

The Key Determinants of Success in Virtual Team Working: Evidence from the Technology Industry

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ABSTRACT

This attempts to identify and evaluate the key determinants of successful team interaction and communication in virtual setting, by taking evidence from managers working in multinational technology firms. The study uses an 18 item-scale survey that describes various aspects of five key determinants of virtual team working—trust building, knowledge sharing, balanced coordination of activities, advanced communication tools and adaptive leadership style. A pilot study is employed for identifying the effectiveness of these determinants and proposals are laid for further study.

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Keywords: virtual team, team working, communication, adaptive leadership, technology industry.

1. INTRODUCTION AND BACKGROUND OF THE STUDY

Aggressive business and outsourcing resulting from the advent of globalization has put a challenge to organizations and constraints on the resources available to them, thus the need for the development of a more effective and resources saving strategy (Starke-Meyerring and Andrews, 2006; Hartel, et al, 2006; Nunamaker, et al, 2009). The technology industry as a major driver of the globalization process must therefore abreast itself to meet the challenges that could cause serious constraints on resources and success (Webster and Wong, 2008).

The 21st century has been embraced with strategic developments aimed at finding solutions or ways out of the many challenges of doing business in a world that is going global (McClean, 2007). Virtual teams emerged as one of such strategies that have given organizations unique prospect of getting people from different geographically dispersed locations together in providing solutions to challenges that would ordinarily be

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difficult for a single mind to solve and breaking the barriers of distance to harness talents (Hong and Vai, 2008; Barenek et al, 2005; Socialdone et al, 2008). Virtual teams with geographically dispersed members has appeared as a cost saving means of tackling some of the resources straining constraints firms in the technology industry are facing without team members having to meet physically (Hertel, et al, 2006; Kankanhalli, Tan and Wei, 2006; Harvey, et al, 2005; Harvey and Griffit, 2007). It present answers to some of the constraints of having to meet in person (Malhotra et al. 2007).

The technology industry is one of those areas where virtual teams have been employed successfully in achieving target goals without putting much pressure on firm's resource pool and thereby benefiting vastly from virtual team efforts (De Pillis and Furumo, 2007). Still, for a virtual team to work successfully and meet its objectives, certain qualities must be built into the team and monitored as their absence could pose a serious impediment to the success of the team. These qualities include access to information (McNamara, et al, 2008) mix personality (Higgs, 2007), the knowledge base of team members (Kanawattanachai and Yoo, 2007; Hong and Vai, 2008), easy communication links (Workman, 2007; Thomas and Bostrom, 2008) trust among team members (Mockaitis, et al, 2009; Robert, Dennis and Hung, 2009) and a well developed strategy (Monalisa et al., 2008). But a well defined goal for forming a virtual team remains critical to its success (Ray, 2003). Of course, virtual team working has not been without challenges, such as creating trust among team members, balancing team members inter-personal skills, motivation, leadership, cultural barriers and social loafing (Kirkman et al. 2002; Hertel et al. 2006; Chidambaram and Tung, 2005). Because of the increasing use of virtual teams particularly in the technology sector, it is worth conducting a study attempting to identify the key determinants that drive the success of virtual team working.

Structure of remaining paper is as below: section 2 details academic context. Section 3 gives details of research methodology.

2. ACADEMIC CONTEXT

Virtual teams are groups whose members are geographically or organizationally distributed (Ishaya and Macaulay, 1999; Carmel, 1999; Beranek, 2000; Armstrong, 2002; Martins et al, 2004). Essentially, this is the most fundamental difference between virtual and traditional group forms (Burke, 1995; Cramton, 2002; Pauline, 2003). Virtual teams depend on computer-mediated technology to communicate and coordinate their work (Beranek, 2000; Webster and Wong, 2008). Putting these two ingredients together, Lipnack and Stamps (1997) describe virtual teams as "groups of people working across space, time and organizational boundaries with links strengthened by webs of communication technologies" (Hertel et al, 2006; Minkin, 2008).

The idea of employing virtual teams first appeared in the 1990s owing to the increasing affinity of multinational companies towards outsourcing and strategic alliances (Starke-Meyerring and Andrews, 2006), the evolution of Internet technologies, rapidly changing competitive environment, shorter project and product cycle times, the pressure for quick and accurate decision making, travel restrictions (Wainfain and Davis, 2004; Nunamaker, et al, 2009), and constraint of quality human resource pool in global technology firms (Felin and Hesterly, 2007). Vlaar et al (2008) and others identified why firms are employing virtual teams. Virtual teams reduce business travel and employee relocation costs (Kern et al, 2002). For instance, as some members do not need to come to the office, the company does not need to provide office or parking space. This enables a firm to hire people residing in a different place, as well as increase the number of people working in a team without an equivalent increase in relocation costs (Carmel, 1999; Carmel and Agarwal, 2002). Workers in no-office setting teams are hence allowed to be more flexible (Vlarr et al, 2008). Companies can easily outsource their operations to build global competence and reap cost advantages, recruiting the best talented work pools without geographical concerns (Cairncross, 2001; Webster and Wong, 2008).

Previous studies have identified several determinants for successful collaboration in virtual group work, including suggestions for both the team leader and other members. Malhotra et al (2007) stated that effective virtual team leaders should be able to establish and maintain trust through using communication technology, ensure that team diversity is understood, appreciated and leveraged among the members, and ensure that individuals benefit from participating in virtual teams. Monalisa et al (2008) analyzed the cases of eight virtual teams from technology industries and identified a three attributes to success—trust, communication, and individual contribution, where ensuring the presence of the first element leads to the next. Ray (2003) emphasized on identifying clearly measurable and easily understood task and process goals supported by an action plan that encourages members to participate. Kirkman et al (2002) used a case study to identify the biggest challenges of virtual team working to be able to establish trust based on performance consistencies, to overcome group process losses, to make a healthy balance of technical and interpersonal skills, and developing creative approaches for providing feedback. Hertel et al (2006) developed an integrated competency model for virtual team members that include success factors such as professional expertise, technical training, cognitive abilities, and tele-cooperation.

These dispersed attributes can be broadly categorized into five key determinants that lead to success in virtual teams—trust building, knowledge sharing, balanced coordination of activities, use of advanced communication tools, and adaptive leadership style. The first of these attributes is trust building. In a team context, trust can be defined as the confidence one member has on the ability, expertise, and dependability of another (Krebs et al, 2006). Developing trust necessitates the building of healthy interpersonal relationships, which may not be easy in virtual settings where group members have not physical or tangible face to ace interaction (Kayworth and Leidner, 2000). In addition, in virtual teams where different members live in different countries, cultural developments act as an impediment to developing mutual understanding and being aligned to one set of goals and objectives (Metiu, 2006; Mockaitis et al, 2009). If groups fail to develop trust, personal conflicts and reduced cooperation can result (Danni et al, 2006; Mockaitis et al, 2009). Some studies revealed that if members of a highly diverse multicultural team can manage the diversity to their advantage, then such teams perform better than ordinary teams (Danni et al, 2006; Thomas and Bostrom, 2008). Mockaitis et al (2009) suggested that the development of trust in virtual teams depend on management of cultural differences, conflicts, task interdependence and communication. The second attribute is knowledge sharing. Face to face interaction is essential to adequate sharing of tacit knowledge (Lave and Wenger, 1991; Nonaka and Tekuichi, 1995), which makes knowledge sharing a further challenge in virtual teams (Lovelace et al, 2001; Sethi et al, 2001; Wilson, 2003). Given the demographic diversity, lack of physically attached work experience and psychological distance between virtual team members (Dube and Pare, 2003), they may not be willing to share all necessary valuable information readily (Sole and Edmonson, 2002). Sharing knowledge across cross functional virtual teams is a pre-requisite to success (Nonaka and Takeuchi, 1995), which can be achieved by shared understanding and learning climate, skillful coaching and job rotation (Hong and Vai, 2008). The third attribute to effective virtual team is a balanced coordination of activities within the members. Several researchers identified that this can be attained through clarity of roles and a fair contribution from the members (Katzenbach and Smith, 1993; Ray and Bronstein, 1995; Aritzeta et al, 2005). Virtual teams with a balanced mix of member contribution have been seen to yield better performance other teams (Hinds and Bailey, 2003; Higgs, 2007). The fourth attribute is use of advanced communication tools. Usually virtual teams communicate via emails, seminars through the Internet (webinars), video conferencing, chat rooms, faxes, instant online messaging, and conference calls (Jarvenpaa and Leidner, 1999; Goodbridge, 2001; Minkin, 2008). The effective and productive use of these computer-mediated tools requires proficient IT skills from the virtual team members, which can be created through facilitating members with proper training (Cramton, 2001; Sinha et al, 2006; Scialdone et al, 2008). The fifth attribute to virtual team success is adaptive leadership style. Adaptive leadership enables individuals to thrive in challenging multicultural environments and allows a group leader to deal with the stress of cultural

diversity and unfamiliarity (Allen, 2008). In addition, the leader can have a better idea of how to direct, motivate the members and administer the team (Burke and Chidambaram, 1995; Pauline, 2003). This study attempts to find out whether these five factors are critical for virtual team success.

3. RESEARCH METHODS

3.1 Research Philosophy and Basic Methodology

The study has been primarily built upon realistic ontological assumption about the generally agreed upon attributes of successful virtual teams as per previous studies conducted. The study predominately depicts a positivist philosophy and follows the deductive approach as it involves the identification of success factors through testing of specific hypotheses using quantitative analysis (Saunders et al, 2000). However, for developing the hypotheses of the study a wealth of literatures from scholars with marginally contrasting viewpoints has been critically reviewed. Since subjective evaluation has been employed to identify the success factors that were initially chosen for examination, a modest degree of social-constructionism prevails (Saunders et al, 2000).

3.2 Research Question and Objectives

The primary research question is: What are the key determinants of successful performance in virtual teams and objective to identify the key determinants of successful performance in virtual teams. This goal can be broken down into specific objectives as follows:

To identify the factors those are most important in attributing to the success of virtual teams in a multicultural setting.

To determine the major challenges of virtual team working.

To identify the benefits of global technology firms of employing virtual teams.

To attain these research objectives, these objectives were transformed in to following questions and the following data requirements were identified:

<i>Investigative Questions</i>	<i>Variables Required</i>	<i>Data Measurement Detail</i>	<i>Data Sources</i>
What are the key determinants of successful performance in virtual teams	Respondent attitude regarding the importance of the factors studied	Feel from very important to not important at all	Survey, Secondary (journal articles)
What are the biggest challenges of virtual team working	Findings of previous studies	Contrasting viewpoints about the relevance of challenges studies	Secondary sources (journal articles and magazines)
What are the benefits of employing virtual teams	Findings of previous studies	Choice from the most popular benefits and their justifications	Secondary sources (journal articles and magazines)

3.3 Research Strategies

As the study follows a deductive approach to identifying the determinants of successful virtual team working, the chosen research strategies are survey and secondary data. For preliminary exploration, a number of peer reviewed academic journals and trade magazine articles were examined, which constitutes the secondary data used in the study. Saunders’s et al. (2000) implied that secondary data includes both quantitative and qualitative data and is suitable for both descriptive and explanatory research (Schutt, 2006). Surveys are mostly associated with the deductive approach and tend to be used for exploratory and descriptive research (Saunders et al, 2000; Schutt, 2006). Before testing the hypothesis, a research framework has been drawn to dramatically depict the relationships between the chosen variables, and identify the influence of moderating and mediating variables. In order to test the validity of this research method, a pilot survey has been designed on people having prior experiences of working in virtual team settings. The sampling frame consisted of all

employees of multicultural technology firms who have previously been or are currently employed in virtual teams.

3.4 Proposal for Collecting Primary Data

For the main survey I propose to collect a larger sample of quantitative data (about 100) by using questionnaire modified from the leanings of the pilot study, a method that allows easy comparisons and gives more control over the research process (Saunders et al, 2000). In a deductive approach the analytical survey emphasizes on the reliability of data collection and the generalisability of results (Saunders et al, 2000; Duval, 2005). The sampling frame will remain unchanged—all employees of multicultural technology firms who have previously been or are currently working in virtual teams. For collecting the data a stratified random sampling will be employed where the sampling frame will be stratified into employees of multicultural and technology firms.

3.5 Method for Choosing the Determinants

Based on review of secondary data, I identified a large number of items that various researchers believed to be the key determinants of successful performance in virtual teams. Following the theme of Parasuraman et al (1991)², these items were then categorized into five broad aspects that determine success of virtual team working—trust building, knowledge sharing, balanced coordination of activities, use of advanced communication tools and adaptive leadership style. These five determinants were then used to formulate the hypotheses and item scales.

3.6 Thesis Statement and Research Hypotheses

The thesis statement for the study is: *“The key determinants of successful performance in virtual teams are trust building, knowledge sharing, balanced coordination of activities, use of advanced communication tools and adaptive leadership style”*. This thesis statement can be segregated into specific hypotheses as follows:

Hypothesis 1—Trust is the belief a virtual group member has on the competence, ability and reliability on another member (Krebs et al, 2006; Mockaitis et al, 2009). It is presumed that building trust between the group members will enhance the performance of the group (Danni et al, 2006; Thomas and Bostrom, 2008), and hence:

H1: Trust building positively influences virtual team performance.

Hypothesis 2—Knowledge sharing is the extent to which a virtual team member reveals competent information to another member (Sethi et al, 2001; Sole and Edmundson, 2002) and it is presumed that unrestricted sharing of key information between group members will enhance performance of the group (Nonaka and Takeuchi, 1995). Therefore we state:

H2: Knowledge sharing positively influences virtual team performance.

Hypothesis 3—Balanced member participation and contribution of activities within a virtual group is presumed to enhance motivation, efficiency, and therefore group performance (Aritzeta et al, 2005; Hinds and Bailey, 2003). So one can say:

H3: A balanced coordination of activities positively influences virtual team performance.

2 Parasuraman et al (1991) refined the SERVQUAL Scales (for measuring service quality) by using 22 item scales to represent five broad dimensions of service quality.

Hypothesis 4—Virtual teams communicate via advanced computer-mediated tools (Lipnack and Stamps, 1997; Jarvenpaa and Leidner, 1999) and efficient use of such tools will enhance group performance (Minkin, 2008). Hence:

H4: Use of advanced communication tools positively influences virtual team performance.

Hypothesis 5—Adaptive leadership style allows a virtual group leader to adjust with cultural diversity and makes it easier to motivate and administer the group (Allen, 2008). Therefore adoption of adaptive leadership style will enhance virtual group performance:

H5: Adaptive leadership positively influences virtual team performance.

3.7 Pilot Study

To conduct the pilot study a questionnaire has been devised (Table 1) to seek the audience’s attitude on key success factors and major challenges of working in virtual teams. The sampling frame for the pilot study was the same as the proposed survey—executives and employees who have previously been or are currently employed in virtual teams.

Table 1
Questionnaire of the Pilot Study

VIRTUAL TEAM (VT) WORKING QUESTIONNAIRE

This is a survey in attempt to identify the effectiveness of various attributes to successful virtual team (VT) working. There is no right or wrong answers. Participation in this survey is completely voluntary. All responses will be kept strictly confidential, and will be used for academic purposes only.

Statement	5	4	3	2	1
01. Trusting my fellow team member is crucial for my effective functioning in VTs	5	4	3	2	1
02. Trusting my team leader is critical for my effective performance in VTs	5	4	3	2	1
03. Trust building between team members is essential for successful VTs	5	4	3	2	1
04. Sharing of knowledge is critical for successful performance in VTs	5	4	3	2	1
05. Receiving quality information from a VT member improves my performance in VTs	5	4	3	2	1
06. Providing quality information to another VT member improves my performance in VTs	5	4	3	2	1
07. Providing quality information to another VT member improves the performance of that member	5	4	3	2	1
08. Balanced coordination of activities is important for effective functioning of VTs	5	4	3	2	1
09. The team leader is responsible for ensuring balanced coordination of activities	5	4	3	2	1
10. VTs with balanced member participation perform better than those where member participation is imbalanced	5	4	3	2	1
11. Balanced coordination improves my performance in VTs	5	4	3	2	1
12. Effective working in VTs requires adaptation of technologically sophisticated	5	4	3	2	1

	communication tools					
13.	The quality of communication tools impacts my performance in VTs	5	4	3	2	1
14.	VT member interactions with advanced communication technologies improves the performance of the whole group	5	4	3	2	1
15.	The VT leader must be able to adapt to different methods of communication for different members in VT	5	4	3	2	1
16.	The VT leader must be able to employ different motivational strategies for different members in VT	5	4	3	2	1
17.	Flexible leadership style is important for effective functioning in VTs	5	4	3	2	1
18.	The virtual team leader needs to have qualities for authoritative, participative, and delegative leadership styles	5	4	3	2	1

We used non-probability sampling and the selection technique employed to collect the data for our pilot study was convenience sampling (Saunders et al, 2000). Self-administered questionnaires were used which were completed by the respondents by either sending out the questionnaires through email or by physically distributing and collecting the returned questionnaires from the chosen participants. The sample size for the pilot study was 25, out of which 3 samples were not returned by the respondents. The remaining 22 samples were used to conduct the pilot study. The pilot study was conducted to check if the respondents encountered any problems in answering the questions and to see if there are any obstacles to collecting and recording the data (Schutt, 2006). The questionnaire for the pilot study was comprised of 18 Likert Scale questions (1 to 5), where the respondents chose the degrees to which they agreed or disagreed with the statements. Each of the five key determinants of virtual team success was covered by three to four questions, which are referred to as item scales (Parasuraman et al, 1991). The number of questions was kept limited to ensure that respondents do not feel weary or lose concentration while responding. Effort was made to keep the item scales short, simple, direct, and easily understandable. The 18 item scales for the five determinants are given in Table 2.

Table 2
Item Scales for the Study

<p>Determinant 1: Trust Building</p> <ol style="list-style-type: none"> 1. T1: trusting my fellow team member is crucial for my effective functioning in virtual teams (Item Scale 1) 2. T2: trusting my team leader is critical for my effective performance in virtual teams (Item Scale 2) 3. T3: trust building between team members is essential for successful virtual teams (Item Scale 3) <p>Determinant 2: Knowledge Sharing</p> <ol style="list-style-type: none"> 1. K1: sharing of knowledge is critical for successful performance in virtual teams (Item Scale 4) 2. K2: receiving quality information from a virtual team member improves my performance in virtual teams (Item Scale 5) 3. K3: providing quality information to another virtual team member improves my performance in virtual teams (Item Scale 6) 4. K4: providing quality information to another virtual team member improves the performance of that member (Item Scale 7) <p>Determinant 3: Balanced Coordination of Activities</p> <ol style="list-style-type: none"> 1. B1: balanced coordination of activities is important for effective functioning of virtual teams (Item Scale 8)

- 2. B2: the team leader is responsible for ensuring balanced coordination of activities (Item Scale 9)
- 3. B3: virtual teams with balanced member participation perform better than those where member participation is imbalanced (Item Scale 10)
- 4. B4: balanced coordination improves my performance in virtual teams (Item Scale 11)

Determinant 4: Advanced communication tools

- 1. C1: effective working in virtual teams requires adaptation of technologically sophisticated communication tools (Item Scale 12)
- 2. C2: the quality of communication tools impacts my performance in virtual teams (Item Scale 13)
- 3. C3: virtual team member interactions with advanced communication technologies improves the performance of the whole group (Item Scale 14)

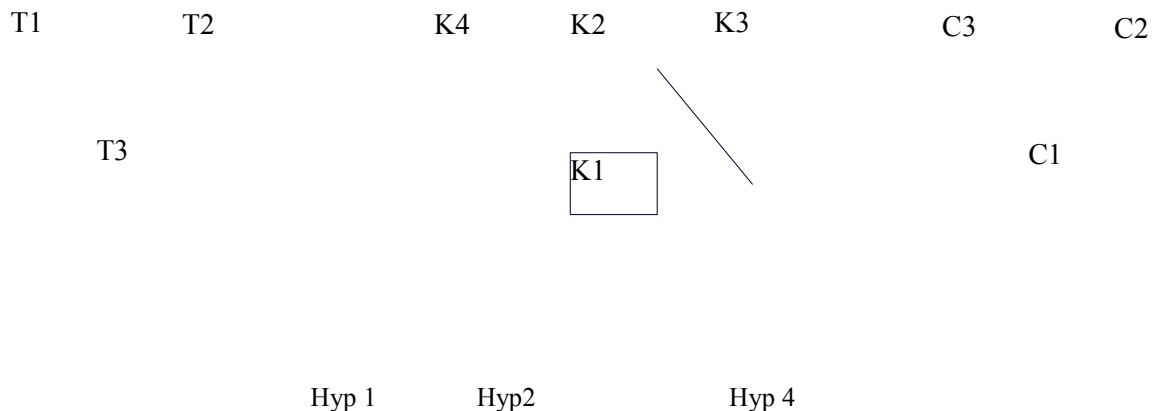
Determinant 5: Adaptive leadership style

- 1. A1: the virtual team leader must be able to adapt to different methods of communication for different members in virtual team (Item Scale 15)
- 2. A2: the virtual team leader must be able to employ different motivational strategies for different members in virtual team (Item Scale 16)
- 3. A3: flexible leadership style is important for effective functioning in virtual teams (Item Scale 17)
- 4. A4: the virtual team leader needs to have qualities for authoritative, participative, and delegative leadership styles (Item Scale 18)

The collected data was analyzed by applying statistical procedures such as t-tests and f-tests to determine individual and joint significance of the items for each of the determinants (David and Gunnik, 1997), correlation between the items, and reliability analysis to test for internal consistency (Rodgers and Nicewander, 1988; Corina, 1993). Statistical software packages SPSS and MS Excel were utilized.

3.8 Research Framework

The relationship between the items and hypotheses can be diagrammatically depicted as follows:



Virtual Team Success Determinants

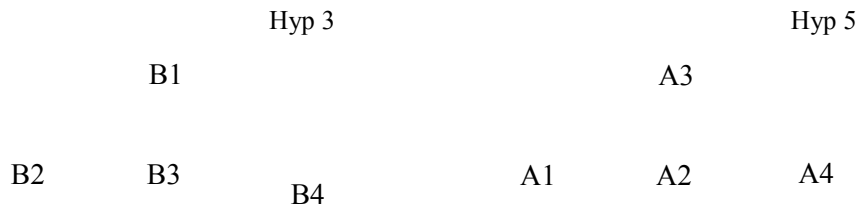


Figure 1: Relationship between the Determinants of Successful Virtual Teams

In the above diagram, the item scales T3, K1, C1, B1 and A3 represent the five primary independent variables which directly ask the research question of whether trust building, knowledge sharing, communication tools, balanced coordination and adaptive leadership style are factors in determining the dependent variable—virtual team success. The rest of the item scales are supportive variables which comprise the each of the five primary independent variables.

3.9 Proposal for Data Analysis of the an Exhaustive Study

In the main survey, the primary data collected will be edited and coded by suing standardized procedures. Hypothesis tests will be conducted for each of the five determinants separately, to test the significance of the item scales (Cohen, 1994). T-test will be conducted to test individual significance and F-test will be conducted for testing the joint significance of the variables, separately for each of the determinants (David and Gunnik, 1997). The five hypothesis tests will determine which of the item scales are significant in influencing the determinant. The independent and dependent measures for hypothesis tests are:

Determinants	Independent Measures	Dependent Measure
Trust Building	T1, T2	T3
Knowledge Sharing	K2, K3, K4	K1
Balanced Coordination of Activities	B2, B3, B4	B1
Advanced Communication Tools	C2, C3	C1
Adaptive Leadership Style	A1, A2, A4	A3

Correlations for the items will be calculated to determine their direction and strength of association. (Rodgers and Nicewander, 1988). Reliability analysis will be performed for internal reliability and consistency (Corina, 1993). Finally, frequency distribution analysis will be carried out to get a general idea of the respondents’ attitudes. Statistical software applications SPSS and MS Excel will be utilized to perform the tests.

4. EVALUATION OF THE RESEARCH STRATEGY

4.1 Strengths and Weaknesses of the Research Strategy

The research strategy comprised of survey and secondary data. The secondary data, which was used to formulate the key determinants (and hence the major challenges) of virtual team working as well as identifying the benefits of virtual teams as stated in the literature review, was taken from peer reviewed academic journals and hence the information used is reliable. One obvious problem in secondary data was the lack of established theories on virtual teams (Dube and Pare, 2004; Vlaar, 2008), as it is still a relatively new

idea. The primary data is to be collected from a survey using self administered questionnaires. While the benefits of using a questionnaire survey include the fact that they allow collection of large amounts of data from a vast population in an economical way and facilitates data comparison (Saunders et al, 2000), surveying is a time consuming, laborious process, and its success depends on the goodwill of the respondents (Saunders et al, 2000).

4.2 Evaluation of the Pilot Study

The pilot study revealed that respondents took about 10 minutes to complete the questionnaire, but did not ask any specific questions on how to respond or what a particular question meant, nor were they unwilling to answer any particular question, suggesting that the items and ranking scales in the questionnaire are easy to understand and hence can be applied in the main survey without alterations. In the pilot test 3 samples were not returned by the respondents, so it is important for the main study to better communicate the importance of the topic so that respondents are more serious. A summary of the results of the pilot study are given in Appendix 1. The inter-item correlations usually ranged over 0.4 implying that there is moderate correlation between the variables. The reliability of all determinants apart from knowledge sharing was over 0.7 implying good internal consistency between the items. The adjusted r-squares of all of the determinants apart from knowledge sharing were satisfactory, implying that the independent measures reasonably explain the variation in the dependent measure. In summary, it would appear from the pilot study that all of the determinants apart from knowledge sharing have significant influence in determining virtual team performance. However, knowledge sharing will still be a part of the main survey and its inclusion will be deleted only after the main survey reveals that it does not have significant influence. Finally, the inclusion of a dependent measure in the questionnaire is vitally important to facilitate regression analysis with the 18 items scales as independent measures where the dependent measure could denote success in virtual team working, and a suggested dependent measure (with a 5-point Likert scale identical to the questionnaire) is as follows:

‘Trust building, knowledge sharing, a balanced coordination of activities, use of advanced communication tools and adaptive leadership style are the key determinants of effective functioning in virtual teams.’

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APPENDIX

Appendix 1

Summary of Results of the Pilot Study

Appendix 1.1: Item Scale Correlations

	Trust Building Item 1	Trust Building Item 2	Trust Building Item 3
Trust Building Item 1 Pearson Correlation	1.000	.492	.428
Sig. (2-tailed)	.	.020	.047
N	22	22	22
Trust Building Item 2 Pearson Correlation	.492	1.000	.537
Sig. (2-tailed)	.020	.	.010
N	22	22	22
Trust Building Item 3 Pearson Correlation	.428	.537	1.000
Sig. (2-tailed)	.047	.010	.
N	22	22	22

* Correlation is significant at the 0.05 level (2-tailed).

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

	Knowledge Sharing Item 1	Knowledge Sharing Item 2	Knowledge Sharing Item 3	Knowledge Sharing Item 4
Knowledge Sharing Item 1 Pearson Correlation	1.000	.299	.189	-.110
Sig. (2-tailed)	.	.176	.399	.627
N	22	22	22	22
Knowledge Sharing Item 2 Pearson Correlation	.299	1.000	.472	.143
Sig. (2-tailed)	.176	.	.027	.525
N	22	22	22	22
Knowledge Sharing Item 3 Pearson Correlation	.189	.472	1.000	.208
Sig. (2-tailed)	.399	.027	.	.354
N	22	22	22	22
Knowledge Sharing Item 4 Pearson Correlation	-.110	.143	.208	1.000
Sig. (2-tailed)	.627	.525	.354	.
N	22	22	22	22

* Correlation is significant at the 0.05 level (2-tailed).

		Balanced Member Coordination Item 1	Balanced Member Coordination Item 2	Balanced Member Coordination Item 3	Balanced Member Coordination Item 4
		1	2	3	4
Balanced Member Coordination Item 1	Pearson Correlation	1.000	.579	.764	.689
	Sig. (2-tailed)	.	.005	.000	.000
	N	22	22	22	22
Balanced Member Coordination Item 2	Pearson Correlation	.579	1.000	.430	.233
	Sig. (2-tailed)	.005	.	.046	.296
	N	22	22	22	22
Balanced Member Coordination Item 3	Pearson Correlation	.764	.430	1.000	.658
	Sig. (2-tailed)	.000	.046	.	.001
	N	22	22	22	22
Balanced Member Coordination Item 4	Pearson Correlation	.689	.233	.658	1.000
	Sig. (2-tailed)	.000	.296	.001	.
	N	22	22	22	22

* Correlation is significant at the 0.05 level (2-tailed).
 ** Correlation is significant at the 0.01 level (2-tailed).

		Advanced Communication Tools Item 1	Advanced Communication Tools Item 2	Advanced Communication Tools Item 3
Advanced Communication Tools Item 1	Pearson Correlation	1.000	.623	.782
	Sig. (2-tailed)	.	.002	.000
	N	22	22	22
Advanced Communication Tools Item 2	Pearson Correlation	.623	1.000	.481
	Sig. (2-tailed)	.002	.	.023
	N	22	22	22
Advanced Communication Tools Item 3	Pearson Correlation	.782	.481	1.000
	Sig. (2-tailed)	.000	.023	.
	N	22	22	22

** Correlation is significant at the 0.01 level (2-tailed).
 * Correlation is significant at the 0.05 level (2-tailed).

		Adaptive Leadership Style Item 1	Adaptive Leadership Style Item 1	Adaptive Leadership Style Item 1	Adaptive Leadership Style Item 4
Adaptive Leadership Style Item 1	Pearson Correlation	1.000	.644	.711	.616
	Sig. (2-tailed)	.	.001	.000	.002
	N	22	22	22	22
Adaptive Leadership Style Item 1	Pearson Correlation	.644	1.000	.556	.383
	Sig. (2-tailed)	.001	.	.007	.079
	N	22	22	22	22
Adaptive Leadership Style Item 1	Pearson Correlation	.711	.556	1.000	.601
	Sig. (2-tailed)	.000	.007	.	.003
	N	22	22	22	22
Adaptive Leadership Style Item 4	Pearson Correlation	.616	.383	.601	1.000
	Sig. (2-tailed)	.002	.079	.003	.
	N	22	22	22	22

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

Appendix 1.2: Reliability Analysis

<i>Determinants</i>	<i>Item Scales</i>	<i>Cronbach's Alpha</i>
Trust Building	<ol style="list-style-type: none"> 1. trusting my fellow team member is crucial for my effective functioning in virtual teams 2. trusting my team leader is critical for my effective performance in virtual teams 3. trust building between team members is essential for successful virtual teams 	0.7374
Knowledge Sharing	<ol style="list-style-type: none"> 1. sharing of knowledge is critical for successful performance in virtual teams 2. receiving quality information from a virtual team member improves my performance in virtual teams 3. providing quality information to another virtual team member improves my performance in virtual teams 4. providing quality information to another virtual team member improves the performance of that member 	0.4923
Balanced Coordination of Activities	<ol style="list-style-type: none"> 1. balanced coordination of activities is important for effective functioning of virtual teams 2. the team leader is responsible for ensuring balanced coordination of activities 3. virtual teams with balanced member participation perform better than those where member participation is imbalanced 4. balanced coordination improves my performance in virtual teams 	0.8326
Advanced Communication Tools	<ol style="list-style-type: none"> 1. effective working in virtual teams requires adaptation of technologically sophisticated communication tools 2. the quality of communication tools impacts my performance in virtual teams 3. virtual team member interactions with advanced communication technologies improves the performance of the whole group 	0.8378
Adaptive Leadership Style	<ol style="list-style-type: none"> 1. the virtual team leader must be able to adapt to different methods of communication for different members in virtual team 2. the virtual team leader must be able to employ different motivational strategies for different members in virtual team 3. flexible leadership style is important for effective functioning in virtual teams 4. the virtual team leader needs to have qualities for authoritative, participative, and delegative leadership styles 	0.8465

Appendix 1.3: Hypothesis Tests

1. Trust Building

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics	R Square Change	F Change	df1	df2	Sig. F Change
1	.569	.324	.252	.7330		.324	4.545	2	19	.024

a Predictors: (Constant), Trust Building Item 2, Trust Building Item 1

b Dependent Variable: Trust Building Item 3

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.883	2	2.442	4.545	.024
	Residual	10.207	19	.537		
	Total	15.091	21			

a Predictors: (Constant), Trust Building Item 2, Trust Building Item 1

b Dependent Variable: Trust Building Item 3

Coefficients

Model		Unstandardized Coefficients	Standardized Coefficients	t	Sig.
		B	Std. Error	Beta	
	(Constant)	1.239	1.085		1.142
	Trust Building Item 1	.255	.257	.216	.996
	Trust Building Item 2	.468	.236	.431	1.987

a Dependent Variable: Trust Building Item 3

2. Knowledge Sharing

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.346	.120	-.027	.7602

a Predictors: (Constant), Knowledge Sharing Item 4, Knowledge Sharing Item 2, Knowledge Sharing Item 3

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.416	3	.472	.817	.501
	Residual	10.402	18	.578		
	Total	11.818	21			

a Predictors: (Constant), Knowledge Sharing Item 4, Knowledge Sharing Item 2, Knowledge Sharing Item 3

b Dependent Variable: Knowledge Sharing Item 1

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		t	Sig.
		B	Std. Error	Beta			
1	(Constant)	3.204	1.431			2.239	.038
	Knowledge Sharing Item 2	.280	.251	.280		1.116	.279
	Knowledge Sharing Item 3	.113	.312	.092		.362	.722
	Knowledge Sharing Item 4	-.185	.248	-.169		-.746	.465

a Dependent Variable: Knowledge Sharing Item 1

3. Balanced Coordination of Activities

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.856	.732	.688	.5353

a Predictors: (Constant), Balanced Member Coordination Item 4, Balanced Member Coordination Item 2, Balanced Member Coordination Item 3

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	14.114	3	4.705	16.416	.000
	Residual	5.159	18	.287		
	Total	19.273	21			

a Predictors: (Constant), Balanced Member Coordination Item 4, Balanced Member Coordination Item 2, Balanced Member Coordination Item 3

b Dependent Variable: Balanced Member Coordination Item 1

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error			
1	(Constant)	-.139	.631		-.220	.828
	Balanced Member Coordination Item 2	.314	.129	.329	2.433	.026
	Balanced Member Coordination Item 3	.394	.178	.387	2.214	.040
	Balanced Member Coordination Item 4	.357	.162	.357	2.199	.041

a Dependent Variable: Balanced Member Coordination Item 1

4. Advanced Communication Tools

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.831	.691	.658	.5957

a Predictors: (Constant), Advanced Communication Tools Item 3, Advanced Communication Tools Item 2

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	15.075	2	7.537	21.238	.000
	Residual	6.743	19	.355		
	Total	21.818	21			

a Predictors: (Constant), Advanced Communication Tools Item 3, Advanced Communication Tools Item 2

b Dependent Variable: Advanced Communication Tools Item 1

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		t	Sig.
		B	Std. Error	Beta			
1	(Constant)	-.358	.703			-.509	.617
	Advanced Communication Tools Item 2	.383	.174	.320		2.203	.040
	Advanced Communication Tools Item 3	.674	.156	.628		4.319	.000

a Dependent Variable: Advanced Communication Tools Item 1

5. Adaptive Leadership Style

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.752	.566	.494	.6359

a Predictors: (Constant), Adaptive Leadership Style Item 4, Adaptive Leadership Style Item 1, Adaptive Leadership Style Item 1

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	9.493	3	3.164	7.825	.002
	Residual	7.279	18	.404		
	Total	16.773	21			

a Predictors: (Constant), Adaptive Leadership Style Item 4, Adaptive Leadership Style Item 1, Adaptive Leadership Style Item 1

b Dependent Variable: Adaptive Leadership Style Item 1

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		t	Sig.
		B	Std. Error	Beta			
1	(Constant)	1.092	.691			1.581	.131
	Adaptive Leadership Style Item 1	.410	.224	.436		1.830	.084
	Adaptive Leadership Style Item 1	.152	.178	.174		.857	.403
	Adaptive Leadership Style Item 4	.243	.181	.265		1.346	.195

a Dependent Variable: Adaptive Leadership Style Item 1

Appendix 1.4: Frequency Distribution of Item Scales

Trust Building Item 1

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Neutral	3	13.6	13.6	13.6
	Agree	9	40.9	40.9	54.5
	Strongly Agree	10	45.5	45.5	100.0
	Total	22	100.0	100.0	

Trust Building Item 2

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	1	4.5	4.5	4.5
	Neutral	1	4.5	4.5	9.1
	Agree	10	45.5	45.5	54.5
	Strongly Agree	10	45.5	45.5	100.0
	Total	22	100.0	100.0	

Trust Building Item 3

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	1	4.5	4.5	4.5
	Neutral	2	9.1	9.1	13.6
	Agree	7	31.8	31.8	45.5
	Strongly Agree	12	54.5	54.5	100.0
	Total	22	100.0	100.0	

Knowledge Sharing Item 1

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Neutral	5	22.7	22.7	22.7
	Agree	10	45.5	45.5	68.2
	Strongly Agree	7	31.8	31.8	100.0
	Total	22	100.0	100.0	

Knowledge Sharing Item 2

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Neutral	4	18.2	18.2	18.2
	Agree	9	40.9	40.9	59.1
	Strongly Agree	9	40.9	40.9	100.0
	Total	22	100.0	100.0	

Knowledge Sharing Item 3

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Neutral	3	13.6	13.6	13.6
	Agree	14	63.6	63.6	77.3
	Strongly Agree	5	22.7	22.7	100.0
	Total	22	100.0	100.0	

Knowledge Sharing Item 4

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	1	4.5	4.5	4.5
	Neutral	1	4.5	4.5	9.1
	Agree	15	68.2	68.2	77.3
	Strongly Agree	5	22.7	22.7	100.0
	Total	22	100.0	100.0	

Balanced Member Coordination Item 1

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	4.5	4.5	4.5
	Neutral	2	9.1	9.1	13.6
	Agree	10	45.5	45.5	59.1
	Strongly Agree	9	40.9	40.9	100.0
	Total	22	100.0	100.0	

Balanced Member Coordination Item 2

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	2	9.1	9.1	9.1
	Neutral	7	31.8	31.8	40.9
	Agree	6	27.3	27.3	68.2
	Strongly Agree	7	31.8	31.8	100.0
	Total	22	100.0	100.0	

Balanced Member Coordination Item 3

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	4.5	4.5	4.5
	Neutral	2	9.1	9.1	13.6
	Agree	11	50.0	50.0	63.6
	Strongly Agree	8	36.4	36.4	100.0
	Total	22	100.0	100.0	

Balanced Member Coordination Item 4

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	4.5	4.5	4.5
	Neutral	2	9.1	9.1	13.6
	Agree	10	45.5	45.5	59.1
	Strongly Agree	9	40.9	40.9	100.0
	Total	22	100.0	100.0	

Advanced Communication Tools Item 1

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	4.5	4.5	4.5
	Neutral	6	27.3	27.3	31.8
	Agree	8	36.4	36.4	68.2
	Strongly Agree	7	31.8	31.8	100.0
	Total	22	100.0	100.0	

Advanced Communication Tools Item 2

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	1	4.5	4.5	4.5
	Neutral	3	13.6	13.6	18.2
	Agree	9	40.9	40.9	59.1
	Strongly Agree	9	40.9	40.9	100.0
	Total	22	100.0	100.0	

Advanced Communication Tools Item 3

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	2	9.1	9.1	9.1
	Neutral	4	18.2	18.2	27.3
	Agree	9	40.9	40.9	68.2
	Strongly Agree	7	31.8	31.8	100.0
	Total	22	100.0	100.0	

Adaptive Leadership Style Item 1

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	4.5	4.5	4.5
	Neutral	3	13.6	13.6	18.2
	Agree	11	50.0	50.0	68.2
	Strongly Agree	7	31.8	31.8	100.0
	Total	22	100.0	100.0	

Adaptive Leadership Style Item 1

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	3	13.6	13.6	13.6
	Neutral	3	13.6	13.6	27.3
	Agree	9	40.9	40.9	68.2
	Strongly Agree	7	31.8	31.8	100.0
	Total	22	100.0	100.0	

Adaptive Leadership Style Item 1

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	4.5	4.5	4.5
	Agree	11	50.0	50.0	54.5
	Strongly Agree	10	45.5	45.5	100.0
	Total	22	100.0	100.0	

Adaptive Leadership Style Item 4

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	4.5	4.5	4.5
	Neutral	4	18.2	18.2	22.7
	Agree	10	45.5	45.5	68.2
	Strongly Agree	7	31.8	31.8	100.0
	Total	22	100.0	100.0	