Chapter 1.52
The Relationship Between E-Collaboration and Cognition

Stephen C. Hayne
Colorado State University, USA

C.A.P. Smith
Colorado State University, USA

ABSTRACT

Recent research has proposed that groupware performance may be strongly affected by the fit between the task and the groupware structures selected for use. We suggest that the link is deeper; there needs to be a fit between the task and the group's cognitive structures as mapped to the groupware structures. In this chapter, we address this shortcoming by integrating recent theories of cognition (distributed cognition, transactive memory, and template theory) from the perspective of electronic collaboration. We refine the concept of cognitive fit as applied to group work and offer propositions for further study. We suggest that template core data is used during situation assessment and that slot data refines response selection. Finally, we propose several techniques by which the group cognitive effort can be minimized, thereby leaving more capacity for the collective task. This approach is especially applicable to naturalistic group decision situations.

INTRODUCTION

An emerging theme in today's workplace is the pressure to do more with less. For example, the U.S. economy continues to expand, even though the number of people employed remains fairly static, resulting in remarkable productivity gains (Bureau of Labor Statistics, 2004). In the public

sector, schools, universities, governments, police, hospitals, and firefighters are all under pressure to reduce their overhead while maintaining levels of service. The military is not immune to these trends; retention and recruitment are serious issues for the military at a time when major operations are taking place in several areas of the world. This pressure to increase productivity creates a stressful work environment for employees and places a premium on the ability to discover ways to work more effectively.

Most work involves some kind of group activity rather than individual activity (Thompson & Fine, 1999). Work groups have many forms, including project teams, boards of directors, management teams, planning teams, juries, and committees of various types. Most important, economic, political, legal, scientific, cultural, and military decisions are made by groups, not individuals (Keltner, 1989).

As the pace of work continues to increase, many work groups must face situations that routinely have high stakes, time-pressure, and uncertainty. In this challenging task environment, group members are often pushed to their limits of performance. Humans have limited cognitive resources of memory, attention, and perception; availability of these resources directly impacts our task performance (Wickens, 1984).

To address some of these limitations, tools have been developed to support specific cognitive strategies for individual decision makers (Kaempf, Klein, & Wolf, 1996). Performance has been shown to improve when there is a good cognitive fit between the task and the tool (Dunn & Grabski, 2001; Vessey, 1991). Software support for group decision-making has been a central research area of information systems in the last 30 years (for reviews, see Dennis & Williams, 2005; DeSanctis & Gallupe, 1987; Jessup & Valacich, 1993; McGrath & Hollingshead, 1994; Nunamaker, 1997). This electronic collaboration (e-collaboration) can be broadly defined as collaboration among individuals engaged in a common task using electronic technologies. While some meta-analyses have shown mixed results (Benbasat & Lim, 1993; McLeod, 1992; Pinsonneault & Kraemer, 1990), many studies have shown that e-collaborative teams can outperform face-to-face teams (Schmidt, Montoya-Weiss & Massey, 2001, as merely one example). However, within the large body of literature on e-collaboration, we are not aware of any software that is designed specifically to optimize the utilization of human cognitive resources in collaborative situations. Most systems have addressed behavioral issues associated with human interaction or have implemented algorithms designed to increase decision or communication efficiency.

Most recently, Dennis, Wixon, and Vandenberg (2001) have suggested that groupware performance may be affected by two factors, the strongest of which is the fit between the task and the groupware structures selected for use. We suggest that the link is deeper; there needs to be a fit between the task and the group's cognitive structures as mapped to the groupware structures. In this chapter, we address this shortcoming by integrating recent cognitive theory with collaboration and put forward several propositions for further study.

THEORETICAL FOUNDATION

Groups can accomplish larger and more complex tasks than individuals. Yet, there are many factors affecting group effectiveness that have been categorized into process losses and process gains (Jessup & Valacich, 1993; Nunamaker, 1997). While this simple model has an intuitive appeal, it begs the question, "How does one maximize gain or minimize loss?" From the perspective of cognition, we believe the answer to this question requires the integration of at least three broad areas of study: