The Past, Present, and Future of End-User Performance

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INTRODUCTION

Over the last decade, end-user computing has become an integral part of the organizational landscape. The emergence of end-user computing can be attributed to the necessity to manage and to effectively use information to function in a knowledge-based economy. Because of the increased organizational computing needs, computer literacy requirements have skyrocketed for clerical and support staff and for many middle and senior management positions (Bowman, Grupe, & Simkin, 1995). The proliferation of microcomputers and the availability of sophisticated user application tools (Shayo, Guthrie, & Igbaria, 1999) have facilitated the widespread implementation of end-user computing technology.

End-user computing has the potential to enhance productivity. However, for this potential to be realized, end users must learn EUC skills and perform at high levels. Given the significance of end-user performance to organizations, literally hundreds of studies have examined factors with potential to influence end-user performance. The purpose of this review is threefold: to review what we know about end-user performance, discuss some of the limitations of research on end-user performance, and to offer suggestions for future research on end-user performance.

BACKGROUND: FACTORS KNOWN TO INFLUENCE END-USER PERFORMANCE

Research in the areas of psychology and organizational behavior has clearly established that characteristics of the individual and the environment influence behavior and performance (e.g., Terborg, 1981). This approach, labeled the interactional approach, is an effective framework to review the factors that influence end-user performance (Jawahar, 2002).

Characteristics of End Users

To be sure, research has examined a variety of individual difference factors with potential to influence end-user performance. For instance, previous research has investigated the influence of attitudes (e.g., Jawahar & Elango, 1998; Kernan & Howard, 1990; Szajna, 1994), aptitudes (e.g., Evans & Simkin, 1989), learning styles (e.g., Bohlen & Ferratt, 1997), cognitive styles (e.g., Davis & Davis, 1990), self-efficacy (e.g., Jawahar & Elango, 2001), goal setting (e.g., Jawahar & Elango, 2001), experience (e.g., Dambrot, Silling, & Zook, 1988), education (e.g., Davis & Davis), age (e.g., Czara, Hammond, Blascovich, & Swede, 1989), and sex (e.g., Harrison & Rainer, 1992) on end-user performance. Organizations and managers can influence some of these individual difference factors, such as attitudes, aspiration or goals, and self-efficacy, more than other factors (e.g., aptitudes, learning/cognitive styles, and demographics). Therefore, this review focuses on the former set of factors.

Attitudes. The preponderance of research on end-user performance has focused on attitudes toward computers to predict end-user performance. However, these studies have generally reported inconsistent results. About one half of the studies that examined the relationship between attitudes and end-user performance have reported a relationship. While some of these studies reported a positive relationship (e.g., Nickell & Pinto, 1986), others have reported a negative relationship (e.g., Hayek & Stephens, 1989). Alternatively, roughly one half of the studies failed to find a relationship between attitudes and end-user performance (Kernan & Howard, 1990; Szajna, 1994). After reviewing these studies, Jawahar and Elango (1998) attributed the inconsistent results to the fact that many of these studies had *incorrectly* used the constructs of computer anxiety and negative attitudes toward computers interchangeably (see Kernan & Howard) and had relied on global attitudes to predict end-user performance.

Drawing on Ajzen and Fishbein's (1980) behavioral intentions model, Jawahar and Elango (1998) theorized that behaviors or outcomes could be best predicted by attitudes that specifically relate to those behaviors than by more global and general attitudes. They proposed that attitude toward working with computers is much more specific and relevant to performance of tasks which require the use of computer skills than the more general attitudes toward computers. Individuals who hold favorable attitudes toward working with computers are more

likely to practice and learn end-user computing skills, and evidence higher levels of performance on tasks that require the use of those skills than those who hold less favorable attitudes. As expected, Jawahar and Elango found that attitudes toward working with computers but not attitudes toward computers explained unique variance in end-user performance. These results were replicated in a follow-up study (Jawahar & Elango, 2001). These two studies together with previous research indicate that attitudes that are specific to the task of working with a computer or a particular software package or packages are more likely to be predictive of end-user performance.

Goals. The positive effect of goal setting on task performance is one of the most robust and replicable findings in the psychological literature (Locke & Latham, 1990; Locke, Shaw, Saari, & Latham, 1981). Literally, hundreds of studies have been conducted on goal setting in a variety of settings and with a wide range of subjects including managers, engineers, and scientists (Locke & Latham). Research on goal setting has documented that specific and difficult or challenging goals lead to higher levels of performance than the absence of goals, easy goals, or "do your best" goals (Locke et al.). Locke and Latham have shown that goal setting, when combined with feedback or knowledge of results, leads to high levels of performance. Thus, goal setting is most likely to improve task performance when the goals are specific and sufficiently challenging, and feedback is provided to show progress in relation to the goal. In a series of two studies, Jawahar and Elango (Jawahar, 2002; Jawahar & Elango, 2001) found that end users' goals to learn and master a software package is in fact strongly related to their performance with the software package.

Self-Efficacy. Self-efficacy is the belief in one's ability to effectively complete a task or exhibit a specific behavior (Bandura, 1982). Theory and research on self-efficacy suggests that, in contrast to individuals with low levels of self-efficacy, the highly efficacious are less apprehensive of change, set more challenging goals, exert more effort, persist in the face of difficulty, and achieve higher levels of performance (Jawahar, Stone, & Cooper, 1992). Prior research has also documented that self-efficacy influences diverse behaviors and performance on various tasks including tasks involving end-user computing (e.g., Gist, Schwoerer, & Rosen, 1989; Jawahar, 2002; Jawahar & Elango, 2001; Stajkovic & Luthans, 1998). For instance, in one study, Gist et al. studied managers and administrators undergoing two types of training in the use of computer software. Trainees with higher self-efficacy prior to training performed better than their low self-efficacy peers on a timed computer task at the end of training. In another study, Jawahar and Elango reported that self-efficacy explained more unique variance in end-user performance than attitudes and goals or aspirations of end users. Enhancing self-efficacy of end users might very well be the single most effective approach to enhancing end-user performance.

Characteristics of the Environment

In contrast to the voluminous research on end-user characteristics, very little research has focused on characteristics of the environment. Even so, several different characteristics have been studied. In deciding which characteristics to include in the review, I relied on two criteria: the quality of research support for the characteristics and/or the relative ease with which organizations and managers can change the characteristic.

End-User Training. Several scholars have acknowledged end-user training as an essential contributor to the productive use of computer systems in organizations (e.g., Compeau & Higgins, 1995). The practitioner literature also supports the view that training is essential for effective use of computer technology (Finley, 1996). Because training can affect the success or failure of end-user computing in organizations (Bostrom, Olfman, & Sein, 1990; Rivard & Huff, 1988), training employees to use information technology productively has become a high priority in many organizations (Aggarwal, 1998). It is now well established that training end users enhances their performance (e.g., Gist et al., 1989). The next step, then, is to identify characteristics of training that facilitate end-user learning and performance.

Opportunity to Practice. Opportunity to practice in the training environment and in the posttraining environment is likely to affect how well trainees learn and use their newly acquired skills to perform their jobs. While the importance of practice for learning new skills is widely acknowledged (Tannenbaum & Yukl, 1992), training and work environments differ in the extent to which they provide trainees opportunities to practice newly acquired skills. For instance, Ford, Quinones, Sego, and Speer (1991) studied Air Force technical trainees after they completed training and found significant differences in opportunity to apply the training; they also noted wide variations in the lengths of time before trainees first performed the tasks for which they had been trained. Opportunities to practice newly acquired skills are likely to strengthen learning and influence how well trainees use those skills. In a study of IRS managers, Pentland (1989) found that attempts to practice trained computer skills immediately upon returning to the job had a major impact on long-term retention. These studies suggest that the opportunity to practice trained skills will significantly influence how well trainees learn and perform with those skills.