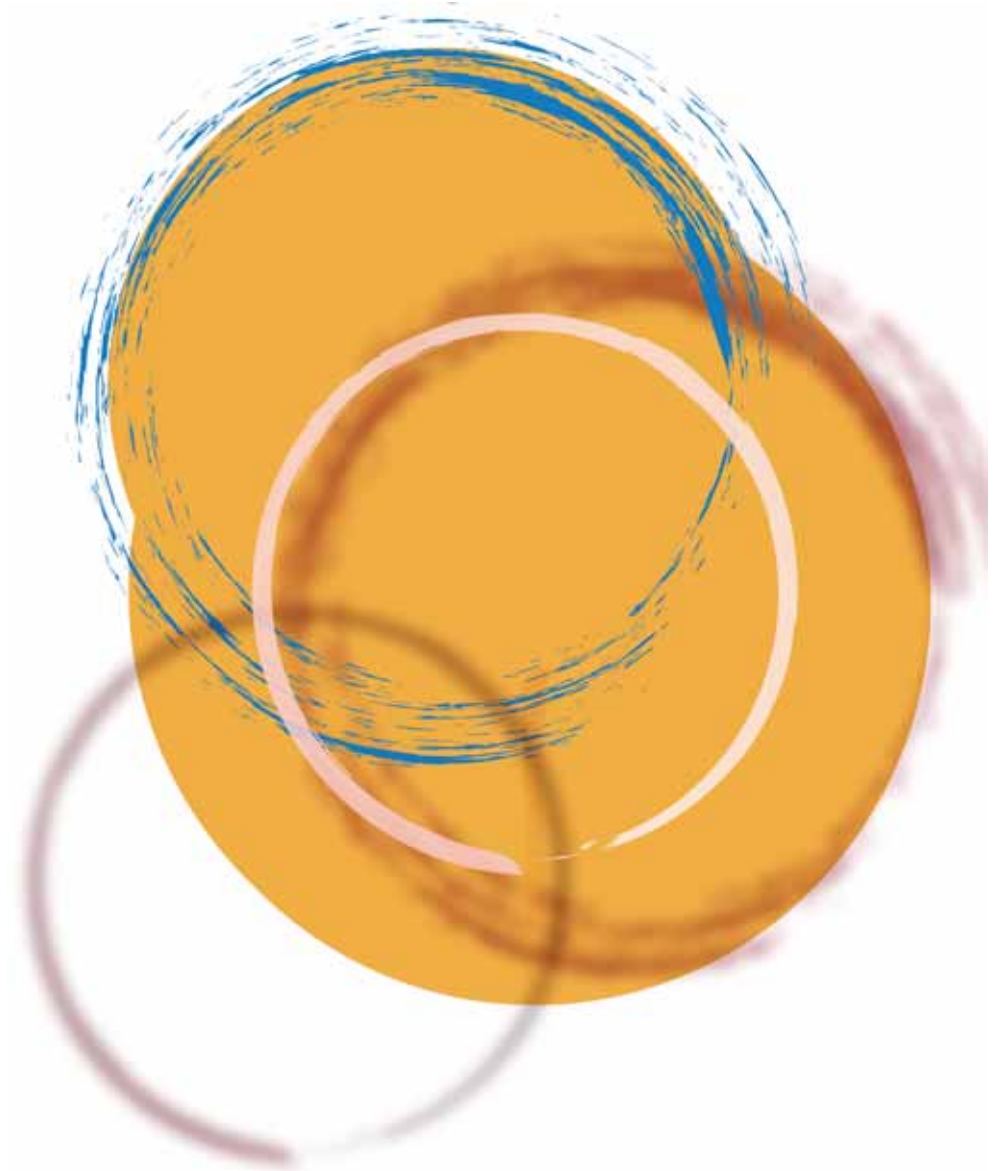


Edited by Mary Kalantzis and Bill Cope



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T. Ramayah, Prof. Muhamad Jantan, Dr. Azzat Mohd. Nasurdin, and Koay Hooi Ling

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Internal Group Dynamics, Team Characteristics, and Team Effectiveness

A Preliminary Study Of Virtual Teams

T. Ramayah, Prof. Muhamad Jantan, Dr. Aizzat Mohd. Nasurdin, and Koay Hooi Ling

Abstract

The advances in ICT and also the advent of the Internet have changed the way we work in the new millenium. Virtual teamworking has already been practised extensively in the West but in the case of Malaysia, a developing country is still struggling to get a strong foothold. In lieu of the above this study looks at the impact of internal group dynamics, team characteristics on the effectiveness of a virtual team among manufacturing companies in the northern region of Malaysia. A questionnaire survey was used to collect data from 152 virtual teams from the multinational firms operating in Penang. The findings showed that team characteristics do not impact internal group dynamics or team effectiveness; while internal group dynamics correlates positively with virtual team effectiveness. Among the dimensions, it was found that team member relations correlates positively with both team performance and team member satisfaction, while team leadership was found to correlates positively with team member satisfaction. Thus it can be concluded that it is important for managers to maintain proper composition and characteristics of the virtual team, while concentrate more effort on the team member relations and team leadership to promote better team dynamics, Communications among team members need to be handled with care. Excessive communication using the wrong means, such as electronic communications, may have negative effects and causes dissatisfaction among team members. At the same time, increasingly, the conventional co-located (face-to-face) teams will endeavor to improve its performance and effectiveness by imitating some of the technologies and the characteristics of virtual team.

Introduction

Today, global virtual teams are playing an increasingly important role in international business by offering organizations the opportunity for reaching beyond traditional boundaries (Pauleen & Yoong, 2001). However, global, multicultural, inter-organizational, virtual teams and the effective use of information and communication technologies (ICTs) present real and compelling challenges to its facilitators, as well as presenting to the teams unparalleled opportunities for expanding on perspective, approaches, and ideas. While research shows that the development of personal relationships between virtual team members is an important factor in effective working relationships, little research has been conducted on the effects of crossing organizational, cultural, time and distance boundaries on relationship building in virtual teams (Pauleen & Yoong, 2001). The use of virtual team has outpaced our understanding of their dynamics and unique characteristics.

Due to the rapid growth of virtual teams in many global organizations, especially to take advantage of the time zone differences by having product development team across all sites to work for 24 hours round the clock rather than the normal single site 8 hours per day, the urge to understand more on virtual team effectiveness and its internal group dynamics has been significant. As such, this research attempts to understand more on the virtual team effectiveness, team dynamics as well as the influence from team characteristics such as team size and functional diversity on team dynamics and team effectiveness. This research has been designed to test a general hypothesis that virtual team effectiveness is influenced by internal group dynamics and team characteristics. Although there have been some studies done in Western countries on related areas in different contexts and settings, most of these are in experimental settings or in a more general perspective. This study attempts to concentrate on the internal group dynamics based on the responses from virtual team members that are working in multi-national organizations in the northern region of Malaysia.

Although there are various definitions of virtual teams, Lurey and Raisinghani (2001), Potter, Balthazard and Cooke(2000), and Andres (2002) have defined virtual team as people who share a common purpose or goal or are given a specific task, and interact interdependently (Lurey & Raisinghani, 2001) and collaboratively (Andres,2002; Potter et al, 2000) within a larger organizational setting, with members dispersed across multiple sites(Andres, 2002), organizational, space, and/or time boundaries (Lurey & Raisinghani, 2001), geographically distributed (Potter et al., 2000) and are often cross-functional in nature, from a variety of organizational departments or business units. These teams have a low frequency of face-to-face contact, and are able to collaborate through the use of emerging computer and communication technologies to enable the organizations to get projects done as quickly as possible while utilizing the skills of project team members that are from different areas of expertise and geographically dispersed (Lurey & Raisinghani, 2001; Potter et al, 2000).

This study is important in understanding the factors that contribute to the success of a virtual team. As the virtual team could possibly consist of individuals from different backgrounds, geographical locations and time zones, thus by nature this could enhance innovativeness of the team when well managed. In addition, the forming of virtual teams enables concurrent engineering for research and development teams (Bal & Teo, 2000), hence, reduces development time, ensuring time-to-market for new products and services. The significance of concurrent engineering has been clearly proven as companies have switched from asking questions like “Why concurrent engineer?” to “How concurrent engineering?” in the Management Roundtable’s Seventh International Conference on Design for Manufacturability, held in Orlando, Florida, USA (Tong & Fitzgerald, 1994).

Conceptual Foundation

The theoretical framework for this study (Figure 1) is adapted from the findings on literature reviews done, especially as a subset of Lurey and Raisinghani’s empirical study (2001) on best practices in virtual teams. Lurey and Raisinghani (2001) studied all factors that contribute to or inhibit the success of a virtual team, including internal group dynamics, design process, and external support mechanisms. However, in this

study, only a few important dimensions of internal group dynamics' impact on team effectiveness have been considered.

In addition, according to Duarte and Snyder (2001), team characteristics have its role in determining the internal group dynamics. Thus, this research has added this component so as to understand further on how team size and the team's functional diversity impact the internal group dynamics. At the same time, Pagell and LePine (2002) and a few other studies found that team characteristics actually influence team effectiveness, thus the relationship of team characteristics, internal group dynamics and team effectiveness has been modified to reflect this relationship, as depicted in Figure 1. This framework is based on the findings from the literature reviewed that follows:

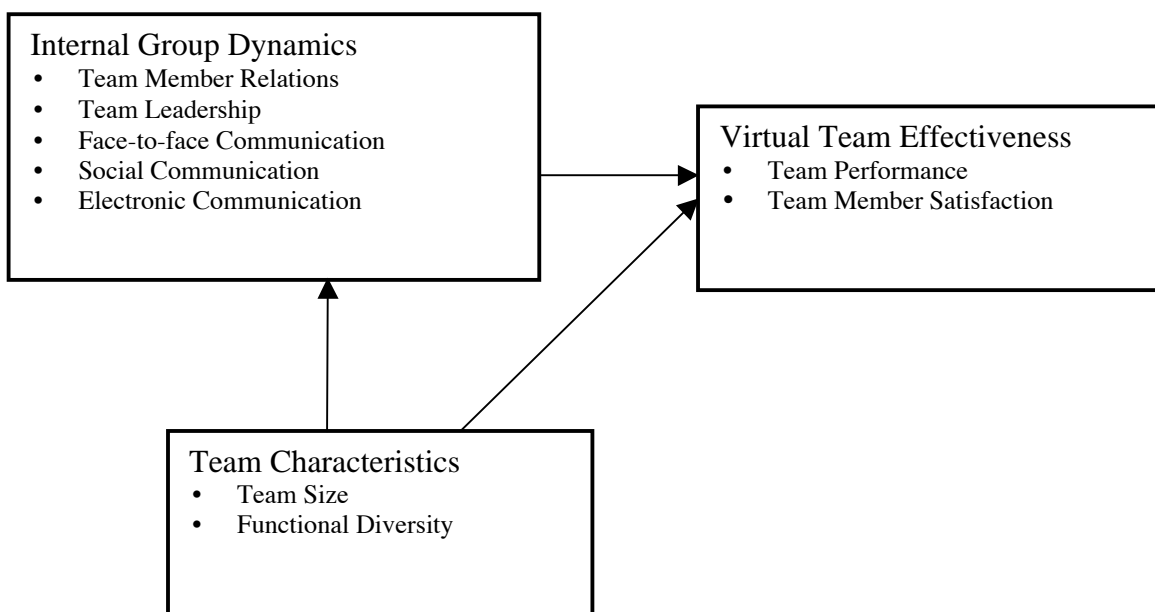


Figure 1

Theoretical frameworks for virtual team effectiveness and related variables.

Team Characteristics and Internal Group Dynamics

Duarte and Snyder (2001) stated that team dynamics are determined by complicated variables that relate to three factors: time, team environment, and team composition. Stoel (2002) in his study commented that group research generally showed that large team size has a negative impact on group dynamics. As cited in Stoel's study, Shaw (1976), in an extensive review of group literature, noted that group size directly influences group characteristics. In addition, he noted that group size directly influence member behaviors in an inverse relationship; the larger the group, the less frequent the communication behavior of the group members. Mullen (1987, as cited by Stoel, 2002) reported results of two meta-analyses examining the relationship between group size and group participation behaviors. The analyses showed that participation in classroom and in religious groups declined as group size increased.

Similarly, Wagner (1987), as cited in Stoel's study, in a study of participatory behaviors in an assigned group project for a class showed that the smaller the group, the more members participated in project preparation behaviors.

As cited by Keller (2001), the use of cross-functional groups can result in negative outcomes such as increased costs (AitSahlia, Johnson & Will, 1995), felt stress, and lower group cohesiveness (Donnellon, 1996; Jehn, 1997; Swamidass & Aldridge, 1996). Duarte and Snyder (2001) stressed that a person's functional background can greatly affect his or her behavior. Thus, a functionally diversified team with members from various departments may potentially promote misunderstanding, and cause the team to have task and social dynamics that keep it in the stages of problem solving and conflict resolution. Church (1995), on his case study on diversity in workgroup settings, shared similar opinion and stressed that this differences often create conflict, and when handled inappropriately, can result in poor performance. The discussion above leads us to the first hypothesis and subhypotheses:

- H₁: Team characteristics correlates negatively with internal group dynamics.
- H_{1a}: Team size correlates negatively with extent of team member relation.
- H_{1b}: Team functional diversity correlates negatively with extent of team member relation.
- H_{1c}: Team size correlates negatively with quality of team leadership.
- H_{1d}: Team functional diversity correlates negatively with extent of team leadership.
- H_{1e}: Team size correlates negatively with extent of face-to-face communication.
- H_{1f}: Team functional diversity correlates negatively with extent of face-to-face communication.
- H_{1g}: Team size correlates negatively with social communication.
- H_{1h}: Team functional diversity correlates negatively with social communication.
- H_{1i}: Team size correlates negatively with electronic communication.
- H_{1j}: Team functional diversity correlates negatively with electronic communication.

Team Characteristics and Team Effectiveness

Past researches found that the lack of training or the wrong team composition will produce critical skill gaps that will inevitably lead to a decrease in overall team performance (Castka, Bamber, Sharp & Belohoubek, 2001; Church, 1998). Stoel (2002) has shown that team size influences group outcomes. As cited by Stoel, in Mullen (1987), a meta-analysis of classroom studies showed that as school class size increased, student achievement decreased. Another study (Green et. al, 1996, as cited by Stoel, 2002) examining the relationship between group size and group outcome in the workplace found a negative relationship between quality of the relationship among team members and both work group size and organization size. An empirical study of rural hospital consortia done by Chan et al. (1999, as cited by Stoel, 2002) found a curvilinear relationship between group size and outcome measures. As group size increased, operating profit and revenue per admission increased until an optimum group size was reached; once the group become too large, the outcomes decreased with additional increases in the group size.

According to Pagell and LePine's study (2002), research on team composition generally attempts to link the characteristics of individuals who compose the teams to

team processes and outcomes. They suggested that heterogeneity promotes performance if the task requires a variety of knowledge, skills, abilities or other characteristics, and homogeneity promotes performance when the task requires a great deal of interpersonal interaction. In addition, there are some studies done on team size that found that a team should be composed of the minimum number of individuals to do the task, however, increased above this minimum can create process losses that detract from performance (Steiner, 1972, as cited by Pagell & LePine, 2002).

According to Lovelace et al. (2001), team functional diversity does not always have positive effects on performance (cf. Ancona & Caldwell, 1992a, 1992b; Bettenhausen, 1991; Jehn, 1995, 1997; Kanter, 1988; Simons, Pelled, & Smith, 1999). In a review, Bettenhausen (1991, as cited by Lovelace et al., 2001) concluded that the overall effect of diversity on team performance is negative, especially in times of crisis or rapid change, because the advantages provided by multiple perspectives are often offset by problems generating consensus. New product team researchers have found similar results. In the same study (Lovelace et al., 2001), it is reported that Ancona and Caldwell (1992a: 338) concluded that functional diversity might result in teams that had less flexibility, had less capacity for teamwork, were more open to political and goal conflicts between functions, and had more difficulty in achieving consensus. Hence, this leads to the second hypothesis and subhypotheses:

- H₂: Team characteristics correlates negatively with team effectiveness.
- H_{2a}: Team size correlates negatively with team performance.
- H_{2b}: Team functional diversity correlates negatively with team performance.
- H_{2c}: Team size correlates negatively with team member satisfaction.
- H_{2d}: Team functional diversity correlates negatively with team member satisfaction.

Internal Group Dynamics and Team Effectiveness

Lurey and Raisinghani (2001) in their study on best practices in virtual teams found that several dimensions in internal group dynamics were strongly positively correlated to the effectiveness of the teams. As cited in Pawar and Sharifi's (1997) study, the successful use of teams is neither new, nor is it unique to concurrent engineering. The early "human relations" studies including the "Hawthorne experiments" and Tavistock's "social-technical" systems have highlighted the extent that groups' interactions, their cohesion and conformity could enhance their performance in the work place. According to Pauleen and Yoong (2001), the link between team effectiveness and team member relationships is an important area of study in virtual teams. Stronger relational links have been associated with higher task performance (Warkentin and Beranel, 1999) and the effectiveness of information exchange (Warken et al., 1997).

As cited by Potter et al. (2000), a study by Watson and Michaelsen (1988) showed that a team's interaction style could affect performance. Group interaction styles are theorized to affect performance because they can impede or enhance team members' ability to bring their unique knowledge and skills to bear on the task, and the extent to which they develop and consider alternative strategies for approaching the task (Hackman & Morris, 1975, as cited by Potter et al.). In general, group interaction styles affect communication and thus team performance by facilitating or hindering the exchange of information among team members.

Klimoski and Hayes's (1980) study, as cited by Miles and Mangold (2002), found that the amounts of effort subordinates expend on the job, as well as their

performance and work satisfaction, are influenced by the attitudes and behaviors of their supervisors. This suggests that a positive relationship between team leaders and team members is imperative to the well-being of the organization. According to Miles and Mangold, there are other researches that have focused on social interaction among team members and its contribution to satisfaction. Campion et al. (1993), as cited by Miles and Mangold, found a significant positive correlation between employees' satisfaction and the presence of communication and cooperation between group members. Positive and significant correlations were also found between employee satisfaction and workload sharing and between employee satisfaction and social support. Similarly, Campion et al. (1993) found a positive correlation between employee satisfaction and the level of communication and cooperation within the work groups. With the above literature review, the following hypothesis and subhypotheses have been formulated:

- H₃: Internal group dynamics correlates positively with virtual team effectiveness.
- H_{3a}: Quality of team member relation correlates positively with team performance.
- H_{3b}: Quality of team member relation correlates positively with team member satisfaction.
- H_{3c}: Quality of team leadership correlates positively with team performance.
- H_{3d}: Quality of team leadership correlates positively with team member satisfaction.
- H_{3e}: Extent of face-to-face communication correlates positively with team performance.
- H_{3f}: Extent of face-to-face communication correlates positively with team member satisfaction.
- H_{3g}: Extent of social communication correlates positively with team performance.
- H_{3h}: Extent of social communication correlates positively with team member satisfaction.
- H_{3i}: Electronic communication correlates positively with team performance.
- H_{3j}: Extent of electronic communication correlates positively with team member satisfaction.

Team Characteristics, Internal Group Dynamics and Team Effectiveness

According to Keller (2001), the use of cross-functional groups can result in negative outcomes. In the same study, it stated that Lawrence (1997) critiqued the model development and research on functional diversity and other organizational demographic variables as placing a "black box" between a demographic variable and outcomes. She argued that intervening subjective or process variables would add explanatory variance to theory about functional diversity and outcomes.

Harris and Harris (1996) found that team performance is highest when the dynamics of group process can occur; and this is more likely to happen when the number of participants is limited for maximum interchange. This suggests that internal group dynamics could be the mediating variable that enables the influence of team characteristics on team effectiveness. Thus, the following hypothesis is formed:

- H₄: Internal group dynamics mediates the relationship between team characteristics and team effectiveness.

Methodology

This is a cross-sectional correlational field study, conducted in an uncontrived environment. There is no strict control on the specific type of virtual teams, including both ad hoc and longer-term virtual teams, as well as on the proportion of team members working from remote sites. The unit of analysis was team and data was obtained by means of a questionnaire from individual respondents working in virtual teams. A sample of about 90 virtual teams from multinational companies in Penang would serve as the respondents in this study based on Roscoe's (1975) rules of thumb for determining sample size (Sekaran, 2000) where it should be preferably 10 times or more as large as the number of variables in the study.

Measuring Instruments

Team Characteristics

There are two dimensions in team characteristics: team size and functional diversity. Team size is measured by requesting the respondents to specify the total number of team members in the virtual team that they are referring to in the response in the Section A of the questionnaire.

Functional diversity is measured by an entropy-based diversity index that measures the degree of distribution across functional areas using the mathematical equation defined by Teachman (1980), and used by Ancona and Caldwell (1992), later by Lovelace et al. (2001), and Keller (2001) (as cited by Lovelace et al., 2001; Keller, 2001).

$$H = -\sum_{i=1}^s P_i (\ln P_i)$$

For team functional diversity or H for heterogeneity, if there are s possible functional areas included in a team, P_i is the probability that the team will be found in the ith functional area. P_i represents the fractional share of the team that is assigned to each functional area. When an area is not represented, the value assigned to it is zero. Thus, the diversity index represents the sum of the products of each function's proportion in the team and the natural log of its proportion. Under this formula, the greater the distribution of team members across different functional units, the higher the score would be for functional diversity. A minimum of zero indicates that there are teams that consist of people from the same functional area, but from different sites or organizations. Thus, teams with zero functional diversity are not cross-functional teams. The higher the value indicates the more functionally diversified is the virtual team.

This dimension is measured through respondents' answer to Question 15 in Section A of the questionnaire, where the break down of team members in each functional area is specified.

Internal Group Dynamics

The internal group dynamics is measured by adapting from the questionnaire used by Lurey and Raisinghani (2001) in their study. There are 28 5-point Likert scale questions in Section B of the questionnaire that mainly concentrates on team member

relations and team process, which are used to measure the five dimensions of internal group dynamics in this study: team member relations, team leadership, face-to-face communication, social communication and electronic communication. Respondents will answer the question by indicating their level of agreement to the statement stated, ranging from 1 for 'Strongly Disagree' to 5 for 'Strongly Agree'. The average of the items representing each variable will be taken as the score to indicate the level of the variable.

Team Effectiveness.

Team effectiveness is operationalized by adapting the questions from Lurey and Raisinghani's (2001) study. There are nine 5-point Likert scale questions in Section C of the questionnaires. The first four questions concentrate on the overall performance of the virtual team, while the other five questions focuses on team members' satisfaction of working in the virtual team.

Findings

A total of 340 copies of questionnaires were distributed, of which 279 were successfully returned. The response rate is 82.06%. From the 279 responses, 11 were rejected due to incomplete data and 14 were received very late after the conclusion of the data analysis. A total of 254 questionnaires were used, and these consist of 152 teams, in which 102 were pairs, while the other 50 were singles. (The 50 singles are the ones that only one team member responded) Table 1 presents the demographic and background of the respondents who participated in this survey and Table 2 shows the information of the organizations that involved in this study, whereas Table 3 analyzed the information regarding the virtual teams in this research.

Table 1
Respondents Profile

Profile	Description	Frequency	Percent
Age	Below 25 years	31	12.20
	26-30 years	118	46.46
	31-35 years	72	28.35
	36-40 years	24	9.45
	Over 40 years	6	2.36
Gender	Male	170	66.93
	Female	84	33.07
Education Level	Ph. D	1	0.39
	Master Degree	25	9.84
	Bachelors Degree	190	74.80
	Diploma	36	14.17
	Certificate	1	0.39
	High School and below	1	0.39
Management Level	Top Level of Management	1	0.39
	Middle Level of Management	59	23.23
	Lower Level of Management	89	35.04
	Non-managerial	105	41.34
Working experience in the organization	Below 1 year	19	7.48
	1-2 years	69	27.17
	3-4 years	44	17.32
	5-6 years	58	22.83
	7-8 years	29	11.42
	9 years and Above	33	12.99
No of Local Teams Joined	0	13	5.12
	1	63	24.80
	2	49	19.29
	3	50	19.69
	4	19	7.48
	5	33	12.99
	> 5	25	9.84
No of Virtual Teams Joined	0	4	1.57
	1	95	37.40
	2	62	24.41
	3	38	14.96
	4	20	7.87
	5	24	9.45
	> 5	8	3.15

Table 2
Organizations Profile

Profile	Description	Frequency	Percent
Sector of Organization	Semiconductor/IC products	82	32.28
	Electrical products	15	5.91
	Computer products	132	51.97
	IT products	4	1.57
	Others	21	8.27
Parent Organization Base	America based	232	91.34
	Japan based	3	1.18
	German based	12	4.72
	Malaysia based	1	0.39
	Others	6	2.36

Table 3
Virtual Teams Profile

Profile	Description	Frequency	Percent
Team Size	Below 5	22	14.47
	6-10	70	46.05
	11-15	25	16.45
	16-20	12	7.89
	Above 20	17	11.18
No. of Departments in Team	1	28	18.42
	2	39	25.66
	3	26	17.11
	4	19	12.50
	5	7	4.61
	> 5	27	17.76
No. of Organizations/Sites in Team	2	67	44.08
	3	33	21.71
	4	21	13.82
	5	11	7.24
	> 5	20	13.16
Time Length Team in Existence	Below 1 year	70	46.05
	1-2 years	39	25.66
	2-3 years	11	7.24
	3-4 years	17	11.18
	4-5 years	5	3.29
	Above 5 years	7	4.61

Team Duration	Short Term	37	24.34
	Long Term	115	75.66
Respondents' Role in Team	Team Member	182	71.65
	Team Leader	43	16.93
	External Team Supporter	17	6.69
	Others	12	4.72
Respondents Joined Team since Team's Inception	Yes	98	38.58
	No	156	61.42

Table 4 provides the summary of the descriptive statistics of the major variables in this study while Table 5 and Table 6 present the bivariate correlation using Pearson Correlation done on the major variables of this study to determine the relationships among the dependent variables and the independent variables.

Table 4
Descriptive Statistics of Major Variables

Major Variables	Mean	Std. Deviation
Functional Diversity	0.90	0.63
Team Size	13.30	14.71
Team Member Relations	3.92	0.41
Team Leadership	3.85	0.45
Face-to-Face Communication	3.25	0.82
Social Communication	3.14	0.65
Electronic Communication	4.00	0.61
Team Performance	3.71	0.49
Team Member Satisfaction	3.83	0.44
Task Complexity	3.88	0.50

Table 5
Correlations between Team Characteristics and Internal Group Dynamics

	Functional Diversity	Team Size
Functional Diversity	1.00	.24**
Team Size	.24**	1.00
Team Member Relations	.02	.05
Team Leadership	-.14	-.02
Face-to-Face Communication	-.04	.17*
Social Communication	-.04	.07
Electronic Communication	-.12	.00

** $p < 0.01$, * $p < 0.05$

Table 6
Correlations between Team Characteristics, Internal Group Dynamics and Team Effectiveness

	Team Performance	Team Member Satisfaction
Functional Diversity	.02	.03
Team Size	-.08	.05
Team Member Relations	.45**	.69**
Team Leadership	.28**	.52**
Face-to-Face communication	.01	.26**
Social Communication	.13	.35**
Electronic Communication	.18*	.20*

** p< 0.01, * p< 0.05

Hypotheses Testing

All the hypotheses were tested using multiple regressions. In order to accept a regression model as valid, all five assumptions that need to be fulfilled have been verified. The relationship is linear, the error term has constant variance, normal and independent. There is no auto correlation problem and all the independent variables are independent. All outliers that are beyond 2.50 standard error from mean have been eliminated from the regression analysis.

H₁ investigates the negative relationships between team characteristics and internal group dynamics. Five separate multiple regressions have been run to test for this hypothesis as there are five dimensions of the dependent variable. Summaries of the results are as stated in Table 7. From the summary table, it is obvious that there is no significant influence of the team characteristics on the team’s internal group dynamics. The coefficient of determination, R-square, for the models ranges from .00 to .03, and the significance level are far higher than 5% for all five models. With the above result, it is concluded that H₁ is not supported. Similarly, all the sub-hypotheses are not supported as well.

Table 7
Multiple Regression Results for Team Characteristics versus Internal Group

	Dependent Variable				
	Internal Group Dynamics				
	Team Member Relations	Team Leadership	Face-to-Face Communication	Social Communication	Electronic Communication
R Square	.02	.03	.03	.00	.01
Sig.	.34	.16	.15	.80	.52
Indep. Var					
Team Characteristics	Standardized Coefficients (Beta)				
Functional Diversity	0.10	-0.14	0.02	-0.02	-0.10
Team Size	0.06	-0.06	0.16	0.06	0.01

** p< 0.01, * p< 0.05

H₂ investigates the negative relationships between team characteristics and team effectiveness. Two separate multiple regressions have been run to test for the hypothesis as there are two dimensions in team effectiveness. The similar assumptions verifications have been done and the outliers eliminated. The summary are as in Table 8. From the summary table, it is obvious that there is no significant influence of the team characteristics on the team’s effectiveness at a .05 significance level. The coefficients of determination, R square, for both models are .01. As a result, it is concluded that H₂, as well as all its sub-hypotheses are not supported.

Table 8
Multiple Regression Results for Team Characteristics versus Team Effectiveness

	Dependent Variables	
	Team Effectiveness	
	Team Performance	Team Member Satisfaction
R Square	.01	.01
Sig.	.58	.59
Indep. Vars.	Std. Coefficients (Beta)	
Team Characteristics		
Functional Diversity	0.07	0.06
Team Size	-0.08	0.05

** p< 0.01, * p< 0.05

H₃ investigates for the existence of positive relationships between internal group dynamics and virtual team effectiveness. The summary is as reported in Table 9. Both models of regression with internal group dynamics as the independent variable versus

team performance and team member satisfaction as the dependent variables are significant at 1% significance level. This indicates that internal group dynamics significantly impact the team effectiveness. Thus, H₃ is supported. In terms of sub-hypotheses, it is found that team member relations correlate positively to both team performance and team member satisfaction at 1% significance level. Team leadership only correlates positively to team member satisfaction at 1% significance level. Electronic communication is found to have negative impact on team member satisfaction at 5% significance level. As a conclusion on the sub-hypotheses, only H_{3a}, H_{3b} and H_{3d} are supported, while H_{3j} is not supported due to the negative impact instead of positive on team member satisfaction.

Table 9
Multiple Regression Results for Internal Group Dynamics versus Team Effectiveness

	Dependent Variables	
	Team Effectiveness	
	Team Performance	Team Member Satisfaction
R Square	.21 **	.66**
Sig.	.00	.00
Indep. Vars.	Std. Coefficients (Beta)	
Team Member Relations	0.39 **	0.65 **
Team Leadership	0.12	0.29 **
Face-to-Face Communication	-0.05	0.04
Social Communication	-0.00	0.05
Electronic Communication	0.02	-0.11 *

** Significant at .01 level (2-tailed)

* Significant at .05 level (2-tailed)

H₄ investigates the role of internal group dynamics as a mediator between team characteristics and virtual team effectiveness. A variable may be considered a mediator to the extent in which it carries the influence of a given independent variable (IV) to a given dependent variable (DV). According to McKinnon et al. (1995), mediation is generally present when:

1. The IV significantly affects the mediator (Attitude);
2. the IV significantly affects the DV in the absence of the mediator;
3. the mediator has a significant unique effects on the DV; and
4. the effect of the IV on the DV shrinks upon the addition of the mediator to the model. Baron and Kenny (1986) has formulated the steps and conditions to ascertain whether full or partial mediating effects are present in a model.

However, from the previous hypotheses testing that have been done, the result from H₁ and H₂ have shown that the models for these two relationships do not exist. Since there are no relationships between team characteristics and team dynamics, and between team characteristics and team effectiveness, hence, it can be inferred that internal group dynamics do not mediate the relationships between team characteristics and virtual team effectiveness.

The summary of findings indicated that team characteristics do not have significant impact on internal group dynamics and team effectiveness. Although the regression model for H_3 for internal group dynamics versus team effectiveness is significant, a closer investigation on the coefficients reveals that only team member relations correlates positively to team performance, while only team member relations, and team leadership correlates positively to team member satisfaction. On the other hand, electronic communication actually correlates negatively with team member satisfaction at 5% significance level. H_4 that relates to the mediating role of team dynamics in the relationship between team characteristics and team performance is also not supported, even though H_3 and the regression model for team characteristics and internal group dynamics versus team effectiveness is significant.

Discussion

Impact of Team Characteristics on Internal Group Dynamics

The results from the testing of Hypothesis 1 show that both team size and team functional diversity does not influence internal group dynamics. Based on the literature findings, there are generally two schools of thought on team size's influence on internal group dynamics. Some past researchers found that when a team's size increases over 20, the team dynamics decreases (Bal & Teo, 2000; Stoel, 2002). On the other hand, another group of researchers were of the opinion that it is inappropriate to limit the team to a specific size as it needs to be large enough to have the skills and expertise to get the task completed, while technology has made it easier for people to communicate and feel less inhibited about offering new thoughts and opinions (Duarte & Snyder, 2001; Harris & Harris, 1996). Thus, there is no 'right' size for a team, although they do not reject the potential negative impacts that may occur.

This suggests that in this study's context for a virtual team, the second school of thought seems to be prevalent. This finding could be due to a few reasons. Firstly, as stated in the previous section, a team needs to be big enough to encompass all the skills and resources required for a specific task. Thus, a small team can be very limited in terms of skill sets, while a larger group has more potential to work on more variety of tasks or larger projects. Although, as team size grows bigger, team members tend to form subgroups (Duarte & Snyder, 2001), and this could possibly create conflicts among these subgroups and affects the team member relations. However, with the ease of technology usage for most of the hi-tech multinational corporations, in which the sample of this study is based on, this has seemed to be overcome. This coincides with Duarte and Snyder's (2001) claimed that technology makes a larger impact on larger groups than with smaller groups. Due to this, the positive effects and negative effects could have compensated each other and thus the overall impact on team dynamics has become insignificant. This may also indicate that the relationship between team size and effectiveness is actually non-linear, where effectiveness increases with size up to an optimal value beyond which the effectiveness will decrease.

In addition, another possible reason could have been the nature of virtual team itself. Although there are many members in the team, most of the time the communication could have been dominated by a few key players. Thus, although the

actual team size is large, the number of active team members is limited (Lipnack & Stamps, 1997, as cited in Bal & Teo, 2000). As a result, the potential negative impact of large team size is not experienced by the team members. This does not affect team member relations, team leadership, and all means of communications for group dynamics.

On the other hand, the first school of thought of past researches on team size could have been proven true in this study as well. The non-impact of team size on internal group dynamics could have been due to the data obtained for this study. It is observed that about 77% of the team sizes collected in this study is of size 15 members or less (Table 3) and the overall mean is only approximately 13 members in a team (Table 4). Only a small percentage of the teams are having more than 15 members in a team. The mean of the team size in this study has not met the limit of 20 as set by some past researchers that could have hindered group dynamics. Thus, the negative impact could not be observed in this study.

Similarly, in terms of team's functional diversity, there are also two main schools of thoughts. Some argued that highly functional diversified team has the advantage of multiple resources and skills (Lovelace et al., 2001; Pauleen & Yoong, 2001; Pawar & Sharifi, 1997; Sosik & Jung, 2002), while others see it as a potential hindrance to group dynamics (Church, 1995; Duarte & Snyder, 2001). Proehl (1997) and Keller (2001) addressed both positive and negative impacts of functional diversity of team.

However, the findings from Hypothesis 1 show that both positive and negative impacts could have compensated each other in the virtual team settings, producing a neutral (and therefore insignificant) impact on team dynamics in this research's context. This provides answers to the research question that team characteristics do not influence team dynamics.

Beside the reasons mentioned above, functional diversity is the essence and the nature of a virtual team. Thus, the multinational corporations that adopted virtual team could have been very cautious when implementing this concept in the organizations. As a result, the team members could have been provided with sufficient training and preparations prior to the forming of the virtual team. Hence, the negative impact of functional diversity does not prevail and the team members' relations are not affected.

In addition, as observed in Table 3, most of the team consists of members from one or two departments (44.08%), and involving only two different sites or organizations (44.08%). This indicates that the diversity levels of the teams are quite low. Thus, the possible negative impact of highly functional diversified team on team dynamics is not easily observed in this study. Furthermore, it is observed that 75.66% of the virtual teams in this study are long term, while only 46.05% of the virtual teams have been in existence for less than a year. More than 50% of the teams have been in existence for more than a year suggests that most of these teams could have been working together repeatedly for long enough to build up the understanding and good relationships among themselves, and have a strong trust among each other to work on the assigned tasks. Consequently, the team members work together well and compensated the possible team dynamics lost due to functional differences and conflicts.

Impact of Team Characteristics on Team Effectiveness

Findings from Hypothesis 2 show that the impact of team size and functional diversity on team effectiveness is insignificant. Similarly, team size and functional diversity are

claimed to have different impacts on team effectiveness by different researchers. Some found that team composition which are big and functionally diversified would inevitably lead to a decrease in overall team performance (Castka et al., 2001; Church, 1998; Lovelace et al., 2001; Stoel, 2002), while others take this as an opportunity for better performance due to the diversified skill sets available. However, they did not deny the potential negative impact from bad team composition (Pagell & LePine, 2002).

This could be due to the virtual team context that this study is based on. Since team size and functional diversity has become the main reasons why most organizations adopt virtual team, the team formation process could have been carried out with great caution, and as such, the negative impact does not prevail. In addition, as stated above, the mean team size of this study is less than 15, the functional diversity is not too high, and the team members are well selected; therefore, the potential negative impact has been found to be insignificant. Thus, indicating that team characteristics do not influence team effectiveness in this study.

Impact of Internal Group Dynamics on Team Effectiveness

From the findings for Hypothesis 3, it is found that internal group dynamics influence team effectiveness significantly. Stronger positive internal group dynamics will bring better team effectiveness. However, among the five dimensions of internal group dynamics in this study, it is found that team member relations play the most important role in promoting team performance and team member satisfaction. This coincides with the findings of most past researches (Lurey & Raisinghani, 2001; Pauleen & Yoong, 2001; Pawar & Sharifi, 1997; Potter et al., 2000). Thus, virtual team that has strong team member relations tends to perform well in the task assigned to them, as well as promote the satisfaction amongst the team members. This is very reasonable as psychologically, team members that do not feel satisfied working in the team will have difficulty performing the tasks given effectively.

In addition, it is also shown that strong team leadership will enhance team member satisfaction. This is similar to the findings of Klimoski and Hayes (1980) as cited in Miles and Mangold (2002). Thus, the role and influence of a virtual team leader should never be neglected. The ability of an organization to choose the appropriate candidate to lead a team will determine the success of the virtual team.

On the other hand, instead of having positive impact on team effectiveness, electronic communication is found to negatively influence the overall team performance. This could be due to the missing human touch when electronic communication is used too extensively. No doubt the proper use of electronic communication could improve communication among virtual team members, but the benefit does not prevail when team members feel less satisfied working in the team. Thus, to answer the research question, strong internal group dynamics correlates positively to team effectiveness. As internal group dynamics improves, the team effectiveness improves in the similar directions.

Meanwhile, from the findings of Hypothesis 2, it is observed that face-to-face communications and social communications do not impact team effectiveness. It is insignificant because there is not much variation on these two variables. This could be due to the recent slow down on the global economic condition. As the business cycle hits the trough, most multinational companies have cut down on travel, thus have not spared enough funding to facilitate face-to-face communication and social

communication. As a result, face-to-face meetings and social activities have been reduced, causing the opportunity to experience the benefits of face-to-face communication and social communication to be minimum, thus lack of variation.

Limitations

Although this research has managed to achieve its stated objectives, there are some limitations that have been observed. Due to time and resource constraints, this study has chosen to select a limited sample from the manufacturing multinational corporations in the proximity. Thus, this has excluded the possible differences that could be observed when service industries are included. Therefore, the findings from this study may not be generalized to the service industry. In addition, due to the differences in the size of the multinational organizations in the proximity, the findings may be slightly biased towards the bigger corporations where more virtual teams are available for sampling of this research.

Furthermore, although virtual teams consist of members from anywhere in the world, all respondents to this research come from local site which are more easily accessible. As a result, the virtual teams are mostly represented through Malaysians' perception. Since Malaysians are used to living in the environment with people from multiple cultural backgrounds, they are high on collectivism (Hofstede, 1980, as cited in Kennedy & Mansor, 2000) and could have higher tolerance and acceptance level on cultural differences (Abdullah, 1992, as cited in Jaouadi, 2000), thus affect the outcome of this study. In addition, some of the virtual teams are represented by only one respondent per team, due to the formation of the virtual teams of one member per site, this may pose some bias to the response to be used to represent the team. However, for teams that are represented by dyads, there has been a great challenge to ensure that the two respondents are responding to the questions posed based on the same teams without being affected by their experiences in other virtual teams.

In addition to the above, there are some gray areas identified in this study with reference to the definition of virtual teams. There are different levels of virtual teaming. Some teams consist of only one or two members from other locations with majority of team members from one site, while others have members spanning across many different locations evenly. Some teams involve only two sites while others involves up to more than five site locations. However, this study does not include teams with all members from the same sites, but separated by different offices some blocks away, in the same building at more than 50 feet apart as defined by Pape (1997) as cited by Johnson et al. (2001). In addition, there are some virtual teams that are very informal in nature. These teams only meet and discuss their problems as it arises, and ends as soon as the problem is resolved in a very short term. As a result, these teams may have very different experiences as compared to longer-term virtual teams that have been formally formed.

Finally, in this study, there is no measurement done on the frequency of face-to-face meetings of virtual teams. Therefore, we cannot assess what is the virtual level of a team. Some teams may have very frequent face-to-face meetings while others never have any. These may potentially affect the overall findings of this study because some of the respondents may have dealt with the same group over and over so frequently that they are so familiar with each other that even without face-to-face meeting now do not affect the team members' relations and team effectiveness. In addition to all the above mentioned, it is important to observe that the sample size for this study is

quite small, thus could have limited the generalizability of this study to other countries or industries.

Conclusion

This study was primarily set to examine virtual team effectiveness, and its influences from team characteristics, and internal group dynamics. Despite the various constraints to this study, the results have been encouraging as it has managed to shed some light for managers and organizations so as to better manage their virtual teams in order to achieve their objectives and goals for competitive advantages.

It is important for managers to maintain proper composition and characteristics of the virtual team, while concentrate more effort on the team member relations and team leadership to promote better team dynamics. Communications among team members need to be handled with care. Excessive communication using the wrong means, such as electronic communications, may have negative effects and causes dissatisfaction among team members.

Virtual team will continue to be the choice for corporations to stay ahead of all their competitors in terms of time and effectiveness. At the same time, increasingly, the conventional co-located (face-to-face) teams will endeavor to improve its performance and effectiveness by imitating some of the technologies and the characteristics of virtual team. In the near future, there may not be any distinction between the two due to the pervasive nature of technology throughout most modern organizations. Thus, this study will serve as a guideline to not only the virtual teams alone, but all other conventional co-located teams as well.

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