Technology Acceptance and Performance: An Investigation into Requisite Knowledge

THOMAS E. MARSHALL, TERRY ANTHONY BYRD, LORRAINE R. GARDINER & R. KELLY RAINER, JR.
Auburn University, USA

Organizations expend large amounts of educational and training resources to improve employee task and job performance. These resources must be allocated efficiently and effectively to increase the probability of organizational success. Information technology (IT) is one organizational area in which education and training are particularly important, largely because IT has redefined the requisite skills for functional competency in the workplace. Through an empirical study, this research investigates how knowledge bases contribute to subjects’ attitudes and performance in the use of a CASE tool in database design. The study identified requisite knowledge bases and knowledge base interactions that significantly impacted subjects’ attitudes and performance. Based upon these findings, alternatives are provided to management that may help organizations increase the performance benefits of technology use and promote more positive attitudes towards technology innovation acceptance and adoption. By structuring education and training efforts to increase performance and enhance positive attitudes, organizations will be better able to optimize their investments in information technology innovations.

Improving human performance in organizational tasks remains a primary goal for modern organizations to increase competitiveness. Goldstein [1993] estimated that organizations invest close to $40 billion in training per year. Within the Fortune 500 companies, 44% of their training investment relates to technical training [Goldstein, 1993]. Organizations expend tremendous resources to improve employee task and job performance. Education and training are principal tools used to improve human performance and promote better decision-making. In fact, many scholars argue that education and training are the main issues that need to be studied to understand human decision-making and problem-solving behavior. Indeed, Rouse and Morris [1986] observed:

To the extent that it is reasonable to characterize any single issue as the central issue, this issue is instruction and teaching. For any particular task, job, or profession, what mental models should people have and how should they be imparted? (p. 357)

This statement suggests two significant implications for organizational success. The first implication acknowledges that individuals must have relevant knowledge bases to perform a work-related task or job competently. The second implication addresses the problem of how to identify these knowledge bases so that organizations can facilitate the necessary knowledge transfer. An individual’s knowledge base refers to the mental model or structural representation stored in long-term memory about a specific domain or process. Many of the activities surrounding the completion of a job or task are influenced by the individual’s relevant mental models or knowledge bases related to that domain or process [Goldstein, 1993; Shaft and Vessey, 1995; Perrig and Kintech, 1985].

Information technology (IT) is one organizational area in which education and training are particularly important, largely because IT has redefined the requisite skills for functional competency in the workplace [Goldstein, 1993; Zuboff, 1985]. In many cases, knowledge of how to complete the relevant task - task-domain knowledge - is essential, but not sufficient, for an individual to perform well in the workplace. Frequently, the individual must also possess competencies in the use of IT to be successful in modern work environments. It is anticipated that the changes in job competencies resulting from technology shifts (e.g., computer-assisted software
engineering (CASE) will increase the cognitive complexity for the worker [Goldstein, 1993]. Therefore, in addition to task-domain knowledge, modern workers might also benefit from knowledge bases associated with the use of IT. This study investigates technology acceptance and adoption by examining how an individual’s knowledge of a tool, in combination with his task domain knowledge, influences attitudes and performance related to the use of an IT innovation.

Dramatic improvements in IT price-performance ratios have contributed to the enormous impact of IT on organizational success. One aspect of this impact is end-user computing, a phenomenon that is reshaping the way organizational tasks are performed. Most organizations have implemented personal computers (PCs) and expect their managerial and professional staffs to become proficient end users with this new technology. The potential impact of IT, such as CASE, is increasing as organizations become more information intensive and more end users adopt the automated tools. Cheney, et al. [1986], Davis and Bostrom, [1993], Cronan and Douglas [1990], and Sein [1988] indicated that training end users to properly use technology tools to construct their own systems is a critical factor in the successful deployment of IT. This expectation of technology proficiency requires many individuals to rethink their current practices and to learn new methods of task accomplishment [Ryan, 1999]. The acquisition of technology proficiency, of course, can be facilitated through education and training. The rapid pace at which organizations are implementing new IT and the tremendous growth of end-user computing are causing an increasing need for subsequent education and training on IT [Goldstein, 1993]. Sein, [1988], and Bostrom, Offman and Sein [1988] have noted the importance of a systematic training program to promote successful end-user computing with respect to systems development.

However, there has been very little, if any, study into what should be the focus of this education and training, especially in the use of IT tools that automate substantial portions of work processes like computer-aided software engineering (CASE), computer-aided design (CAD), computer-aided instruction (CAI), and expert systems (ES). With IT tools such as these, much of the knowledge about the job requirements (e.g., software engineering in CASE) are embedded in the technology itself. As noted by Goldstein [1993] and Howell and Cooke [1989], increases in technology and machine responsibility may result in increased cognitive demands on people. In such cases, the question becomes “What knowledge is needed by the user to accomplish his or her task while utilizing a process-automating tool like CASE, CAD, CAI, or ES?” Is task-domain knowledge necessary, and if so, what level of proficiency is sufficient? Or is knowledge associated with the systems model and operational procedures of the automated tool required for user satisfaction and enhanced performance? Galliers and Swan [1997] propose that effective IS design must integrate both formal and informa

THEORETICAL BACKGROUND

In considering the knowledge associated with the use of an automated IT tool like CASE, researchers have identified at least two distinct knowledge bases that are possible [Sein, 1988; Bostrom, et al., 1988; Pei and Reneau, 1990]. One is a conceptual model that constitutes much of the theoretical foundation underlying the use of the automated tool involved. This conceptual model is closely connected to the methodology embedded in the tool [Hackathorn and Karimi, 1988; Henderson and Cooprider, 1990]. In contrast, the step-by-step operating procedures related to the use of the IT tool constitute another possible knowledge base or skill-set for an individual [Goldstein, 1993]. Past research has provided evidence that, given a sufficiently complex task, knowledge of the tool’s conceptual model facilitates superior learning compared to operational knowledge of the IT tool [Borgman, 1986; Eylon and Reif, 1984; Halasz and Moran, 1983]. In many cases, the conceptual model is hypothesized to provide an organizational structure for scheduling and controlling the operational procedures related to the tool.

In the Davis and Bostrom [1990] study, contextual knowledge was deemed essential for an individual to achieve meaningful learning. Davis and Bostrom [1990] found that interface designs that are more similar to the user’s conceptual model were both easier to learn and more productive. Investigating training needs for end users, Davis and Bostrom found that the ability to acquire new knowledge was strongly