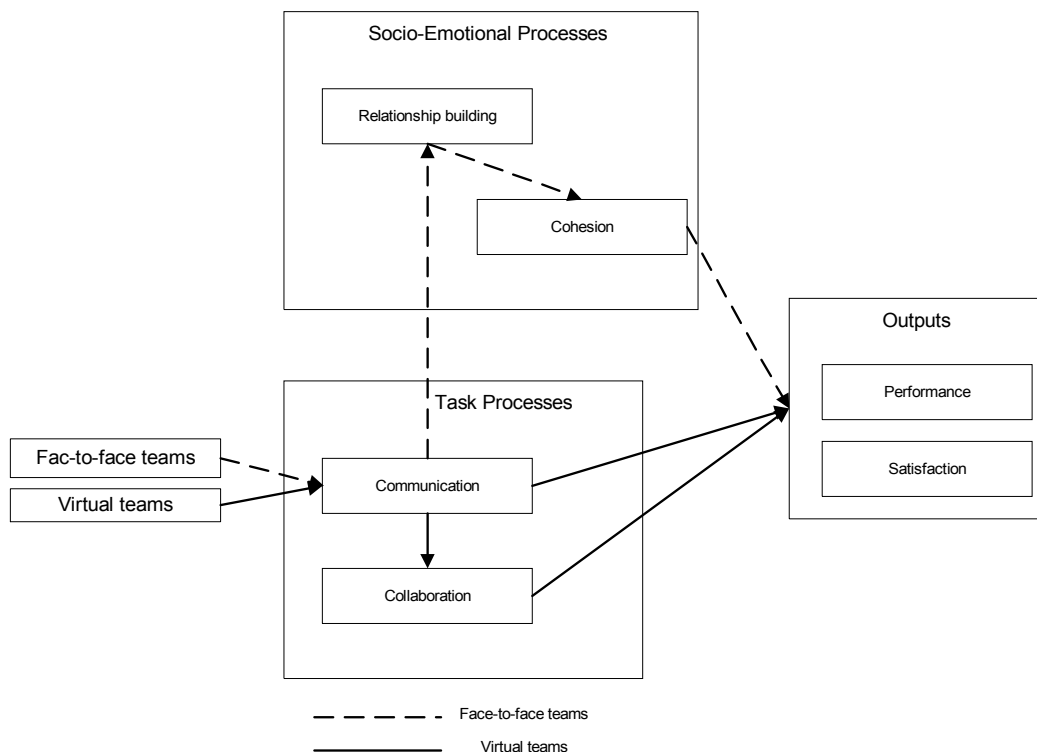


Figure 2 The different routes of VT and FTF

4. Research Methodology

In order to test these hypotheses, this research adopted a field study design controlled within an educational setting. A case study was developed by the researchers as a group assignment to run over four weeks. The study ran over two semesters and in semester one, students attending ‘Information Systems 1’ as part of a Business Degree were grouped into 68 teams of four for face-to-face interaction. In semester two, a new cohort of students were assigned into 72 groups for virtual team interaction only. Students in semester one were provided with tape recorders and rooms for discussion and observed by the researchers. Students in semester two communicated through Blackboard only (students were drawn from different tutorial classes and would not normally know each other). After students completed the assignments, written questionnaires were distributed in the lectures and tutorials to ascertain students’ reactions to the case operation and perceptions of satisfaction and performance.

The questionnaire comprised eight parts representing the six variables of the framework: communication, relationship building, cohesion, collaboration, performance, perceptions of process, and also perceptions of outcomes and solution satisfaction. Structural Equation Model (SEM) by Lisrel 8.72 was applied to obtain the best-fit models for both teams. Firstly, Confirmatory Factor Analysis (CFA) was used to identify the contribution of each measurement item. In addition, a t-test using SPSS was applied to provide an answer to research question 1.

5. Data analysis and results

Table 1: The t-test results of the difference in performance and satisfaction between VT and FTF

Item	Group	Size	Mean	Deviation	t-value	Degree of Freedom	P-value
Performance	fff	107	5.2461	1.3281	2.226	253.363	.027**
	vt	200	4.8650	1.6013			
Process Satisfaction	fff	107	4.9603	1.1086	1.648	255.316	.101
	vt	200	4.7238	1.3500			
Outcome Satisfaction	fff	107	5.1659	1.2816	.184	241.741	.854
	vt	200	5.1363	1.4573			
Solution Satisfaction	fff	107	5.2897	.9667	-.952	226.644	.342
	vt	200	5.4020	1.0182			
Total Satisfaction*	fff	107	5.1386	.9802	.408	251.454	.684
	vt	200	5.0873	1.1704			

*Satisfaction is divided into three parts: process satisfaction, outcome satisfaction and solution satisfaction. Total satisfaction is the total of the three parts.

From table 1, it can be seen that performance is significant. Thus hypothesis 1a is supported. This means that FTF groups perceive a better performance level than VT groups. The satisfaction parts (process, outcome, solution and total satisfaction) are not significant, thus, hypothesis 1b is not supported. However, the means of FTF groups are larger than those of VT groups (except for solution satisfaction) and so while there is no statistical evidence to prove that FTF groups perceive a higher degree of satisfaction compared with VT groups, we can assume that FTF groups sensed a higher extent of satisfaction than VT groups. This result is consistent with studies by Galegher et al. (1994), Straus (1997) and Warkentin et al. (1997).

The best-fit models for both FTF and VT teams by SEM are shown in Figure 3 and highlight the following points:

- (1) There is no factor “collaboration” in FTF model while there is no factor “cohesion” in VT model.
- (2) Comparing “communication” and “relationship building”, FTF (0.89, $t=7.09$) and VT (1.01, $t=10.84$) have a similar positive strength implying that communication has a positive effect on relationship building in both FTF and VT.
- (3) Satisfaction does have a positive effect on performance in both teams.
- (4) The paths of FTF and VT affecting the performance and satisfaction are different. FTF has two paths: one is communication \rightarrow relationship building \rightarrow cohesion \rightarrow satisfaction \rightarrow performance. Another is from communication to satisfaction directly, and then affects performance. VT also has two paths: one is communication \rightarrow collaboration \rightarrow satisfaction \rightarrow performance; another is communication \rightarrow relationship building \rightarrow satisfaction and performance. According to the paths described, it can be seen that FTF is social-oriented while VT is both task and social-oriented.

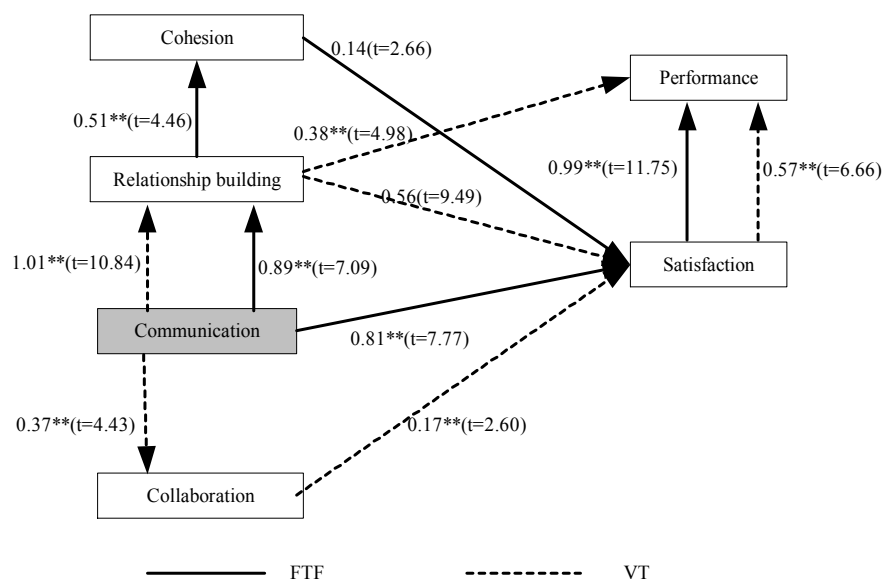


Figure 3 The comparison of FTF and VT models

Direct effects and indirect effects of FTF and VT

The relationships between factors and their impacts on performance and satisfaction, are summarized below.

Communication:

Communication has a strong direct effect on satisfaction but weak indirect effect on performance for FTF. That is, if there is an excellent communication within FTF teams, the degree of satisfaction will be higher and hence, there is a stronger possibility of obtaining higher performance levels. For VT, communication has a strong indirect effect on satisfaction and performance. This implies that communication must affect satisfaction and performance through other factors instead of affecting them directly in a virtual environment.

Relationship building:

Relationship building has weak and indirect effects on satisfaction and performance for FTF while relationship building has strong and direct effects on satisfaction and performance for VT. These results are surprising. One possible reason is that relationship building affects cohesion and then cohesion affects the performance and satisfaction in FTF. Relationship building becomes an intermediate factor. But in VT, cohesion is not so important a factor and so relationship building becomes a direct factor affecting the performance and satisfaction.

Cohesion:

Cohesion impacts only on the FTF environment and not the virtual environment. In addition, the effect is weak, direct on satisfaction and weak, indirect on performance. It would seem as if VT members found it difficult to conceptualize themselves as a “team” and rather focused on building relationships with individual members of the team.

Collaboration:

Collaboration only impacts on the virtual environment and not in the FTF environment. Like cohesion’s effect, it is weak, direct on satisfaction and weak, indirect on performance. One of the reasons for this finding may relate to the nature of the independent tasks set in the case study. Due to the time limitation of four weeks the tasks were independent rather than inter-dependent and so there was very little need for coordination across the tasks. Collaboration was required for task setting, reviewing and collating activities only. These activities are easily completed in a face-to-face environment but require some greater co-ordination efforts in a virtual environment. Table 4 summarises the results of the hypotheses testing.

Table 4 The test results of the hypotheses 2a, 2b, 3a, 3b, 4a, 4b, 5a, 5b, 6

No	Hypothesis	Support	
		FTF	VT
2a	Cohesion is related to performance	Yes	No
2b	Cohesion is related to satisfaction	Yes	No
3a	Communication is related to performance	Yes	Yes
3b	Communication is related to satisfaction	Yes	Yes
4a	Collaboration is related to performance	No	Yes
4b	Collaboration is related to satisfaction	No	Yes
5a	Communication is related to relationship building	Yes	Yes
5b	Relationship building is related to cohesion	Yes	No
6	Communication is related to collaboration	No	Yes

Hypothesis 7 is in regard to the different routes of FTF and VT: Hypothesis 7a emphasizes the assumption that VT teams focus on the task dimensions while hypothesis 7b assumes that FTF teams focus along social dimensions. By observing Figure 3, FTF does have the stronger tendency toward the social dimension. But VT tends to be both social and task dimensions.

6. Discussion and Conclusions

From the results, communication and relationship building are the key issues. Communication is the most important factor in a virtual environment. Good collaboration and relationship building rely on excellent communication. To overcome these problems three methods are proposed:

- Enhance the training of VT members

This includes the use of systems, tools and techniques to speed up information exchange and present well-organised information. This should take place independently of the group task and prior to it.

- Provide clear instructions

Providing clear instructions before the start and identifying clearly the role of the facilitators (Casper-Curtis, 2002) or instructors (Swan, 2001) helps members to cope with unexpected events. For example, if one member suddenly disappeared and lost contact, other members could take over his job or instructors/managers could help re-organise the team, instead of members wasting time and developing anxieties.

- Build strong relationships

Pauleen (2003) studied seven VT leaders from a variety of New Zealand organisations and built a framework involving actions to facilitate the relationships of VT members. The researchers amend his framework and propose a framework to improve the relationships of VT members as shown in Figure 4.

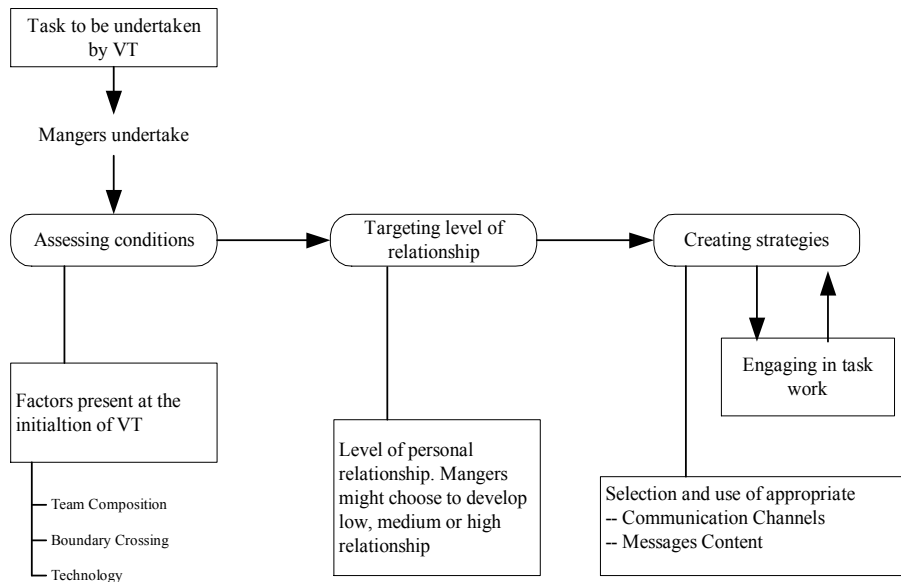


Figure 4 A VT Relationship Model (Amended from Pauleen, 2003)

This research has derived a number of conclusions: (a) confirmed the fact that FTF groups perceive higher levels of performance and satisfaction compared to VT groups; (b) identified the factors that affect the performance and satisfaction of FTF and VT; (c) explored the factors' interactions and their impacts on performance and satisfaction; (d) proposed solutions to improve the performance and satisfaction of VT. Specially, the study identifies the importance of relationship building, social and task factors in a virtual environment.

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