Virtual Teams

Robert M. Verburg
Delft University of Technology, The Netherlands

INTRODUCTION

Global market developments and the large-scale use of diverse applications in the area of information and communication technology have been key factors in the emergence of distributed teams. Such teams are often referred to as virtual teams. Virtual teams enable collaboration between people across traditional boundaries and offer tremendous opportunities for various achievements. Businesses are no longer tied to a single time zone and are, for example, able to develop software around the 24-hour clock. The Internet as the almost universal medium for interaction across boundaries has created an infrastructure that enables many organizations to launch virtual teams. Hardly any technical obstacle for communication and collaboration across geographic boundaries remain as these processes are supported by high tech collaboration solutions, such as groupware and other collaborative applications (e.g., videoconferencing, electronic blackboards). Virtual teams have a number of opportunities that are not found with colocated teams, such as involving rare expertise.

For example, a group of eight scientists from different organizations rapidly developed a revolutionary rocket engine design by working under geographically dispersed conditions and without prior work relationships (Majchrzak, Rice, Malhotra, King & Ba, 2000). The complex and innovative design could not have been developed without the expertise of the eight highly specialized scientists. However, the design was not only a result from a careful combination of expertise but required a number of interdependent iterative "virtual" brainstorming sessions among the team of rocket scientists. All these activities were performed through a collaboration tool called "the Internet notebook" whereby the specialists spend no more than 15% of their time on the project.

As the example illustrates, virtual teams have the advantage of bringing people together without the obvious constraints with regard to travel time, workspace, and socialization. Virtual teams perform a variety of tasks and are also defined in various ways. Martins, Gilson, and Maynard (2004) have defined virtual teams as teams whose members use technology to varying degrees in working across locational, temporal, and relational boundaries to accomplish an interdependent task. Earlier definitions were focused more on making a distinction between virtual teams and conventional colocated teams, mostly based on geographic distribution and mediated communication. Virtual team research is focusing increasingly on real world virtual teams, which often have some virtualness characteristics, but only seldom resemble "pure forms". Therefore virtualness is now widely accepted as being dimensional in nature. More attention is also given to the fact that virtual teams are first and foremost teams, who are carrying out interdependent tasks under difficult circumstances.

BACKGROUND

Being virtual is a matter of degree and refers, according to various authors, to dimensions such as spatial distance, time, cultural diversity, temporality, organizational contract, and mode of interaction (DeSanctis, Staudenmayer & Wong, 1999; Jarvenpaa & Leidner, 1998; Mowshowitz, 1997). Mediated communication is an important dimension. Some teams meet regularly face-to-face, but may have also some e-mail-based interaction, while other teams interact intensively and almost exclusively via various media and sophisticated groupware tools. Geographic distance and different timeframes may obviously be important reasons for groups to communicate electronically.

"Virtuality" refers to the extent to which a group is geographically distributed (Bell & Kozlowski, 2002), and to the extent that team members rely on ICT mediated communication (Dubé & Paré, 2004). Proposed indicators or measures of virtuality are therefore the relation of face-to-face to non face-to-face communication, the average distance between the members, but also the number of working sites represented in the team together with the number of members at each site (see also Kirkman, Rosen, Tesluk & Gibson, 2004; O'Leary & Cummings, 2002). Teams that span large geographic distances between members, will likely encounter additional complicating factors such as cultural diversity, different organizational affiliation, and distribution of members over different time zones. Apart from the above factors, virtual teams are also often associated with shorter life cycles and low member stability.

A useful definition of a team (or work group) is a collection of individuals who see themselves and who are seen by others as a social entity, who are interdependent because of the tasks they perform as members of a group, who are embedded in one or more larger social systems (e.g., community, organization) and who perform tasks that affect others (Guzzo & Dickson, 1996). Although often not defined,

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a number of implicit characteristics of conventional teams seem to include that members are often permanent employees of one organization, are often colocated and the main form of interaction consists of face-to-face contact.

Virtual teams may not seem to be crucially different from colocated teams. There are comparable levels of responsibility for adequately performing basic processes of groups, such as information sharing, cooperation, coordination and team building. Virtual teams do also have to mobilize the necessary resources, and need to develop a cohesive team with clear goals. However, virtual teams have to care for these processes under conditions of geographic distribution, which has been found to be significantly and negatively related to work processes and team effectiveness (Cramton, 2005). Inadequate ICT tools or infrastructures and the incompatibility of technology will also result in barriers for cooperation. But with sufficient attention to team building and adequate ICT tools these problems may be overcome. The process of team building can be difficult in the virtual context, specifically when the "life cycle" of a team is short, the stability of membership is limited and face-to-face meetings are scarce. *Global* virtual teams have to deal with the additional issues of communicating across different time zones, languages, and cultures (Montoya-Weiss, 2001).

Other problems may include missing nonverbal cues in communication and a lack of unplanned social encounters, resulting in problems with awareness of availability and state of others, of progress of the work or of the setting in which others work (see e.g., Steinfield, 2002). These barriers may result in a lack of trust and cohesion, which often may lead to lower performance levels. Jarvenpaa and Leidner (1998) confirmed that global virtual teams might start with a form of swift trust (Meyerson, Weick & Kramer, 1996), but that such trust appears to be fragile and temporal. Cramton (1997) illustrates, for instance, the multiple interpretations members of virtual teams may give to the meaning of silence of their distant team members. Additionally, virtual team membership can be highly fluid, demanding for continuous adaptation processes between the existing team and new members, who bring their own beliefs and frame of reference. It is this system of views and beliefs people hold that is often considered very important for team functioning. This system is often referred to as a mental model, which can reflect knowledge and belief systems about members in the team, the teams' task, team interaction processes, and the technology used in the team (Cannon-Bowers, 1993). A high degree of sharedness of mental models has been suggested to lead to more effective teams. However, the distributed nature of, and ICT mediated communication in virtual teams hamper efficient development of shared mental models. Member diversity in organizational affiliation, professional background, and national cultures can complicate matters further.

TEAM PERFORMANCE

A crucial difference between colocated and virtual teams is the fact that virtual teams have the opportunity to combine and integrate both colocated and distributed interaction. Virtual teams may combine the better of two worlds and may therefore have an advantage over conventional teams. Virtual teams require certain tools in the area of information and communication technology (ICT) to support interaction. Some modern tools have sophisticated functionalities that provide such teams with opportunities that conventional teams do not have. One of the major effects of the introduction of collaboration technology has been that certain types of meetings can now be held with a large number of participants. Moreover, some tools allow for easy storage and retrieval of information and for collaborative editing of documents. Research results on the performance of virtual teams, relative to face-to-face teams have been mixed. Virtual teams have been generally found to take more time to complete tasks. However, virtual teams have been found to outperform face-to-face teams on idea generation tasks. In general research results in the area of team performance, and quality of work have been mixed and often contradictory (Martins et al., 2004).

So far, the development of virtual teams has mostly been technology-driven, almost neglecting other aspects of work, such as knowledge sharing, combining expertise, and dividing tasks.

In order to reach an optimal level of functioning, these new types of collaboration require new ways of organizing and managing. Major challenges for both managers and employees are the consequences of dealing with virtual teams. Systematic insight in the design and performance of effective (global) virtual teams is therefore an important prerequisite. It is clear that virtual teams may face substantial barriers for effective cooperation and that the probability of failure is ever present. The next section presents a model for analyzing the reasons for failure and can support the design of virtual groups.

Analyzing Virtual Teams: A Model

The model is based on a general model of group functioning, called the Dynamic Group Interaction model (DGIn-model), which is applied in several case studies (Andriessen, 2002; Andriessen & Verburg, 2004). The purpose of this model is not to limit the analysis of collaborative activities to specific aspects, but to structure the analysis by providing ideas and insights that have proven their value in other contexts.

In this model, elements of several theories are brought together. Three levels of behavior are taken into account, that

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