E-Collaboration Technologies Impact on Learning

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INTRODUCTION

Universities and corporate training facilities have been investing in information technologies (IT) to improve education and training at an increasing rate during the past decade. Many new companies as well as educational units are emerging to provide tools, services and content to enable the effective design of IT-based learning solutions (ASTD, 2004). Although research on technology-mediated learning has increased in recent years, it still lags behind developments in practice. Many predict that the biggest growth in the Internet, and the area that will prove to be one of the biggest agents of change, will be online learning, or e-learning (Bostrom, 2003). The boom in the application of technology to education and training underscores a fundamental need to understand how these technologies can be used to improve the learning process.

E-learning research has only recently attracted the attention of information system (IS) scholars, although the topic has been consistently of interest to educational researchers. In spite of the interest, research in this area has been fragmented (Alavi & Liedner, 2001; Bostrom, 2003). One of the reasons for this fragmentation is the lack of agreement on definitions and terms, especially e-learning. In this article, we focus on the definition given by Alavi and Liedner (2001)—"Technology-mediated learning (or e-learning) is defined as an environment in which the learner's interactions with learning materials, peers, and/or instructor are mediated through advanced information technology"

Although the initial focus of e-learning in the Educational literature has been at the individual level, a review of Education literature points out that learning strategies are shifting towards a more active and group-oriented learning referred to as cooperative or collaborative learning (Alavi et al., 1995; Kelley, 1998). Collaborative learning (CL) evolved from the work of psychologists such as Johnson (1981) and Slavin et al. (1985). It refers to instructional methods that encourage students to work together to accomplish shared goals, beneficial to all. It involves social (interpersonal) processes where participants help each other to understand as well as encourage each other to work hard to promote learning (Johnson & Johnson, 1999).

CL is a versatile procedure and can be used for a variety of purposes ranging from teaching specific content to ensuring active cognitive processing of information during a lecture or demonstration (Johnson et al., 1992, 1994). CL procedures have also been found to be more effective than traditional instructional methods in promoting student learning and academic achievement (Johnson et al., 1981; Slavin et al., 1985). In a comparison of CL vis-à-vis traditional classroom learning, Education researchers found that a collaborative approach increases student involvement with the course as well as with each other, increases the level of critical & active thinking, promotes problem-solving skills and increases student satisfaction (Gupta & Bostrom, 2004).

E-collaboration technologies facilitate collaborative learning by offering a rich, shared, virtual workspace in which instructors and students can interact one-to-one, one-to-many, and many-to-many in order to learn together anytime and anyplace (Bostrom et al., 2003). These technologies can be broadly classified as asynchronous/online anywhere tools such as email, discussion databases, streaming audio/video; or synchronous/online live (real-time) tools such as instant messaging, chat, audio/video conferencing.

In spite of the growing importance of e-learning and CL, important research is lacking in collaborative e-learning (CEL). Most of the research in the Education literature has concentrated on face-to-face forms of collaboration or using minimal technology to support it. With advances in information systems, there have

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been rapid advances in distance learning and virtual team learning. Greater amount of learning is now done using synchronous or asynchronous technology than ever before and there is a need to understand this phenomenon in detail. Finally, the research is lacking good grounding in theory and has focused on input-output models rather than focusing on the process involved in attaining the learning outcomes.

In this article, we first review the IS and Education literature. Next, we identify the primary reasons for the inconsistency in findings in both literatures. Finally, we present a theoretical model for investigating collaborative e-learning. The conclusion section briefly provides directions for future research.

BACKGROUND

E-collaboration technologies are broadly defined as electronic technologies that enable co Research in collaborative e-learning (CEL) has two strong reference disciplines: IS and Education. As mentioned earlier, IS e-learning research has been very limited especially in the CEL area, with only a limited set of chapters focused on CEL. The empirical research in IS stems from the long tradition of Group Support System (GSS), an early e-collaboration technology, research with its focus on process gains/process losses in collaborative settings. Some studies have explored the use of GSS to foster case discussions in a traditional classroom (Hashaim, Rathnam, & Whinston, 1991; Leidner & Fuller, 1997). Others have examined the use of GSS to enable collaboration in small teams of students in traditional classes. As summarized in Table 1, some studies have reported a positive effect of e-collaboration technologies (Alavi, 1994; Drummond, Boldyreff, & Ramage, 2001), while others have not (Alavi et al., 2002; Hiltz, Coppola, Rotter, & Turoff, 2000).

Substantial research in the area of technology supported to learning groups has been done in the area of education. This research domain is known as computer-supported collaborative learning or CSCL. In a recent metareview, Lou, Abrami, and d'Apollonia (2001) examined 122 studies for comparison between small groups versus individual learning when students learn using computer technology. The meta-analysis indicates that, on average, small group learning has significantly more positive effects than individual learning on student individual achievement, group task performance and several process and affective outcomes. However, the meta-analysis pointed out a wide variation in the results of the experiments (Lehtinen, Hakkarainen, Lipponen, Rahikainen, & Muukkonen, 2003). Post-hoc analysis suggests that the important structures accounting for the variance in the outcomes were technology, task, group and learner characteristics. For details refer to Lou et al. (2001) and Lehtinen et al. (2003).

Given the potential and pervasiveness of computing technology, it is important to understand the reasons for the variance in results in both IS and education. We highlight four important limitations:

1. Research in the area of CSCL uses both technology as well as collaboration to enhance learning. However, these studies do not differentiate between the effect of collaboration or technology. Most of the studies have compared CSCL to individual learning without technology. To establish the effectiveness of CSCL, studies need to analyze the incremental benefit of collaboration and/or technology.
2. Studies have been done in different contexts using different e-collaboration technologies making it impossible to compare experiments. The studies also do not distinguish between different pedagogical ideas on how computers have been implemented in the learning environment. In addition, most of instructional technology research in Education has focused on content-delivery, designed for individuals, whereas, most IS research has focused on technology to support collaboration, not content-delivery. In a typically education study, two-person team would sit around computer system going through content together. We are starting to see much richer blended technologies environments being used but there is little research on these new environments.
3. There has been a lack of well-controlled experiments hampering internal validity of results. Only a few longitudinal studies have been conducted. Studies are also limited in the number of participants and amount of content covered. Most of the studies described the systems and conditions as well as the participants' conversation processes but presented no data on learning outcomes. Education researchers also point out the variance in results that exists in these studies.

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