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Computer-Supported Collaborative Work and Learning:
A Meta-Analytic Examination of Key Moderators in Experimental GSS Research

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ABSTRACT

Evident and growing research interest has been witnessed on the relationship between the use of computer-based systems and effective communication in group-related activities such as collaborative learning and training. The various terms accorded to this research stream include virtual teams, e-collaboration, computer-supported collaborative work, distributed work, electronic meetings, etc. A notable and well-accepted aspect in the information system field is group support systems (GSS), the focus of this article. The numerous GSS studies have reported findings which may not be altogether consistent. An overall picture is much in want which attends to the synthesizing of the findings accumulated over decades. This article presents a meta-analysis study aimed at gaining a general understanding of GSS effects. We investigate six important moderators of group outcomes, namely group size, task type, anonymity, time and proximity, level of technology, and the existence of facilitation. The results point to important conclusions about the phenomenon of interest; in particular, their implications vis-à-vis computer-supported collaborative learning technologies and use are discussed and highlighted along each dimension of the studied variables.

Keywords: *collaborative learning; collaborative support systems; group support systems; group DSS; meta-analysis*

INTRODUCTION

Group or team-based work and collaborations are becoming an integral part of education and learning environments. With the advance of information communication technologies, there has been a growing potential for utilizing computerized systems to support idea generation, project assignment, instant communication among the IT-age students and educators. The phenomenon has arrested the interest of both

educational field and information systems (IS) researchers. In education realm, an emerging area in the instructional technology field called *computer-supported collaborative learning* (CSCL) has focused on the ways to support group learning in different forms of technologies; the technologies include electronic discussion environments, distance learning systems, and intelligent agents (e.g., Koschmann, 1996; Ready, Hostager, Lester, & Bergmann, 2004; Strijbos, Martens, & Jochems, 2003).

In IS literature, *Group Support System*s (GSS) research has accumulated a substantial body of knowledge on the effects of computer-based systems in supporting group work in related to a variety of tasks such as idea generation and decision making. Based on the success of using GSS technology to support groups in nonacademic settings, researchers have begun to explore ways to apply GSS technology in classroom to support and enhance group-based learning (Tyran & Shepherd, 2001). GSS are used in a classroom setting or distance learning groups to support and structure group communication and learning activities (e.g., Alavi, Marakas, & Yoo, 2002; Sawyer, Ferry, & Kydd 2001; Leidner & Jarvenpaa, 1995).

While the past studies centered along using GSS to enhance group work outcomes are numerous, the findings are not altogether consistent. Many researchers have devoted towards efforts in figuring out what GSS can help the group to achieve by reviewing and summarizing the previous studies. Several early meta-analyses exist (e.g., Benbasat & Lim, 1993; McLeod, 1992; Shaw, 1998). Other reviews involve tabular methods which are unavoidably less rigorous (Fjermestad & Hiltz, 1999). Tyran and Shepherd (2001) presented a GSS research framework for analyzing the impact of collaborative technology on group learning, by referring to an earlier framework concerning electronic meeting systems on group processes and outcomes (Pinsonneault & Kraemer, 1990). Nevertheless, as the framework is built based on face-to-face or "same time, same place" research studies (Leidner & Jarvenpaa, 1995), it is somewhat limited in its applicability to group work or learning in other forms such as distributed work or Web-based distance learning. Dennis and Wixom (2002) examined five moderators (task, GSS tools, type of group, group size, and facilitation) and their potential effects on GSS use. It has been noted that for GSS researchers trying to extend the common body of knowledge—and for GSS technology practitioners, such as teaching facilitators, seeking to apply research appropriately—it is necessary for them to "look deeper than the overall effects of GSS use" (p. 236, Dennis & Wixom, 2002). A pertinent question is *under what conditions* collaborative technology use would improve group performance because there are *moderators* that influence the specific effects of GSS (Beauclair, 1989; Dennis & Wixom, 2002;).

Following this idea, instead of focusing on examining the effect of GSS technology alone, the current study attempts to look into *how key moderators individually and jointly influence important group work outcomes* using a meta-analytic technique to help us arrive at conclusions backed by quantitative analysis, as well as provide insights that can be brought into both CSCL and GSS areas. Specifically, our primary interest concerns the use of GSS technology and research in the learning environment. Correspondingly, the article focuses on six important moderators which are pertinent to both organizational and educational contexts; they are group size, task type, anonymity, time and proximity, level of technology, and the existence of facilitation. Hypotheses of the effects they may bring to the group along with the use of GSS, as well as the research model, are articulated. Next, we present a meta-analysis on 33 quantitative experimental studies to gain a synthesized view of the GSS effectiveness. The subsequent sections dwell on the results and discussions relating to each of the outcome variables. We conclude the article by pointing out the relevance to, and implications for, computer-supported collaborative learning research; as well, future research avenues are identified.