

Improving the Performance of Virtual Teams through Team Structure

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ABSTRACT

The field of team structure refers to the work of traditional teams and needs to be adjusted to the 21st century and its communication types of medium, specifically to the virtual environment. Our research question is whether output of virtual teams (namely teams whose members do not meet face to face) such as efficiency, effectiveness and satisfaction, is affected by the division of labor, hierarchy and work process. Furthermore, corporate output of virtual teams can be increased by fostering the team structure. A model, suggesting that the team structure can be manipulated in order to increase the team's output will be presented, and a methodology to examine this model will be illustrated. Our preliminary findings show that the virtual-structured teams are more successful than virtual-unstructured teams in completing the task ($p=0.0056$); virtual-structured teams and virtual-unstructured teams are equally satisfied ($p=0.0726$); and virtual-structured teams and virtual-unstructured teams take the same time ($p=0.2280$) to carry out the task. Virtual team is a common way of working, and will expand in the future. Thus, the importance of the theoretical and practical implementation of the research will be discussed.

General Terms

Management.

Keywords

Virtual teams, Team structure, Team performance.

1. INTRODUCTION

There has been a transformation from individual work to team work in the last few decades (Ilgen, 1999), and many organizations use teams for many activities done by individuals in the past (Boyett & Conn, 1992 ; Katzenbach & Smith, 1993). The use of virtual teams has also become common particularly in international organizations and global companies. In light of this growing phenomenon, the traditional definition of "team structure" will be redefined, as part of the model that predicts the influence of the virtuality and structural levels on processes, social and tasks, that effect team output. Finally a methodology will be illustrated to examine the research model and a discussion of preliminary finding. The research will contribute a better understanding of virtual teams in hope of improving the teams work in the virtual world.

2. LITERATURE REVIEW

Virtual team design has so far been treated as an afterthought by virtual team researchers. Investigation of team structure in the virtual environment holds significant promise for research and practice (Powell, Piccoli & Ives, 2004). Integration between virtual teams and structural characteristics raises the question "Has the virtual era put an end to team structure?" Leavitt (1996) claims that the rapid changes impose organizations to reduce structures. Hackman (2002), on the other hand, predicts that team structure will always exist and managers will continue to be bothered by team design. We will review virtuality levels and structural characteristics of teams, in order to grasp an integrated view of the subject.

Virtuality Level

Virtuality level of a team has become an integral part of a team's definition (Martins, Gilson & Maynard, 2004). Many variables are affected by the virtual level of a team. Face-to-face team member are more cohesive (Huang et al., 2003), have stronger social ties (Warkentin, Sayeed & Hightower, 1997), are more dedicated to the task and to other team members (Olson & Teasley, 1996), have a stronger team identity (Bouas & Arrow, 1996) and have more affection to other team members (Weisband & Atwater, 1999), than in virtual teams. Strong social ties in virtual teams can be achieved but will take longer time than in face-to-face teams (Burke & Chidambaram, 1996). Many researchers have attempted to find the reasons why virtuality has a negative influence on team output: frequency and distance (Cramton & Webber, 1999), the fact that team members are not familiar with one another (Gruenfeld et al., 1996), the difficulty in sharing information, and insufficient and confusing discussions (Thompson & Coovert, 2003). Another group of researchers compared communication technologies, assuming that technology limits information (Straus & McGrath, 1994). The comparisons concluded that face-to-face teams are more efficient than teams using video (Andres, 2002), and video communication is more efficient than audio (Burke et al., 2001), adding text into video or audio communication improves performance (Baker, 2002), and satisfaction (Olson, Olson & Meader, 1997). Maruping & Agarwal (2004) show that teams tend to use different sorts of communication technologies for different kinds of interpersonal interactions.

Characteristics Team Structures - Division of Labor, Hierarchy and Work Process

Division of Labor

The division of labor does not have a direct influence on team performance, but has an indirect influence, by means of perceived

efficiency and team coordination (Strijbos et al., 2004), and is a stronger predication variable than individual characteristics (Ahuja, Galletta & Carley, 2003). The use of expertise assists in reducing errors (Potter & Balthazard, 2002a) and function diversity is important in achieving team efficiency (Bunderson & Sutcliffe, 2002). A team that is structurally diverse is one that its members have different positions or tasks and are distributed in different branches, can be exposed to unique information. In this manner, sharing unique external information elevates performance (Cummings, 2004).

Hierarchy

In order to explain the importance of the manager in integrative groups, Maier (1967) compares the group to a starfish and the leader of the group to the starfish's central nervous system. When individuals act as an organized unit, they become a higher type of organization - a single whole organism. Even when there is no formal division of labor, the role of the leader is divided between team members (Johnson et al., 2002). When there is a formal leader, status labels has a strong effect on team members (Weisband, Schneider & Connolly, 1995). But a series of studies has shown that more importantly, effective virtual leadership is dependent on the ability to communicate (Kayworth & Leidner, 2001/2002 ; Tyran, Tyran & Shepherd, 2003 ; Kim, Hiltz & Turoff, 2002). In practice, leaders send more messages (and longer ones) than others (Yoo & Alavi, 2004).

Work Process

In large teams meeting procedures are better known and there is better technology coordination then in small groups (Bradner, Mark & Hertel, 2002). Studies show that successful teams focus: on the task (Hofner, 1996), on structured goals (Huang et al., 2003) and on the development of routine (DeSanctis, Wright & Jiang, 2001). Successful teams also take a lot of time to understand the process and contents of the work (Iacono & Weisband, 1997 ; Ocker & Fjermestad, 2000), especially in the initial stages (Hause et al., 2001). Not only does the medium limit the team's ability to coordinate information (Graetz et al., 1998), virtual teams spend a great deal of time understanding how to execute the task (Lebie, Rhoades & McGrath, 1996), and team meeting that it's members are distant physically take longer time than face-to-face meetings (Siegel et al., 1986). Coordination process are related positively to performance and satisfaction (Powell, Piccoli & Ives, 2004), and become more significant as time passes (Burke & Chidambaram, 1995).

3. RESEARCH MODEL

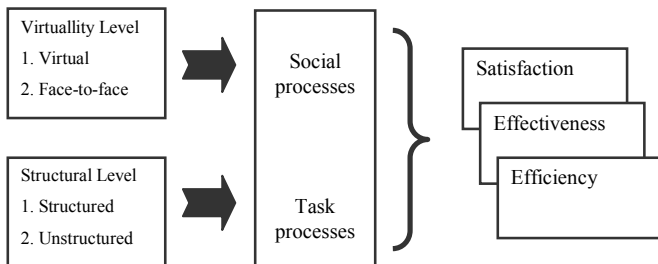


Figure 1. Research Model

The research model is depicted in Figure 1. According to the model there are two major affecting variables, the **virtuality level** and the **structural level**. These two affect two types of processes: **social** and **task**. Finally, the measurable (dependent) variables are the outputs of the team work: **efficiency**, **effectiveness** and **satisfaction**.

4. RESEARCH HYPOTHESIS

Hypothesis no. 1 – for an intellectual task, a structured team's output (with a formal Division of Labor, Hierarchy and Work Process) is superior to an unstructured team's output (without a formal Division of Labor, Hierarchy and Work Process).

Hypothesis no. 2 – for an intellectual task, a virtual team's output is inferior to a face-to-face team's output.

Hypothesis no. 3a – for an intellectual task, structured team's task processes are superior to unstructured team's task processes.

Hypothesis no. 3b – for an intellectual task, structured team's social processes are superior to unstructured team's social processes.

Hypothesis no. 3c – for an intellectual task, virtual team's task processes are superior to face-to-face team's task processes.

Hypothesis no. 3d – for an intellectual task, virtual team's social processes are superior to face-to-face team's social processes.

Hypothesis no. 4a – for an intellectual task, virtual-structured team's task processes are superior to virtual-unstructured team's task processes.

Hypothesis no. 4b – for an intellectual task, virtual-structured team's social processes are superior to virtual-unstructured team's social processes.

Hypothesis no. 5 – for an intellectual task, a virtual-structured team's output is superior to a virtual-unstructured team's output.

5. METHODOLOGY

The research is divided into two parts: qualitative and quantitative. The qualitative part will include interviews with virtual team managers and members in organizations. The quantitative part will include an experiment, in which a team task will be given to subjects. The subjects, who are grouped into teams, will have to share information in order to complete the task. The combination of the qualitative and quantitative parts will address our hypothesis and examine the research model.

In-depth Interviews with Virtual Team Managers and Members

Interviewees will include employees from diverse organizations, who participate in virtual teams in order to complete different types of projects. They will answer questions in order to understand the organization, the nature of the team and its activities, how the team operates and the difficulties the team faces. The aim of the interviews is to deepen the understanding of how virtual teams work in practice (compared to an artificial environment), and to focus on difficulties they face, by examining the development and existence of structural characteristics. We intend to interview 30 virtual team managers and members.

Experiment

Subjects will be divided randomly to teams of three. Each team will be assigned with a task that will take approximately 30 minutes to complete. The research design is 2x2 Between Subjects Factorial Design: the factors are team structure (structured vs. unstructured) and type of communication (virtual vs. face-to-face). The research design includes a total of four experimental conditions (see Table 1). Each condition will be implemented on 20 teams, thus the experiment will include (4 conditions * 20 teams * 3 subjects =) 240 subjects.

	Virtuality Level	Structural Level	Remarks
1	0	0	Face-to-face -unstructured team
2	0	1	Face-to-face -structured team
3	1	0	virtual-unstructured team
4	1	1	virtual-structured team

Table 1. - Experiment Conditions

Procedure

Subjects will be invited in groups of three, to virtual meetings (or non virtual meetings) that will be conducted using MSN-Messenger (or face-to-face meetings). The process of the unstructured condition of the experiment will include an intellectual task. Each team member will receive a separate type of information, and only the aggregation of all the information will reveal the whole "picture" and lead to the correct solution. The process of the structured condition of the experiment will be similar with the exclusion of the preliminary manipulation: instructions in writing will be given to the team members. The instruction will include nominating a chairperson who will be responsible of assembling the puzzle of information and appointing a spokesperson and an information coordinator in the team. In addition, a recommended work procedure will be given to the team members.

Operationalization of the Dependent Variables

Efficiency- the time required to complete the task.

Effectiveness- the group's solution compared to the correct solution.

Satisfaction- team members' reaction to the task will be measured by their understanding of communication, and satisfaction of medium, results and process.

Task and Social Processes- a textual (or audio) recording will be saved for each virtual (or face-to-face) meeting. Task and social processes will be measured by content analysis: The analysis, from each meeting, will include the number of social positive phrases compared to the number of social negative phrases; and the numbers of task question phrases compared to the number of task answer phrases, accordingly to Bales (1950) model.

6. PERLIMINARY FINDINGS

Interview Summary

15 interviews were conducted (out of the 30 planned) with virtual team managers and members. The interview summary shows that virtual teams are a new phenomenon, in which managers lack the proper tools to deal with. It is obvious to virtual team members

that virtual teams operate without structural characteristics. The form of communication (virtual compared to face-to-face) will determine whether the processes will be task or socially oriented: virtual communications is task oriented, while face-to-face communication will tend to include also social aspects. Although the cost of virtual meetings is lower than face-to-face meetings, there is a place for improvements in order to increase productivity. Virtual communication is not inadequate, but it needs to be more organized in order to be more efficient.

Experimental Summary

Fifty experiments were preformed (out of the 80 planned) among undergraduate students in an academic college. An initial statistical analysis was performed considering that the data will increase substantially in the future.

The initial analysis indicates, for each hypothesis respectively, that:

1. Structured teams are more successful than unstructured teams in completing the task; structured teams are more satisfied but take longer time in carrying out the task.
2. Virtual teams are less successful than face-to-face teams in completing the task; virtual teams are less satisfied and take longer time in carrying out the task.
- 3a. Structured team's task processes are inferior to unstructured team's task processes.
- 3b. Structured team's social processes are superior to unstructured team's social processes.
- 3c. Virtual team's task processes are superior to face-to-face team's task processes.
- 3d. Virtual team's social processes are inferior to face-to-face team's social processes.
- 4a. Virtual-structured team's task processes are inferior to virtual-unstructured team's task processes.
- 4b. Virtual-structured team's social processes are superior to virtual-unstructured team's social processes.
5. Virtual-structured teams are more successful than virtual-unstructured teams in completing the task; virtual-structured teams are more satisfied but take longer time in carrying out the task.

T-Tests comparing virtual-structured teams to virtual-unstructured teams show that the virtual-structured teams are more successful than virtual-unstructured teams in completing the task ($t=-2.8527$; $p=0.00561$); virtual-structured teams and virtual-unstructured teams are equally satisfied ($t=-1.8207$; $p=0.0726$); virtual-structured teams and virtual-unstructured teams take the same time ($t=-1.2154$; $p=0.2280$) to carry out the task.

The manipulations demonstrate that the three dimensions (hierarchy, division of labor and work process) are well manipulated in the experiment group. However, most of the team members in the control group admitted that they had an organized work process, although they were not given specific instructions to do so.

7. INTERIM DISCUSSION

Structure increases effectiveness of virtual teams. Structure also increases satisfaction and efficiency of virtual teams, but these effects are not significant. Therefore, structure does overcome one

(absolute) negative impact of the virtuality - less effectiveness. It is obvious that structure takes time, thus, in the short run it can not contribute to the team efficiency. It seems that satisfaction remains an unresolved question.

Structure increases social processes and decreases task processes, yet these effects are not significant. Further investigation of the processes stability might lead to finding the reason why satisfaction was unchanged.

Most of the team members in the control group admitted that they had an organized work process, although they were not given specific instructions to do so. A practical conclusion is that in order to improve virtual teams success, as opposed to traditional teams, one should focus on hierarchy and division of labor rather than on work process, which is carried out anyway by the team members. This is probably due to the disadvantage of virtual teams - the transfer of information is limited. However, this may be transformed into an advantage. For example: gender, age and ethnic background of team members are known to traditional team members who see one another and can clearly identify their team members: male or female, younger or older, and ethnic background. It is possible that the division of labor and hierarchy in traditional teams are based on stereotypes of team members. For example, a young white male may be appointed as a team leader instead of an older female from a minority group, which might be more suitable to the position. This lack of information to virtual team members can lead to the division of labor and hierarchy which is based on professional criteria for the successful completion of the task.

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