An experimental investigation of the effects of artificial intelligence systems on the training of novice auditors

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Abstract
The primary objective of this research is to investigate the impact of task-technology fit on users' performance when using artificial intelligence systems for auditing tasks. Four artificial intelligence auditing systems, two problem-solving programs, and four questionnaires were developed. A laboratory experiment was performed with 292 undergraduate auditing students. The results suggested that the effect of task-technology fit on accuracy in solving problems was marginal for case-based reasoning with unstructured tasks. No significant effect was found on problem-solving accuracy for rule-based reasoning with structured tasks. The task-technology fit, however, marginally increased users' certainty of the correctness of their solutions.

1. Introduction

Artificial intelligence techniques such as rule-based reasoning[1] and case-based reasoning[2] can be used to implement intelligent tutoring systems. These training systems enhance cognitive information processing by providing the knowledge and the problem-solving strategies of experts to novice users (Murphy, 1990; Leidner and Jarvenpaa, 1995). Recently, institutions such as the University of Massachusetts and London School of Economics have developed intelligent tutoring systems to improve the effectiveness of both classroom education and on-the-job-training (Garcia, 1990; Angelides and Doukidis, 1990; Soloway, 1991; Woolf, 1996). Top engineering students at the University of Massachusetts indicated that intelligent tutoring systems helped them to develop a deeper level of understanding and enhanced communication with engineers and technicians (Woolf, 1996). Intelligent tutoring systems are also currently employed in the field of auditing (see, e.g. Böer and Livnat, 1990; Eining and Dorr, 1991; Morris, 1992; Marcella and Rauff, 1994). These systems improve novices' problem-solving performance (Böer and Livnat, 1990; Eining and Dorr, 1991).

Researchers are currently debating the benefits of case-based reasoning versus rule-based reasoning. Riesbeck and Schank (1989) believe that people do not reason from prior cases when well-established rules are available. In contrast, Ross (1989) argues that novices solve problems by using earlier examples without examining explicit statements of the relevant principles, explanations, or procedures. People solve problems either by using prior cases or by using rules, depending on how well each method fits the characteristics of the task. Consequently, either case-based reasoning or rule-based reasoning is likely to be more suitable for particular auditing domains, i.e. rule-based reasoning is effective for auditing activities that use theory to solve problems (Chi and Kiang, 1993; Allen, 1994). Conversely, case-based reasoning is proficient for auditing tasks that use experience to solve problems. Therefore, artificial intelligence systems that are more consistent with the characteristics of the task domain are expected to be more successful as training tools. This research investigates the impact of task-technology fit on users' performance in problem-solving. It also determines whether task-technology fit plays a role in the users' certainty of the correctness of their solutions.

The remainder of this paper proceeds as follows. The first section presents and explains the cognitive fit model. The second section presents a task-technology fit framework and the impact of task-technology fit on users. The third section describes the research method. The fourth section discusses the results and the last section provides conclusions, limitations of the research, and directions for future study.

2. Theoretical issue

Various theories from cognitive psychology have been adopted by researchers to explain the effect of expert systems on users' judgmental performance in problem solving. Some studies have applied cognitive theories, such as memory theory[3] and cognitive learning theory to predict the effects of artificial intelligence systems on problem solving and learning (see e.g. Murphy, 1990; Eining and Dorr, 1991). Other studies have used mental models theory[4] to predict the effect of matching the structure of the artificial intelligence system with the users' previous knowledge structures on problem solving (see e.g. Pei and Reaneau, 1990). Finally, some studies have used cognitive-fit

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