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Partha Mohapatra
University of Kentucky

Dan Stone
University of Kentucky

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Partha S Mohapatra
University of Kentucky
partha.mohapatra@uky.edu

Dan Stone
University of Kentucky
dstone@uky.edu

ABSTRACT

Learning from decision aids is important for organizational success. Thus, it is important to explore the factors that might enhance or hinder learning from decision aids. In this paper, we study two important factors that might affect knowledge acquisition from decision aids: prior knowledge and hyperlinks within decision aids.

Keywords

Learning, decision aids, strategic systems auditing, hyperlinks

INTRODUCTION

Decision-aid use pervades among public-accounting firm auditors. Decision aids can do more than simply aid in making decisions; they can assist learning by facilitating the transfer of knowledge to users of decision aids (Pei, Steinbart, and Reneau, 1994; Rose and Wolfe, 2000). Decision aids can help auditors learn new models and new applications of existing models. Such learning can facilitate auditor knowledge and assist auditors when decision aids are unavailable (e.g., in spontaneous consultations with clients).

Existing education in accounting primarily trains auditors in accounting rules and their application to specific auditing tasks. Recently, however, many of the largest auditing firms have started using strategic systems auditing (SSA) to more clearly identify auditing risks (Bell, Marrs, Soloman and Thomas, 1997). But using the SSA approach is complex because it invokes an auditing process that requires clear understanding of risks and opportunities in the client's business model. Computerized decision aids are one possible means of helping auditors learn SSA processes.

In this study we focus on two important factors that may influence how well learners may acquire expertise about SSA from decision aids. One factor is the presence of an transaction-based schema. Auditors previously trained in rule-based auditing who must then learn SSA may benefit less from SSA decision aids than auditors not previously trained in rule-based auditing. The second factor is the effect of hyperlinks within decision aids. Web-based decision aids are increasingly popular, intensifying the importance of exploring how hyperlink-based decision aids can add value. In addition, the research investigates whether the detrimental effect of prior knowledge is influenced by the structure of the decision aid (i.e., with hyperlinks or without hyperlinks).

LEARNING AND SCHEMA

Learning occurs by associating information with existing schema (Glover, Prawitt and Spilker, 1997). A schema is "a cognitive structure that represents knowledge about a concept or type of stimulus, including its attributes and the relations between those attributes" (Fiske and Taylor, 1991, pp. 98). A schema helps a learner to recognize a problem as belonging to a specific category that requires particular steps for completion (Tarmizi and Sweller, 1988; Rose and Wolfe, 2000). Acquisition of new schema proceeds in stages. Based on Anderson's ACT* learning theory (Anderson, 1982), acquisition of new schema proceeds from declarative knowledge acquisition (facts about the domain) to procedural knowledge acquisition (ability to apply a set of factual knowledge toward problem solving) (Smedley and Sutton, 2003). An auditor can learn about a methodology or a principle only after passing through these two stages of learning to form the new schema.

PROACTIVE INTERFERENCE IN LEARNING

During both learning stages (as described in ACT learning theory), learners may attempt to map new information to existing schema structures (Armstrong, 2001). When learners obtain new information, they search for the schema that matches closely to the new concept introduced. While doing so, transfer of learning takes place

Positive transfer of learning takes place when the knowledge acquired in the first phase facilitates learning the new concept in the second phase. This happens when the concept that is introduced is superficially similar to the existing knowledge and can be mapped correctly to the existing schema (Armstrong, 2001). For example, learning how to drive a car with standard transmission might facilitate learning to drive other cars with standard transmission (Schunk, 1996).

Negative transfer of learning takes place when the knowledge acquired in the first phase hinders learning in the second phase, when the introduced concept differs from the existing knowledge and the learner makes an incorrect analogy to the existing schema. For example, learning to drive a car with standard transmission might hinder learning to drive with automatic transmission; the driver might try to use a clutch and shift gears, and thereby ruin the transmission (Schunk, 1996). Negative transfer of learning occurs when the concept that is introduced differs from the existing knowledge and the learner makes an incorrect analogy to the existing schema. Consequently, new knowledge cannot be integrated with the existing schema because the new knowledge does not fit with the existing schema recalled from memory (Armstrong, 2001; Vera-Munoz, 1998). Negative transfer of learning is also called *proactive interference in learning* (Schunk, 1996).

Several examples illustrate proactive interference in learning. In the software industry, software programmers who were trained in procedural programming have difficulty learning object-oriented programming because of interference from their previous schema (Nelson, Armstrong and Ghods, 2002). Similarly, customers learn less about product quality and attributes when they learn the relationship between brand image and product quality before learning the relationship between product attributes and product quality (Osselaer and Alba, 2000).

DECISION AIDS AND LEARNING

Decision aids assist decision makers in gathering, processing or analyzing information for a decision (Libby, 1981). The aids are used for accounting problems including tax practice, internal-control evaluation, auditor's bond-rating predictions, and bankruptcy predictions (Changchit, Holsapple and Madden, 2001). Most research focuses on the impact of decision aids in improving the quality of decisions and the decision processes (Brown and Eining, 1997). In contrast, few have explored the impact of decision aids on learning.

The impact of decision aids on learning is important for two main reasons (Rose and Wolfe, 2000). First, if decision aids in a particular situation are unavailable, the decision maker must rely on acquired knowledge to solve the problem in an ad-hoc situation. Second, decision aids are made for specific, narrow contexts. When users acquire knowledge from decision aids, they can use that knowledge in a broader context when necessary.

Some empirical studies have been conducted to find the efficacy of decision aids as knowledge acquisition tools. However, studies have shown conflicting results (Eining and Dorr, 1991; Fedorowicz, Oz and Berger, 1992; Moffitt, 1994; Murphy, 1990; Glover et al., 1997). These conflicting results suggest that there are different factors that might affect learning from decision aids.

LEARNING AND HYPERLINKS

With web-based decision aids becoming popular (Chen, Hong and Jeng, 1999), a pertinent question is whether hyperlinks within decision aids can promote learning. Researchers posit that hyperlinks are indeed suited for learning in complex domains (Spiro, Coulson, Feltovich, and Anderson, 1988; Mao, Benbasat and Dhaliwal, 1996). Researchers provide some evidence showing that hyperlinks within decision aids effectively encourage contextualized access to knowledge (Mao and Benbasat, 1998). Further, educational researchers ascertain that hyperlinks facilitate learning when the task is goal specific (Last and O'Donnell, 2001). However, we still need evidence about the effects of hyperlinks on learning from decision aids.

HYPOTHESIS DEVELOPMENT

With the aforementioned information and theories, we develop the hypothesis in this section.

Effect of decision aid on learning in the presence of prior schema

Based on interference theory, learners who have transaction-based schemas will experience interference when they learn a new paradigm about SSA. The transaction-based schema is based on SFAS 66, which does not consider the underlying economics of the company's performance. It does not look into the market conditions, regulatory environment, or the strategy of the client company. However, SSA is based on these considerations. When a learner attempts to learn about SSA from the decision aid, the transaction-based schema also gets "triggered" and interferes with learning because attempted learning and existing schema are disparate and confounding. So, we propose:

Proposition 1: Participants who have prior transaction-based schema will acquire less procedural knowledge about SSA from a decision aid than will participants without a transaction-based schema.

Effect of hyperlinks on learning from a decision aid

Cognitive load occurs when the limited working memory (short-term memory) is packed beyond its processing ability (Rose, 1998). To facilitate learning, decision aids should decrease cognitive load so that cognitive resources can be devoted to acquiring knowledge (Rose and Wolfe, 2000). Hyperlinks decrease cognitive load by decreasing the demands on working memory because the user does not have to remember the contents of one screen to another (van Vliet and Wilson, 1993). This allows users to concentrate more on the task and devote their cognitive resources to learning. Therefore, hyperlinks will facilitate learning, because users devote more cognitive resources to learning.

Proposition2: Participants who use a SSA-based decision aid that includes hyperlinks will acquire more procedural knowledge about SSA than will participants who use a SSA-based decision aid without hyperlinks.

PROPOSED RESEARCH METHODOLOGY

Students enrolled in master and senior-level accounting courses will participate in this study. Most will have little previous knowledge of SSA. The study will be an Internet-based experimental design of 3x2 between participants. The 3x2 between-participants manipulation is done for variables "prior-schema" and "hyperlink-based explanations."

Prior-schema has three levels: 1) Induced transaction-based schema: In the "presence of transaction-based schema" condition, participants receive a rule-based SFAS 66 tutorial to induce the transaction-based schema. Then they go through a SSA-based decision aid. 2) Absence of transaction-based schema: In the "absence of transaction-based schema" condition, participants receive only the SSA-based decision aid. 3) Control group: In the "control" condition, participants receive only the SFAS 66 tutorial.

The variable "hyperlink-based decision aid" has two levels: with hyperlinks decision aid and without hyperlinks decision aid.

After participants go through the tutorial and/or the decision aid, they study a simplified version of a published strategic auditing case and make risk assessments for the transactions and activities. The risk-assessment questionnaire consists of five questions that test how well the participant judges risk assessment using the procedural knowledge gained from the SSA-based decision aid. We based the correct risk assessment on the recommendations and findings in the published case. Participants' response in the risk-assessment questionnaire is then compared with the recommended risk-assessment to assess the level of procedural knowledge acquisition.

CONCLUSION

Learning about strategic systems auditing from decision aids is important because auditing firms encourage the use of strategic systems auditing. Although auditors may be deeply entrenched in accounting methods, they must learn about different strategy-based approaches to auditing. This research explores how prior accounting knowledge will affect those who are learning new strategy-based approaches. We do not yet know if hyperlinks within decision aids improve learning. This study will attempt to show empirically that hyperlinks within decision aids increase learning.

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