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Global Virtual Teams: Towards a Research Framework to Evaluate Effectiveness in using Group Support Systems

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ABSTRACT

Globalization and the growth of multinational corporations, coupled with advanced information technology have brought GVTs (GVT's) into the spotlight. The authors examine prior research on group technologies, group structures and group decision making to develop a framework for research on GVT's. Literature is reviewed and the approaches are examined in terms of their strengths and weaknesses in providing criteria for team effectiveness. A framework is presented to suggest paths researchers may take in determining factors including knowledge, skills, and abilities that may improve GVT outcomes.

INTRODUCTION

With the rapid development of advanced computer and telecommunication technology, policies and politics, higher computer literacy, and globalization (Igbaria 2001), global virtual teams (GVT) have gained a significant amount of attention among individuals, government, and organizations in the United States and around the world.

For many extended multinational enterprises, GVT's are the backbone of research and development, support, engineering and manufacturing (Applegate, Austin & McFarlan 2007). This dependence on GVT's requires organizations to create effective strategies to properly deploy and manage these environments to improve the performance of group tasks.

Three main components comprise the GVT environment: the GVT itself, the group support systems (GSS), and the tasks to be performed. Ultimately these elements, when aligned lead to performance. Performance within the GVT environment can be influenced by many potential factors such as the diversity and trust among GVT members, organizational environment and culture, time, space, and technological adoption and use.

GVTs are created to perform specific tasks, and can be supported and influenced by the use of information and communication technology (ICT) such as GSS when completing such tasks. Further, the use and effectiveness of GSS can be influenced by the knowledge, skills, and abilities of each team member in using such technology to support group collaboration and decision-making in completing tasks. Previous research posits that when GVT's adopt and use the technology that "fits" the task to be completed performance and group effectiveness increases.

The proposed research framework will (1) integrate two predominate theories in group related research: task-technology fit theory (Zigurs and Buckland, 1998) and adaptive structuration theory (DeSanctis and Poole, 1994), and (2) determine what GVT member knowledge, skills, and abilities of GSS are required to improve the level of effectiveness in GVT environments.

PREVIOUS RESEARCH

Global Virtual Teams

A GVT is an internationally distributed group of people who serve as a critical mechanism for integrating information, making decisions, and implementing actions around the world (Maznevski and Chudoba, 2000,

Canney, Davison, and Ward 1999). Teams are composed of globally dispersed members that come from different continents or countries, and rarely meet face-to-face. Most meetings and/or collaborations take place with the support of information and communication technology (ICT) such as group support systems (GSS).

Team members are a basic element of GVTs. Members may be selected to represent a specific skill, culture, time zone, or other such factor. Duarte and Snyder (1999) suggest a set of competencies for virtual team members: project management, networking, self-management, boundary management, interpersonal awareness, and use of technology.

Some researchers propose that the effects of advanced technologies are less a function of the technologies themselves than of how they are used by people. People adapt systems to their particular work needs, or they resist them or fail to use them at all. There are wide variances in the patterns of computer use and consequently, their effects on decision-making and other outcomes (DeSanctis and Poole, 1994) in GVT environments. According to popular belief, advances in information technology have enabled people to work across organizational boundaries and have provided the infrastructure for independent firms across the globe to function together as if they were a single company (Cohen & Mankin, 1999).

GVTs offer organizations many potential benefits. These include knowledge and expertise, creativity and innovation, improved customer service, and a global presence. These benefits can lead to a higher competitive position within the global marketplace.

GVT's can also serve many potential challenges. These challenges include functional (e.g., educational background, experience, and expertise) and social (e.g., differences in race, culture, gender, and age) diversity among team members (Kankanhalli et al., 2006), organizational environment, trust, communication, time, space, and technology adoption and use (Jarvenpaa et al.,1998, Jarvenpaa and Leidner,1998, and Maznevski and Chudoba, 2000. These challenges can lead to conflict and a lack of trust and cohesion. With the potential benefits and challenges GVTs offer, it is important for organizations to create effective strategies to properly deploy and manage these environments to improve the performance of group tasks.

There has been a significant amount of empirical research on the use of information and communication technologies in groups. However, these studies contain a number of limitations and have created several problems of interpretation. One major limitation of the body of empirical evidence on groups using computers is the extent to which each group of researchers has worked with (1) different kinds of computer systems, (2) different kinds of group participants, (3) different kinds of tasks, and (4) different patterns of dependent variables (Hollingshead & McGrath, 1995, and McGrath & Hollingshead, 1994). Although the variation in research could be an advantage, the problem is that the systems, tasks, subject populations, and dependent variables seldom overlap across studies (McGrath & Berdahl, 1998).

Another limiting condition is that a very large proportion of the research is based on very short-term studies, often of people new to the use of computers, or of that particular computer system. Little of that work explores effects of experience over time, and virtually none of it explores effects of change in members, tasks, technology, or context. Ignoring effects of such factors over time may have had major consequences for how results have been interpreted (McGrath & Berdahl, 1998).

When considering the GVT environment, empirical research is limited to a few studies on specific elements of GVT processes and performance. When coupled with research on use of ICT, findings do not provide a well-integrated understanding of GVT process and performance (Maznevski & Chudoba, 2000). Zigurs and Buckland (1998) developed a theory of task-technology fit and group support systems effectiveness. This theory however, was not operationalized or tested in the GVT environment.

Group Support System

Group support systems combine communication, computer, and decision technologies to support problem formulation and solution in group meetings (DeSanctis and Gallupe, 1987). They are information-based environments that support group collaboration and include, but are not limited to, distributed facilities, computer

hardware and software, audio and video technology, procedures, methodologies, facilitation, and group data (Dennis et al., 1988).

Zigurs and Buckland (1998) define group support systems technology as a set of communication, structuring and information processing tools that are designed to work together to support the accomplishment of group task. Communication support tools include technology that supports, enhances, or defines the capability of group members to communicate with each other. Process structuring tools include technology that supports, enhances, or defines the process by which groups interact, including capabilities for agenda setting, agenda enforcement, facilitation, and creating a complete record of group interaction. Information processing tools include technology that offers the capability to gather, share, aggregate, structure, or evaluate information. The combination and use of these tools can potentially support and improve the performance of GVT performance.

Task

The nature of a task plays an important role in a group's interaction process and performance (Poole et al. 1985, Shaw 1981). A GVT's task will require specific behaviors amongst team members to be completed successfully. This may include using specific processes, information, and/or both. Each task has a level of complexity. The more complex the task, the higher the demand will be among team members in carrying out the task. Some tasks, such as compiling literature on a specific product or service to provide to sales teams may require little demand/interaction amongst two or more members of a team. Other tasks, such as software development, where team members are located across the globe, may require an increased demand in interaction among all members within, and who support, a GVT.

Group support systems can support a GVT in carrying out a variety of tasks, such as simple, problem, decision, judgment, and fuzzy tasks. Zigurs and Buckland (1999) describe these tasks as:

- *Simple task* focuses on a single desired outcome, a single solution scheme, and no conflicting interdependence or solution scheme/outcome.
- *Problem task* focuses on finding the best solution scheme from among multiple possible schemes, which satisfies a single, well-defined desired outcome.
- *Decision task* focuses on crafting a solution that best satisfies multiple outcomes.
- *Judgment task* focuses on resolving the conflict and uncertainty in information associated with the task.
- *Fuzzy task* has very little focus. Group members expend most of their effort on understanding and structuring the problem.

The tasks, along with examples are summarized in Table 1.

Table 1: Zigurs & Buckland (1999) Task Categorization with Examples.

TASK TYPE	EXAMPLES
Simple	Brainstorming
Problem	Brainstorming with solution selection for a single problem
Decision	Brainstorming with solution selection for multiple problems
Judgment	Team consensus
Fuzzy	Problem structuring

Performance

Performance among GVT can be affected by many different factors including, functional and social diversity among team members, organizational dynamics, trust, time, space, and technology adoption and use. The adoption and use of ICTs, such as GSS, can potentially affect the performance of a team's ability to complete tasks and make decisions. Overall performance and team effectiveness could potentially improve if GVT members apply the GSS technology that best fits the task they are trying to complete (Zigurs and Buckland 1999). Without applying the best

task-technology fit, the group's performance and overall effectiveness may be compromised. Zigurs and Buckland have identified fit profiles that are expected to enhance group performance. These fit profiles are shown below in table 2.

Table 2: Fit Profiles of Task Categories and Technology Dimensions
(adapted from Zigurs & Buckland (1999).

Tasks	Communication Support Dimensions	Process Structuring Dimension	Information Processing Dimension
Simple	High	Low	Low
Problem	Low	Low	High
Decision	Low	High	High
Judgment	High	Low	High
Fuzzy	High	Medium	High

The terms low, medium, and high used in table 2 are used to describe an approximation for the level of support needed by GSS technologies to complete tasks and increase group performance. For a simple task such as brainstorming among team members, there is a high demand for communication technology support. The technology that offers the best fit will support and enhance the group's ability to share ideas amongst the team.

Conversely, for decision tasks where solutions have been introduced, discussed, and selected require a lower demand for communication technology support. However, they do require a higher demand for process structuring and information processing technologies.

Effective collaboration among individuals, teams, and organizations is a major contributing factor to the success in all GVT environments. Therefore, ensuring facilitation and support of these collaborations should be the starting point when creating GVT's and deploying information and communication technologies.

Collaboration among GVT members is performed with the use of asynchronous (i.e., email, voicemail) and synchronous (i.e., video conferencing, teleconferencing) technologies. In the global team environment, team members must have or acquire the necessary information and communication technology skills to perform specific duties to complete tasks thoroughly. Without the necessary knowledge, skills and abilities (KSA) of information and communication technologies, the effectiveness among GVT members may be compromised.

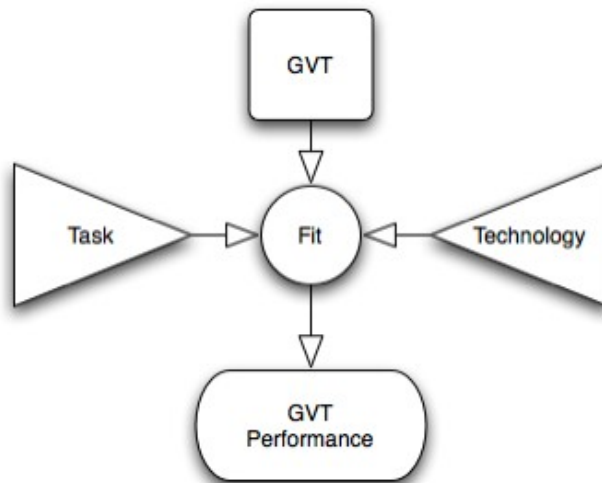**Figure 1: Task-technology fit can affect GVT performance.**

Figure 1 illustrates how GVT performance is affected by the fit between task and technology. To be most effective, the GVT must use the technology that best fits the task requirements.

The proposed research framework will (1) integrate two predominate theories in group related research: task-technology fit theory (Zigurs and Buckland, 1998) and adaptive structuration theory (DeSanctis and Poole, 1994), and (2) determine what GVT member knowledge, skills, and abilities of GSS are required to improve the level of effectiveness in GVT environments. The resulting framework can help guide future researcher strategies in this area. Ultimately, research on GVT's will help organizations, managers, and GVT members determine the level of KSAs required to carry out tasks more effectively. Further, it will encourage managers to provide their employees with on-going training on critical KSA of information and communication technologies.

PROPOSED RESEARCH FRAMEWORK

The research framework integrates two predominate theories in group related research: task-technology fit theory (Zigurs and Buckland, 1998) and adaptive structuration theory (DeSanctis and Poole, 1994).

As described in the previous section, task-technology fit theory suggests that an appropriate task-technology fit should result in higher performing groups (see Figure 2).

Figure 2. General Model of Task/Technology Fit Theory (Zigurs & Buckland 1998).
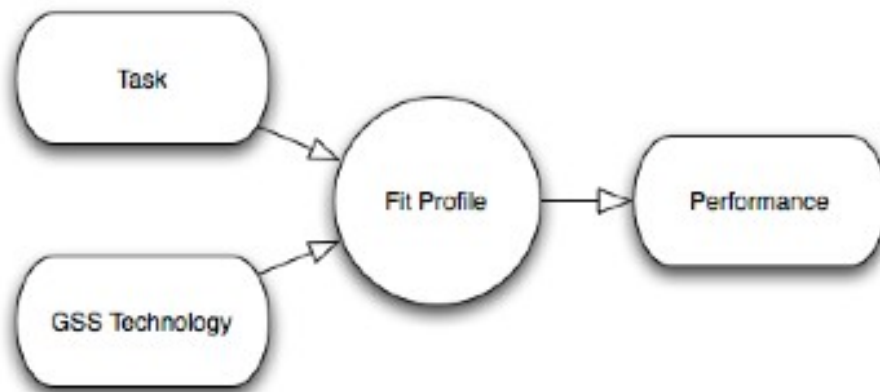
The Adaptive Structuration Theory (AST), as depicted in Figure 3, illustrates the interplay between advanced information technologies, social structures, and human interaction.

**Figure 3: Adaptive Structuration Theory (AST) Model
(adapted from DeSanctis & Poole, 1984).**
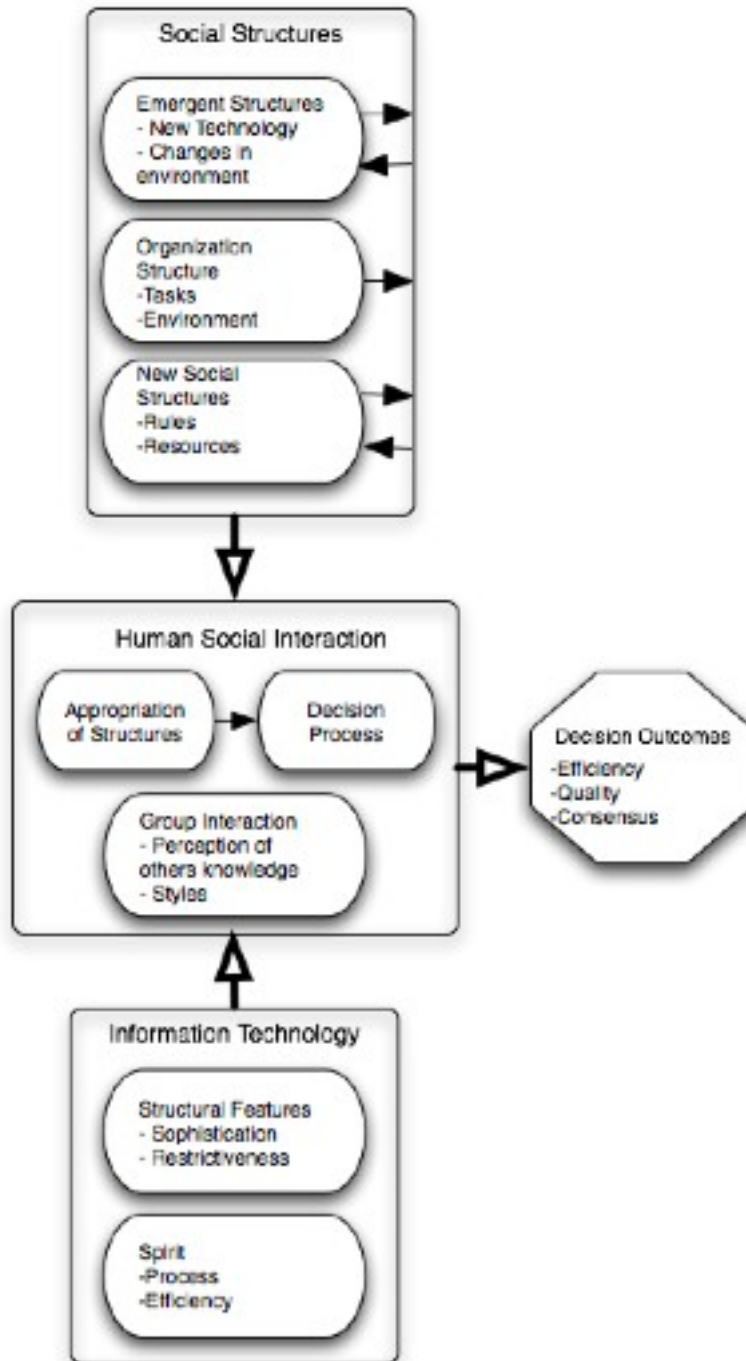
AST focuses on social structures, rules and resources provided by technologies and institutions as the basis for human activity. Social structures serve as templates for planning and accomplishing tasks. Technology is designed to incorporate these structures, creating new structures within the technology. The technology presents an array of social structures for possible use in interpersonal interaction, including rules (e.g., voting procedures) and resources (e.g., stored data, public display screens). As these structures then are brought into interaction, they are instantiated

in social life. So, there are structures in technology, on the one hand, and structures in action, on the other. The two are continually intertwined; there is a recursive relationship between technology and action, each iteratively shaping the other (DeSanctis and Poole 1984).

Information and communication technologies such as GSS include structures used by GVT members to carry out tasks. An example is an information processing system. An information processing system can be designed to meet the needs of the internal and external stakeholders of the team who could either influence or be influenced by the new system (Applegate et al 2007). The system can be constructed to aggregate data for a group that makes conservative decisions or riskier decisions. In essence, the system can be constructed so that its output is based on the social structures of the team.

The team members' knowledge, skills, and abilities (KSA) of information and communication technologies (ICT) may influence how group support systems are adopted into group interactions, and hence, affect project outcomes.
As displayed in Figure 4, the expansion of the task-technology fit theory to include detailed elements of structure and abilities related to GVT's reveal many details that may be of interest to researchers.

Figure 4: GVT Research Framework.
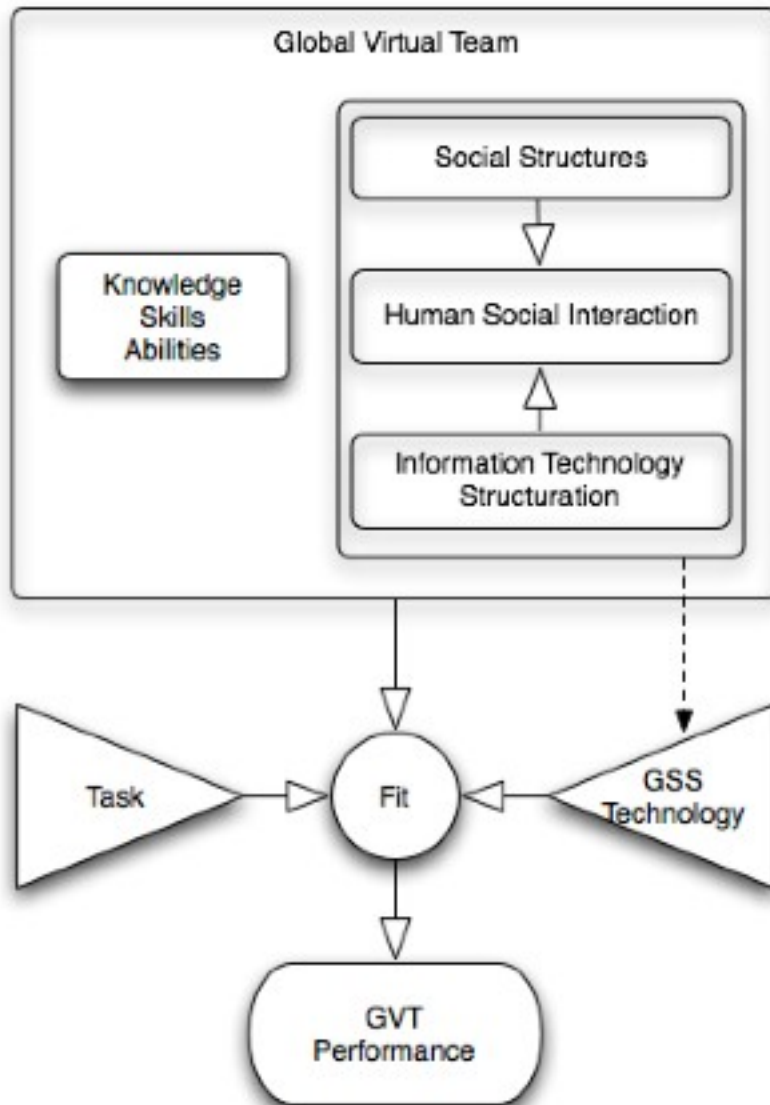
As stated in the previous section, the Zigurs and Buckland model has never been operationalized or tested in a GVT environment. One element that makes the GVT environment unique is the structures of those teams. The social structures, human interactions and information technology structures are 'virtual' and more likely to be influenced by many factors ranging from ethnic culture (i.e. role of women) to language proficiency (Zhu, Coulson & Rohm 2004). Another benefit to the inclusion of structuration theory is the availability of testing instruments from prior research. Furthermore, by expanding the Zigurs & Buckland model to include elements of structuration theory, many new elements are revealed that may impact performance.

The goal of the framework is to narrow specific factors that could reveal how to improve GVT effectiveness. The inclusion of KSA's as they pertain to the GVT is also supported by prior research on group support systems (DeSanctis & Poole 1994). The KSA of the GVT in relation to ICTs and GSS is likely to impact the fit as described by Zigurs & Buckland. Ultimately this will affect performance. Therefore, including KSA as a research element in this framework may guide researchers in determining specific KSA attributes that may contribute to GVT success.

CONCLUSION

The purpose of creating this model is to facilitate a discussion surrounding the unique elements of GVT's. As globalization forces governments and corporations to rely heavily on group communications and GVT's, it is our responsibility as researchers to assist in developing methodologies to improve outcomes. By using this framework as a starting point, researchers will be able to selectively test elements to help identify determinants of success.

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