Is Usage a Missing Link in Explaining the Perceived Learning Outcome of Technology-Mediated Learning?

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Abstract—**Information systems (IS) researchers have demonstrated that usage is a key variable in explaining the performance impact of information technology. However, existing technology-mediated learning (TML) studies have not examined the influence of usage on learning outcome and the factors that determine the usage of TML. To address this research gap, our study presents and tests a TML model by drawing insights from two research streams. First, following the IS literature, we incorporate the impact of technology usage on individual performance. Second, building on the social cognitive theory, we study the influences of self-efficacy beliefs (system and subject domain) and affective responses (affect and anxiety) on technology usage. Based on 503 matched responses collected using two-stage questionnaire surveys, our analyses confirm the significance of usage in mediating the effects of system self-efficacy and anxiety on perceived learning outcome, but not in mediating the effects of affect and subject-domain self-efficacy. We find strong support for the influences of self-efficacy beliefs on affective responses. Self-efficacy beliefs of the users are also observed to change over time and perceived learning outcome plays a significant role in explaining this change. Our research enhances the existing TML theory by producing useful insights regarding the influence of social cognitive factors of learners on the usage of TML and how usage mediates the influence of these variables on perceived learning outcome.**

Index Terms—**Affect and anxiety, perceived learning outcome, self-efficacy, technology-mediated learning (TML), technology usage.**

I. Introduction

INFORMATION TECHNOLOGY (IT) has brought significant changes into our work and life in the last three decades. Since the introduction of Internet connectivity and Web-based technologies, IT has added new dimensions to teaching and learning at all levels of education and training [32], [41], [63]. The use of technology-mediated learning (TML)and virtual learning environment (VLE), broadly known as e-learning, is gaining significant momentum in both higher education and corporate training [6], [32], [41], [78]. A report by Datamonitor[1] (2004) suggested that the global e-learning market for higher education is set to grow with a healthy compound annual growth rate (CAGR) of 12%, translating to about $1.8 billion by 2008. According to International Data Corporation (IDC)[2] (2006), the world-wide market for corporate e-learning is forecasted to grow from $6.7 billion in 2004 to over $21 billion in 2009, a CAGR of 25.9%.

TML is defined as an environment in which the learners' interactions with learning materials, peers, and/or instructors are mediated through advanced ITs [5]. Because corporate environments are changing more rapidly, organizations are turning to TML to train their employees and to enhance their organizational performance. Through TML, these organizations can diagnose skill gaps among employees, prescribe task-specific learning activities, and provide predictive assessments in order to determine the scale of professional development required by the business operations. For individual learners, TML presents a novel approach for acquiring new skills and knowledge in more flexible, independent, and stimulating manners without time and location constraints. Therefore, to evaluate the benefits of TML, organizations tend to correlate TML usage with learning performance, whether individual or organizational.

Previous studies on IT utilization and IT impact, particularly on the impact of decision support systems (DSSs), have established the positive relation between technology usage and organizational/individual performance [26], [27], [42], [47], [49]. This stream of research argues that the extent of information system (IS) use is a good predictor of the performance derived from the system. Like most information systems, the objectives of TML are closely linked to the needs of the enterprise. Hence, educational institutions and corporate organizations expect to achieve individual learning outcome and performance from TML usage. However, one of the relatively unexplored areas in the growing body of research on TML is the relationship between TML usage and learning outcome and the antecedents of TML usage such as learner characteristics. While the business process reengineering approach to building corporate information systems can enhance the use of a good spectrum of information systems [56], such an approach might not hold in case of systems such as the TML. This is because learning via TML provides an opportunity for cognitive improvement that is unique to an individual. Variations in individual learning

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