Virtual Teams Vs Face to Face Teams: A Comparative Study on Performance Indices

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Abstract

At present, the physical part of the work has shifted to virtual ways of doing work. These has been a growing emphasis on boundary-less ways of work environments that operate in 24x7 cycle and in different time zones. Unlike, traditional Face to Face (FTF) teams, Virtual Teams (VTs) are more complicated as they transcend the boundaries of time, space and culture. The study aims to find out, which type of team is more performance oriented: VT or FTF Team? To answer this question, the present study utilized an experimental design to measure the Performance Outcomes in VTs and FTF Teams, for which a total of 10 teams were formed. The subjects were same in both the team types FTF and VTs. Results indicated that VTs are equally performance oriented as FTF teams or even better than FTF teams.

Keywords: Dispersed Teams, e-Teams, Face to Face teams, Traditional Teams, Virtual Teams

Introduction

Team has been conceptualized as one of the most important organizational forms (Townsend et al., 1998).

Team has been referred to as a small group of members in which they have common purpose, interdependent roles and complementary skills to accomplish a task (Yukl, 2006). Cohen and Bailey (1997) defined team as "a collection of individuals who are interdependent in their tasks, who share responsibility of their outcomes, who see themselves and who are seen by others as an intact social entity embedded in one or more larger social systems, and who manage their relationship across organizational boundaries" (p.241).

Lately, a new and novel type of team has generated interests of both organizations and scholars. Increasing 24x7 competition (Algesheimer et al., 2011), globalization, advances in Information Technology, cooperation and collaboration among organizations, and a move towards flatter organizational structures and knowledge work cultures have provided ways to the new form of team, generally referred as 'Virtual Teams' (Townsend et al., 1998). This novel type of team has stimulated interests of both members of the organizations and researchers. In the early 1990's the

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concept of VTs had taken some shape and place. Since then VTs are increasingly being adopted by companies all around the globe, as a form of organizing work, driven by the increase in globalization, international trade, and fast communications networks/technologies (Duarte and Cunha, 2015).

The term "virtual" specifies distributed and dispersed work that is primarily based on electronic communication tools (Hertel et al., 2005). VTs are considered as independent groups of individuals that work across time, space, and organizational boundaries with communication tools that are heavily dependent on advanced information technologies (Driskell et al., 2003; Thompson and Coovert, 2003).

Defining Virtual Teams

Some authors defined VTs with respect to geographical distance and communication technologies. For instance, Ale-Ebrahim et al. (2009) defined VTs as "small temporary groups of geographically, organizationally and/or time dispersed knowledge workers who coordinate their work predominantly with electronic information and communication technologies in order to accomplish one or more organization tasks" (p.2655).

Prior to 2000, Kristof et al. (1995) defined VT as "a self-managed knowledge work teams, with distributed expertise that forms and disbands to address a specific organizational goal" (p.230). Suzanne (1998) defined

such teams on the basis of continuity and described as a group of dispersed knowledgeable and skilled workers who concentrate on a goal temporarily or on on-going basis. In recent times, Wadsworth and Blanchard (2015) noted that VTs exist on a continuum, wherein there are pure VTs, moderate VTs, and FTF teams. Moderate VTs are somewhat virtual in the sense that team members primarily interact FTF, but also spend time working with each other through information and communication technologies.

According to Henry and Hartzler (1997) VTs have the following characteristics:

a) Members are distributed across national or international geographies and work at distance from same or different locations,

b) The team size is usually less than 20,

c) Team members accomplish tasks, solve problems, and reach at decisions jointly and collaboratively,

d) Members are held accountable for their coordinated team results.

Hertel et al. (2005) maintained that VTs have at-least two persons who coordinate and collaborate to achieve common goals through electronic communication media (such as, e-mail, fax, phone, video conference, etc) wherein at least one of the team members works at a different location, organization, or at a different time zone.

Face-to-Face versus Virtual Teams

Bell and Kozlowski (2002) differentiated VTs and FTF teams on the basis of distance and communication media. The researchers claimed that FTF teams work in close physical proximity and work under the same roof. On the other hand, they claimed that VTs are physically separated and tend to work by relying on CMC. Interestingly, a hybrid form of teams is also emerging where a FTF team is often joined virtually by other member(s) who might be physically away but interact with the remaining FTF team. The increasing popularity of 'Work-From-Home' often integrates such VT members with a FTF team in the office. Table I shows the distinguishing characteristics of VTs and traditional FTF teams.

Table I: Distinguishing Characteristics of Virtual and Traditional teams

VTs	All Teams	Traditional Teams
• Geographically dispersed • Communication through technology	• Multiple individuals • Task interdependence • Shared goals • Organizational setting	• FTF • Communication primarily in person

(Source: Horvath and Tobin, 2001)

According to Duarte and Snyder (2006) VTs can be more complicated in contrast to FTF teams because they transcend time, distance, and organizational boundaries that use CMC systems to collaborate.

Sproull and Faraj (1997) pointed three aspects in which electronic communities are superior to those of FTF communication: First, physical location is irrelevant in electronic communication. Second, the invisibility issue in electronic communities is reduced by the use of video chats such as Skype. Third, logistical and social costs to participate in electronic communities are lower.

According to Hiltz and Wellman (1997) unlike FTF, virtual communities tend to be larger, more dispersed

in space and time, more densely knit, have members with more heterogeneous social characteristics, such as, lifecycle stage, gender, ethnicity, and socio economic status, but with more homogeneous attitudes.

VTs are more task-oriented initially. Over the period of time, VTs appear to lessen their task focus (Chidambaram and Bostrom, 1993; Walther, 1995).VTs also report weaker relational links to team mates in comparison to traditional teams (McDonough et al., 2001; Warkentin et al., 1997).

Review of Literature

Some researchers acknowledge that working in VTs can have a favourable impact on effectiveness (e.g.

Maynard et al., 2012), quality of project, performance (e.g. Altschuller and Benbunan-Fich, 2010), decision making (e.g. Pridmore and Phillips-Wren, 2011), idea generation (e.g. Alnuaimi et al., 2010), satisfaction (Huang et al., 2010), organizational commitment (Horwitz et al., 2006), while some other researchers keep suggesting that working virtually negatively effects effectiveness (Schweitzer and Duxbury, 2010).

The effectiveness can be measured from ratings of outside (Cummings and Haas, 2012) and by objective measures of team performance (Rapp et al., 2010).

Some actual task based performance indices are also reported by a few studies in virtual and FTF contexts. For instance, actual task performance (e.g. Hambley et al., 2007; Staples and Zhao, 2006), productivity (Andres, 2002) have been used in some studies. Surprisingly, no comparative study of effectiveness on the basis of performance Indices are spotted yet in India.

Researchers have reported mixed results for performance in VTs and FTF teams ranging from no difference (e.g. Straus and McGrath, 1994) to a wide difference where VTs were found to be superior to that of FTF teams (e.g. Staples and Zhao, 2006).

Some researchers also compared performance on the basis of complexity of task, an idea generation task or an intellectual task (Straus and McGrath, 1994), real world task (Nicholson et al., 2007), business simulation task such as case involving marketing strategies (Montoya-Weiss et al., 2001), case involving choosing the most likely suspect in a murder mystery (Warkentin et al., 1997), and consensus seeking desert survival task (Staples and Zhao, 2006). No such study of comparative performance has been found in India. Based on the review of prior researches, the researcher then framed the question.

Research Question

Which type of team is more performance oriented: VT or FTF Team?

Objective and Hypotheses

Based on the theory building and research to date, the researcher tries to answer the research question by understanding the Performance Outcomes in terms of Performance Indices such as Average Individual Error Score (AIES) & Team Error Score (TES) and Team Process Indices such as Team Functioning (TF), Team Effectiveness (TE), and Team Synergy (TS) in VTs as compared to FTF teams. Therefore, the objective and its related Hypotheses of the present study are as follows:

Objective:	To assess the differences between Performance Indices in FTF and VTs
	H1: AIES in FTF Team is no different from VT
	H2: TES is higher in VT than FTF Team
	H3: TF is higher in VT than FTF Team
	H4: TE is higher in VT than FTF Team
	H5: TS is higher in VT than FTF Team

Methodology

Participants and Sampling Technique

To assess the differences between the Performance Indices in FTF and VTs on Correlated Groups- 50 students pursuing a 2-year full-time MBA were employed from a leading business school, wherein 82% were males and 100% belonged to the age group of 21-30. The demographic profile of the students is shown in Table II.

As the intent of the present research study, it was decided that "purposive sampling" would be the right approach to the sampling of the study elements for the present design. Purposive sampling is essentially a non- probability sampling method that is characterized by the use of judgement and a deliberate effort to obtain representatives samples by assuming presumable typical areas or groups in the sample.

Table II: Demographic Characteristics of Sample

Demographics	Frequency	Approx.Percentage
	n=50 students Correlated groups	
GENDER Male Female Unreported	**9** **41**	**18%** **82%**
AGE Less than 20 21-30 Above 30 Unreported	**0** **50** **0** **0**	**100%**

Intervention Procedure

The researcher formed 10 teams of 50 students (5 students in a team). These 50 students were then randomized in two types of teams: a) FTF teams b) VTs. In this Correlated Group experiment, the researcher controlled the experiment about team context and learning effects as randomization was done in allotment of team members to teams.

The communication in VTs was again mediated through synchronous chat systems using smart phones, laptops or desktops whichever was available. However, the communication in FTF teams was in person only.

The researcher utilized two different consensus seeking tasks (Desert Survival and Bushfire Experiment with the same subjects. Bushfire Survival scenario was used in VTs while Desert Survival Task was used in FTF contexts.

Utilization of Consensus Seeking Scenario- Bushfire Survival Task

The present study utilized Bushfire consensus seeking task that requires interpersonal processes such as discussions, negotiations, to arrive at a solution. It also had an expert solution available that measures Individual and Team Performance Indices such as AIES, TES, TF, TE, TS.

Bushfire Survival Task (see human synergistic website[1]) was so chosen because the subjects were less familiar with this scenario. Generally, in this task, participants view a short movie that places them into a bushfire scenario in a forest of Australia with the rest of their team mates. Participants are then challenged to rank 12 potentially useful items in order of relative importance to their survival. Solutions are first developed by the individuals and then in groups. Scores were generated by comparing individual answers with the team answers to those provided by the experts.

The bushfire survival situation scenario takes approximately 2 hours including scoring and debriefing. Bushfire Survival task is an interdependent collective task that requires teams to solve a problem that has a correct answer (i.e. an expert answer). This task have the aspects of a judgment/decision making since a team member cannot prove the correctness of his/her answer and has to persuade teammates, and has aspects of negotiation/cognitive conflict task. Team mates have to discuss and resolve differing opinions regarding survival strategies and the ranking of the items.

Desert Survival Scenario

A consensus seeking decision making task that requires interaction and communication and that have an expert solution available (to create a measure of Individual and Team Performance Indices such as AIES, TES, TF, TE, TS) was used for the present study.

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[1] http://humansynergistics.com/docs/default-source/product-info-sheets/bushfire-product-info-sheet.pdf?Sfvrsn 2

Desert Survival Task reported in Pareek & Rao (1985) was chosen for the present research as it presents a scenario that few people have relevant experience in. In this task, participants first read a short document that places them into an airplane crash scenario in a desert with the rest of their team mates. The task challenges the participants to rank 15 items they might need for the survival. By having team members complete the exercise individually and then as a team, the difference between the individual solutions and the team's solution can be identified with the help of expert ranks.

The Indices in survival scenario are calculated as:

- AIES= Average of Individual Member Error Scores in a Team
- TES= Sum of the deviations of team answer as a whole from the experts answers
- TF= {Highest Individual Error Score (HIES)- TES};
- TE= (AIES-TES); and
- TS= {Lower Individual Error Score (LIES)-TES}

All these Indices become a proxy measure of the group's ability to perform as a team. For the purpose of the present research these are called Performance Indices.

Research Findings and Analysis

Different Performance Indices such as AIES, TES, TF, TE, and TS were compared between FTF and VT. To compare the mean scores on Correlated Groups Paired Sample t test was used.

Hypothesis 1 examined the differences in the AIES in FTF and VT. The paired sample t test analysis revealed that there is a significant difference in the AIES in FTF (mean score= 4.39) and VT (mean score= 3.74) at p=.010, two tailed as shown in Table III. Therefore, this result leads to the rejection of null Hypothesis I, which states that AIES in FTF is no different from VT.

Hypothesis 2 examined the differences in the TES in FTF and VT. The analysis revealed that there is no significant difference in the TES in FTF (mean score= 3.51) and VT (mean score= 3.59) at p=0.412 (one tailed) as shown in Table III. Therefore, this result leads

to the rejection of Hypothesis 2, which states that TES is higher in VT than FTF Team.

Hypothesis 3 examined the differences in the TF in FTF and VT. The analysis revealed that there is no significant difference in the TF in FTF (mean score= 0.89) and VT (mean score= 1.37) at p=0.168 (one tailed) as shown in Table III. Therefore, this result leads to the rejection of Hypothesis 3, which states that TF is higher in VT than FTF Team.

Hypothesis 4 examined the differences in the TE in FTF and VT. The analysis revealed that there is a significant difference in the TE in FTF (mean score= 1.91) and VT (mean score= 0.14) at p=0.0025 (one tailed) as shown in Table III. Clearly, team effectiveness in FTF team is higher than in VT. Therefore, this result leads to the rejection of Hypothesis 4, which states that TE is higher in VT than FTF Team.

Hypothesis 5 examined the differences in the TS in FTF and VT. The analysis revealed that there is no significant difference in the TS in FTF (mean score= -0.66) and VT (mean score= -0.97) at p=0.269 (one tailed) as shown in Table III. Therefore, this result leads to the rejection of Hypothesis 5, which states that TS is higher in VT than FTF Team.

Discussion

The researcher's a priori expectation was that the AIES would be same in FTF team and VT. Surprisingly, this was not the case. It was observed that AIES was found to be more in FTF team than VT which implies that members in VT performed better individually. Therefore, this result provided no support to Hypothesis 1.

Could it be due to the Hawthorne Effect (Wickstrom and Bendix, 2000)? Hawthorne Effect signifies that whenever a participant is informed that they are going to be observed under an experimental condition, they become more alert and try to perform well. It is possible that for virtual contexts, students became more alert and attentive for their performance in a novel team context than their familiar FTF context, thereby leading to high performance in such teams. Moreover, conceptually Hawthorne effect also applies to a Control Group. However, the present study does not support Hawthorne effect in the context of FTF group

Table III: Paired Sample t-Test for Performance Indices in Face-to-Face and Virtual Teams

N = 50, FTF = 10 teams: VTs = 10, Correlated Groups											
		FTF Team				**VT**					
		Mean		**SD**		**Mean**		**SD**			
AIES		4.39		0.58		3.74		0.40			
TES		3.51		0.94		3.59		1.14			
TF		0.89		0.65		1.37		1.37			
TE		1.91		0.93		0.14		1.00			
TS		-0.66		0.83		-0.97		1.10			

	Mean	**SD**	**Std Error Mean**	**95% confidence interval of the difference**		**t**	**df**	**Significance**	**Hypothesis**	**Result**
				Lower	**Upper**					
AIES	0.65	0.63	0.20	0.20	1.10	3.26	9	0.010 (2-tailed)	H1	Not Supported
TES	-0.08	1.08	0.34	-0.85	0.70	-0.23	9	0.412 (1-tailed)	H2	Not Supported
TF	-0.48	1.50	0.47	-1.55	0.59	-1.02	9	0.168 (1-tailed)	H3	Not Supported
TE	1.77	1.52	0.48	0.68	2.86	3.69	9	0.0025 (1-tailed)	H4	Not Supported
TS	0.31	1.51	0.48	-0.77	1.39	0.64	9	0.269 (1-tailed)	H5	Not Supported

(control group) because FTF group did not outperformed or done equally well as compared to virtual teams.

Also, this observation does not support the notion put forward by Duarte and Cunha (2015) that Computer Mediated Communication (CMC) hampers their individual performance levels in VTs due to the reduced informal communication that establishes low level of interpersonal contact and enhances workers isolation, leading to increased levels of stress, burnout, and depression. It should be noted that our VTs were specifically constructed for one-time use. These are different from permanent VTs where pathological effect of isolation from members could impair performance.

The researcher's a priori expectation was that the TES would be same in FTF team and VT. As per the observations there were no significant differences in TES in both the team types. It signifies that team performance was equally good in both the types of teams. This provided no support to Hypothesis 2..

The other observations based on other Indices such as: TF, and TS, implied that there were no significant differences in these Team Performance Indices. However, there was a significant difference in TE due to AIES-TES where AIES is higher in FTF teams. All these observations led no support to Hypotheses 3-5.

The possible reasons for such types of Performance Indices individually and in groups of both the team types could be the role of group affect, perceived communication and verification, and leader emergence across teams. The observations based Team

Performance Indices implied that VT is equally useful or not useful to that of FTF teams in accomplishing the tasks. VTs function, perform, and synergise as equally as FTF teams owing to some of the following reasons:

a) opportunities for leader emergence on shared basis:

b) communication identification and verification,

c) group affect.

Wickham and Walther (2009) were of the view that VTs can often be created without the leader, wherein team members take the responsibility to fill in the role of a leader. Therefore, the present study possibly support the emergence of leaders on shared basis.

In addition to leader emergence, identity communication, and identity verification play a very important role in teams, especially in VTs. Identity communication comprises of methods and techniques a person uses to convey self- identities in teams. On the other hand, identity verification is the process of bringing others to confirm one's identity (Wilson et al., 2015). Prior work in FTF settings observed that identity communication and verification may produce individual and group benefits such as: creativity (Cheng et al., 2008); career growth (Ibarra et al., 2005), motivation to perform (Dutton et al., 2010), satisfaction, meaning, and self-worth (Thatcher and Greer, 2008). Studies on VTs are less in terms of identity communication and verification. However, in a notable exception, Ma and Agarwal (2007) examined the influence of virtual co-presence (feeling of togetherness with others in a VT environment), persistent labelling (use of ID or label for a long time in virtual environment), self-presentation (process to communicate one's identity over VTs), and deep profiling (sharing personal and social identity information in virtual mode) on identity verification. Wilson et al. (2015) proposed in their paper of VTs that perceived identity communication and verification positively influences VT performance. The present study results support the possibility of communication identification and verification in VTs.

The other possible factor that could impact the individual and group outcome is the group effect (combination of positive and negative emotions at collective level impacts individual and group performances) as pointed by Barsade and Gibson (2012). The present work presumes the effect of group effect on team performance through its results.

Similar levels of Performance Indices obtained in the present study do not support the claim made by Duarte and Cunha (2015) that VT communication act as a barrier to group level performance as well due to decreased informal communication. It can be also said that at group level, there is possibility of a greater communication identification and verification with other group members owing to efficient ways of using technologies in VTs. As our VTs were created for special purpose and were temporary, the alienation sometimes observed in physically dispersed members might not at all be noticeable. On the other hand, the VT members were found to be comfortable as FTF owing to widespread usage of CMC in their daily lives. Smartphone using generation is truly smart!

The present study contradicts the results of Hambley et al. (2007) work as they also found that superior task performance was achieved in rich media than those communicating in less rich media. Again, the difference with this study is that they used FTF, videoconference, and chat systems while the present study only used FTF and VT (using instant messaging system allowing instant uploading of audio/video too).

As far as team performance, TF, and TS are concerned, the present study had same outcomes in both the team types. Therefore, the study is in contrast to all previous studies such as Andres (2002) and Staples and Jhao (2006). Andres (2002) found that team productivity and quality were more in FTF than in video conference conditions. Staples and Jhao (2006) observed performance were superior in virtual than FTF teams.

With these observations we could simply put that VTs are as effective to FTF teams or even better than FTF teams. Could these be due to effective decision making, open and clear communication, clarity of goals, defined roles and responsibilities, mutual trust, conflict management, and coordinated efforts over virtual networks? These potent mechanisms have not been tried and tested particularly in the present study and therefore can be explored in future studies.

Implications

The results of the present study have some practical implications. The findings possibly suggest that using more rich and synchronous ways of doing work virtually enhances performance. For example, WhatsApp allows its users to have group chats real time, conversations over calls, instant uploading of audio, video, or images in a relatively inexpensive and convenient, yet effective, manner. Moreover, the findings suggest the potential advantageous role that information technology may play in enriching performance. As technology has become a key tool in the research and practice in the field of Organizational Behaviour, this study results help contribute to the growing case for the use of this technology in measuring team outcomes which adds to academic implication.

Given that we are now the part of the virtual world, the need for technological training can be expected to increase which would help build confidence in using technologies within the organizations. With this, it can be proposed that such technology trainings will escalate the productivity in real life and its use will continue to gain in popularity in training and development efforts in today's and future workplaces. Therefore, appropriate technology training program can be more confidently designed to cater to the new thinking and new approaches that are needed for the dynamic environment facing today's workplaces.

Limitations of the Present Study and Suggestions for Future Researches

The present study has several limitations and in view of these a few avenues for future researches have been suggested.

First, the findings of this study should be used with caution as the limited non-probability sample has been used in the present experiment pertaining to National Capital Region of India. Further researches are required to be conducted across regions, across samples and across cultures to allow generalizations. *Second,* the drawback is that the researcher was unable to create VTs over dispersed geographic locations and observe the effects of temporal distance on Performance Indices. Future researches may create virtual teams across geographies. *Third,* the present experimental study simulating the VTs was conducted in classroom laboratory settings and with students as sample, and not in the actual VT work settings. Future experiments may be conducted in real organizational settings with actual workforce, on real life problem solving tasks and assignments to synthesize the effect of real dispersed VTs, FTF teams, and or amalgamated teams. *Fourth,* the present study used only FTF and chat systems primarily WhatsApp to conduct the experiment. It will be important to investigate the impact of using different media, which have the aspects of media richness and social presence such as Video Conferencing that is more realistic with VTs in applied settings. *Fifth,* in the present study, the experimenter could not control the Hawthorne Effect. The future researches could exercise greater control to mitigate these effects. *Sixth,* future researches may also pursue to assess more comprehensive comparisons by ensuring different lengths of training, types of interface, different tasks based on complexities, and types of technology that are media rich or enable social presence. Future research should pay attention to developing further understanding of how the extra visual and audio information, flash animations provided by a virtual world may influence team outcomes.

Conclusion

Globalization, advanced technologies, and 24x7 competitions have enabled the organizations transcend the boundaries of traditional FTF teams to VTs. These new kinds of distributed work teams operate in a virtual team environment in a 24 hour cycle and tap the strength of diversity in terms of skills, experience, knowledge, and expertise, all around the globe. Unlike FTF teams, VTs are bigger, faster, and better. The trend of these teams that are supported by electronic or CMC system is not likely to go away.

The literature seems to be lacking a thorough understanding of the mechanisms in virtual teams. The present study contributes to the growing case of virtual teams and information technologies in the field of Organizational Behaviour. Also, the comparison of virtual and FTF teams are worthy of additional studies on the basis of objective and subjective performance outcomes. The findings of the present research support the notion that VT performs, functions, or synergizes equally or even better as compared to FTF teams both at individual and at team level.

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