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The construction of an internet-based intelligent system for internal control evaluation

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Abstract

Over the past two decades, several applications have been developed as a training tool in transferring the knowledge of auditors' internal control evaluation to novices. Nevertheless, most of the systems previously developed were abandoned regardless of their positive outcome. The main reason for this disappointed story might lie in the rigid nature of the systems. This study reports the development of such a system integrated with the Internet as an attempt to increase the system's flexibility and ease of use. The development process is described as well as an experiment conducted to examine the value of the system is reported.

Keywords: Intelligent system; System development; Internal controls; Knowledge transfer

1. Introduction

Every year, firms spend several thousands of dollars to train novice employees in their respective professions to increase their expertise. At the same time, undergraduate and graduate students invest heavily in higher education classes in order to be trained in a particular field of study. One major concern is what methods can be used to maximize the return of these training investments, i.e. to effectively and efficiently move the novice to the expert level.

Technology can be used to give trainees practice and feedback. The role of computers is to increase society's capabilities and efficiency. Computers are rapidly changing the training environment. Internet technology provides new and innovative ways to enhance the learning experience, especially to give the trainees easy access to helpful information that would have been difficult for them to access without the Internet.

It is important to investigate if there are further ways to harness the power of information technology to enrich the learning process. Experience with problem-based learning indicates that trainees can significantly improve their problem solving skills if they practice often with problems. Some trainees require more time to carefully analyze the problems and come up with solutions. Typically, the trainees are encouraged to practice more with the problems if they can do it at their convenience—during the workday, at night, or on weekends.

This paper discusses the construction of an Internet-based intelligent system to transfer auditors' internal control evaluation knowledge to novices. Unlike other on-line training techniques, this system provides an interactive learning experience. The integrated learning environment is designed to provide an effective process for training novices on how to evaluate internal control systems. Previous studies have shown that users' performances are improved when interactivity is prominent (Changchit, Holsapple, & Viator, 2001b). Therefore, a significant aspect of this system lies in the interactive nature of the system. The system does not only present users with text or other types of multi-media, but users are also required to interact with the system by entering the data into the system. The system leads them step-by-step on how to detect internal control weaknesses. When the weakness is detected, it is reported immediately to the user.

2. Background and related literature

Several auditing firms and researchers have spent considerable effort developing audit decision aid systems with the hope that such systems can help users make better decisions when performing audit functions (Bailey et al., 1985; Biggs & Morrison, 1990; Boritz, 1985; Brown & Jones, 1998; Brown & Phillips, 1990; Cummings &

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Apostolou, 1987; Cummings, Lauer, & Baker, 1988; Fedorowicz, Oz, & Berger, 1992; Frederick, 1991; Gal, 1985; Graham, Damens, & Ness, 1991; Messier, 1995; O'Leary & Watkins, 1989; Vinze, Karan, & Murthy, 1991). There have been several reasons why such a system was needed. For instance (1) an auditing task was getting increasingly complicated, (2) because of increased competition, CPA firms were forced to charge less for their services than they had in the past, and thus, they were looking for cost-cutting tools, (3) CPA firms found that there was too much variability in their auditors' decisions and they wanted to curtail the problem by introducing standardized decision-support systems, and (4) researchers saw the rule-base of intelligent systems as an excellent way to analyze how auditors made decisions (Messier & Hansen, 1989).

A number of reviews has been published dealing with the nature of expertise in auditing (Arens & Loebbecke, 1994; Bonner & Pennington, 1991; Fedorowicz et al., 1992, Libby, 1995; Lieb & Gillease, 1996; Viator & Curtis, 1998; Weber, 1999). Among these articles, several have examined experienced auditors' internal control knowledge (Eining & Dorr, 1991; Libby, 1995). Intelligent systems for internal control evaluation are generally developed using either professional literature for a knowledge source, interview, or protocol analysis to acquire knowledge from human experts (Holsapple & Raj, 1994; Meservy, 1985). The resultant system is able to emulate the results of an auditor's internal control evaluation process.

Prior studies found that subjects who practiced making decisions with the aid of a system were better and quicker at reaching decisions than subjects who practiced without the support of the system (Changchit, Holsapple, & Madden, 2001a; Eining & Dorr, 1991; Fedorowicz et al., 1992; Murphy, 1990; Oz, 1989; Wong & Monaco, 1995). In addition to being used as a direct decision aid, researchers have contended that intelligent systems could also be used to train non-expert users (Biggs, Messier, & Hansen, 1987; Bonczek, Holsapple, & Whinston, 1981; Bonner & Walker, 1994; Borthick & West, 1987; Changchit, 2001; Changchit et al., 2001a,b; Ege & Sullivan, 1990; Gal & Steinbart, 1992; Holsapple & Whinston, 1987; Odem & Dorr, 1995; Pei & Reneau, 1992; Steinbart & Accola, 1994).

Nevertheless, several early system applications were not put into use. There were several factors that contributed to their lack of success (Durkin, 1996). First, the technology on which they were implemented usually was not suitable for the development of the system. Second, some system projects were applied to domains that were too large in scope. Third, some developers ignored the fact that the system had to be integrated with other systems in an organization, and hence, the systems were built, but then abandoned. Fourth, most systems previously developed were lacking flexibility. They were quite rigid and did not allow an open environment to the users. Part of the reasons might be because most systems had been built in the 1980s and early 1990s. Since technology during that period was not as advanced as it is today, it is not surprising that those systems did not have the Windows-like graphical user interface that we take for granted today (Messier & Hansen, 1989; Nelson, Libby, & Bonner, 1995).

The Technology Acceptance Model (TAM) suggests that users will be encouraged to use the system according to two factors: (1) perceived usefulness and (2) perceived ease of use (Davis, Bagozzi, & Warshaw, 1989). With the advance in technology, an Internet-based intelligent system might help increase these two factors. With the Internet-based feature, subjects are able to practice with the systems as many times as they prefer until they feel comfortable with the internal control evaluation technique. Unlike the other systems previously developed, the system reported in this paper was developed as an Internet-based application. One advantage of the Internet use is that it is appealing to users and aligns with the way most people now prefer to learn. The system gives an open-enrollment atmosphere to users. The online feature allows them to learn at their own pace. They can practice with the system at their convenience—during the workday, at night, or on weekends.

The remainder of this paper begins with the development process including the knowledge acquisition method. The next two sections describe how the system is validated and examined for its usefulness. The last two sections discuss the findings and conclusion.

3. Development process

Internal control issues are important to all organizations in order to assure the accuracy, reliability, and timeliness of the resulting financial reports (Weber, 1999). The study and evaluation of internal controls is a problem involving the expertise of well-trained auditors. The internal control evaluation process is characterized by the use of heuristic rules to determine how well the client's controls support specific assertions for specific accounts (Gadh, Krishnan, & Peters, 1993). The review and evaluation of internal accounting controls is a critical step in every financial audit and is an area in which the auditor exhibits substantial expertise (Meservy, Bailey, & Johnson, 1986). It is necessary to determine the reasoning that auditors use in evaluating a client's internal control system. Such knowledge was formalized, represented, and stored in a knowledge system. Then, the usefulness of the resultant Internet-based intelligent system was tested.

The knowledge incorporated into this intelligent system formalizes the expertise of an auditor experienced in evaluating an internal control system of the sales and collection cycle in medium-size merchandising organizations. The expert from whom the knowledge for this system was acquired is a partner in a major international accounting firm. He has more than 10 years of experience in the area of internal control evaluation and demonstrated significant interest in the research project.