Can the Unified Theory of Acceptance and Use of Technology Help Us Understand the Adoption of Computer-Aided Audit Techniques by Auditors?

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ABSTRACT

Auditors have been slow to adopt certain voluntary technologies, including CAATs, though they can improve efficiency and effectiveness. We employ a well-validated IT model, the Unified Theory of Acceptance and Use of Technology (UTAUT), to model the voluntary adoption of technology in auditing.

Auditors read a case and answered questions related to: the model's predictors, intention to use technology, and individual characteristics. Consistent with UTAUT predictors, auditors indicated greater use for positive performance improvements, lower expected effort, and higher facilitating conditions (FC). An effort x FC interaction shows that FC did not matter for low effort, but for higher effort, greater FC resulted in higher use. Though age, gender, and experience moderate many UTAUT predictors, only experience had a marginally significant direct effect on intention for auditors. Our results suggest the UTAUT is a valid model to study audit technology adoption decisions, but other individual characteristics need to be explored.

Key Words: Technology Acceptance, Audit Technology, UTAUT, CAATs

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INTRODUCTION

The use of Information Technology (IT) in the audit engagement can significantly improve audit efficiency and effectiveness (Bell et al. 2002; Curtis and Payne 2008). Although Auditing Standard No. 5 (PCAOB 2007) requires the increased integration of information technology (IT) into the financial statement audit process, the acceptance of technology and the utilization of computer-aided audit techniques (CAATs) has been slower than expected (Rowe 2008) and much slower than the acceptance of technology for audit planning and administration. For example, Janvrin et al. (2008) report that the lowest use of technology in the entire audit engagement is the testing phase. According to Rowe (2008), the use of technology in this phase of the audit is optional while software use in other parts of the financial statement audit is mandated. Thus, it seems reasonable to assume that the voluntary nature of audit testing software has contributed to its slow pace of adoption. Yet it is this very "optional" technology that can provide some of the most significant gains in audit effectiveness as well as efficiency[1].

This phenomenon has received little attention from the audit research community, perhaps due to the lack of a familiar methodology to explore such issues. In order to better understand why auditors are relatively resistant to the use of optional technology, we employ a theory of technology acceptance from the Information Systems research community. While there are many differences between the context typically studied with this theory (corporate user acceptance of existing technology) and

[1] Examples include the search for unrecorded liabilities and other fraud-related activities. In fact, the use of technology to identify unusual journal entries enabled the internal auditors at WorldCom to begin the unraveling of one of the largest frauds in US history.

financial audit teams, the model is adequately robust to guide our exploration of this problem.

We modified the instrument employed by Venkatesh et al. (2003) in the validation of their unified technology acceptance model (i.e. the UTAUT, or Unified Theory of Acceptance and Use of Technology), to conform to a financial audit context. The resulting model of audit technology acceptance helps to explain the attitudes of those financial auditors in regard to the use of computer-aided audit techniques (CAATs). From the data provided when 70 in-charge financial auditors completed the modified instrument, we find that three of the four UTAUT factors are relevant to the adoption of optional audit technology. Specifically, all factors were correlated with intention to adopt substantive testing software, in the expected directions. In multivariate analysis, performance expectancy, effort expectancy and facilitating conditions were positively related to intention to adopt substantive testing software, and social influence was not relevant in this voluntary setting. Effort expectancy and facilitating conditions interact such that the perception of greater assistance with the software (facilitating conditions) appears to compensate when the effort expectancy for use of the software is greater. Finally, experience with larger audit clients is the only individual characteristic related to intention to adopt.

This study contributes to our understanding of the audit environment by modeling the technology adoption decision within audit engagements. These results may aid the profession in finding impediments to technology adoption, and accounting researchers by identifying new avenues for research. In the next section we describe the research model used in this study and develop hypotheses specific to an audit setting. Following

this we present our statistical analyses including a test of the model. We conclude with a discussion of the results, implications for practice and limitations of this research.

RESEARCH MODEL AND HYPOTHESIS DEVELOPMENT

Acceptance and Use of Technology

Technology acceptance by users is one of the most widely researched topics in the information systems area. The robust stream of acceptance/adoption studies is anchored in behavioral intention. According to this approach, an individual's decision to accept/adopt a technology is a conscious act that can be predicted by their behavioral intention. Technology acceptance theory is based primarily on the Theory of Reasoned Action (TRA), proposed by Fishbein and Ajzen (1975), which postulates that beliefs influence attitude, which in turn shapes a behavioral intention to engage in a particular behavior. The Theory of Planned Behavior (TPB) extends TRA by incorporating perceived behavioral control to account for situations where an individual lacks the control or resources necessary for carrying out the targeted behavior, despite a positive attitude toward it (Ajzen 1991). The Technology Acceptance Model (TAM) shares with TRA the common thread that connects attitude to behavioral intention, but differs in its theorized determinants of attitude and behavioral intention. TAM is also specifically designed to address the determinants of end user computing technology acceptance (Chau and Hu 2002).

An abundance of technology acceptance studies in recent years resulted in the development of several competing models that address user acceptance of technology.

Recently, Venkatesh et al. (2003) reviewed the eight most prominent models/theories[2] that predict behavioral intentions and/or usage, developed a unified model that incorporates elements of the previous eight models, and empirically validated the resulting model. This new model, known as the Unified Theory of Acceptance and Use of Technology (UTAUT) is depicted in Figure 1. Venkatesh et al. (2003) report their model explains up to seventy percent of variance in intention to use technology, outperforming previous models.

(insert Figure 1 here)

The UTAUT has four predictors of behavioral intention or usage - performance expectancy, effort expectancy, social influence and facilitating conditions. The predictors are defined as follows (Venkatesh et al. 2003, 447-453):

> ***Performance expectancy*** *- "…the degree to which an individual believes that using the system will help him or her to attain gains in job performance."*
> ***Effort expectancy*** *- "…the degree of ease associated with use of the system."*
> ***Social influence*** *- "…the degree to which an individual perceives that important others believe he or she should use the new system."*
> ***Facilitating conditions*** *- "…the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system."*

Performance expectancy (PE) in the UTAUT model was derived from a combination of five similar constructs including perceived usefulness, extrinsic motivation, job-fit, relative advantage and outcome expectations. Performance expectancy is the strongest predictor of intention within each of the individual models

[2] These models/theories include: Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM), Motivational Model (MM), Theory of Planned Behavior (TPB), Combined TAM and TPB (C-TAM-TPB), Model of PC Utilization (MPCU), Innovation Diffusion Theory (IDT), Social Cognitive Theory (SCT)

reviewed and was found significant at all points for both voluntary and mandatory settings[3] in Venkatesh et al.'s (2003) model-validation.

In the UTAUT model, effort expectancy (EE) captures the notions of perceived ease of use and complexity. Ease of use is the second component in the classic study by Davis (1989) and is generally believed to have a significant influence on technology acceptance as well as perceptions of usefulness. In validation of the UTAUT, EE was significant in both voluntary and mandatory usage contexts, although only for the first period of usage. Since practice increases one's comfort with software, effort-oriented constructs logically would become less salient after learning hurdles are overcome.

In the UTAUT model, social Influence includes consideration of the person's perception of the opinion of others, his or her reference group's subjective culture and specific interpersonal agreements with others, as well as the degree to which use of an innovation is perceived to enhance one's image or status in one's social system (Venkatesh et al. 2003). This encompasses constructs from previous models such as subjective norm, social factors and image. This construct suggests that an auditor would be sensitive to the opinions of others, resulting in decisions consistent with the social norms around them. In their validation tests, Venkatesh et al. (2003) found that social influence was not significant in voluntary contexts, but becomes important when use is mandated.

Facilitating conditions (FC) represents organizational support, and includes the constructs of perceived behavioral control, facilitating conditions, and compatibility from prior models. Results from the UTAUT validation suggest that FC was significant in both

[3] Models and their components apply differentially depending upon the voluntariness of usage. Interestingly, even when usage is mandated by the organization, researchers have found significant variation in both intention to use and actual usage.

voluntary and mandatory settings in the initial usage period, but its influence on usage intentions disappeared after this. Additionally, FC appears to be fully moderated by effort expectancy, such that, when both PE and EE are present, FC becomes nonsignificant in predicting intention[4].

Acceptance and Use of Technology in the Audit Profession

The focus of our study is somewhat different from most of the prior studies employing technology acceptance theory, in that we explore whether the theory can help to explain an external financial auditor's decision to voluntarily implement new technology on an audit engagement. In one of the few studies in this area, Pennington et al. (2006) found that the qualitative overload of technology use (due to perceived lack of knowledge of the technology) mediates the relationship between perceived ease of use and intention to use CAATs on a future engagement. Bedard et al. (2003) examined the effects of training on user acceptance of electronic workpaper technology. Their results suggest that training enhances the acceptance of audit technology, through its effect on users' perceptions of their task and computer self-efficacy, which in turn impact perceptions of usefulness and ease of use.

In a third study involving an audit context, Loraas and Wolfe (2006), explored the learning of new technology, varying the presence of a strong external influence to learn the technology. When the external referent was present, perceived support for the technology and perceived usefulness of the technology were the only direct determinants of learning, while perceived costs of failure to learn and loss of advantage if one doesn't learn the technology were the only direct determinants in the absence of

[4] Venkatesh et al. (2003) did find that FC was significant in predicting actual usage of technology beyond that explained by behavioral intentions. The test of actual usage is beyond the scope of this study - we instead rely on prior research to confirm the link between behavioral intention and actual behavior.

an external referent. Curtis and Payne (2008) also explored the influence of an external referent, in their case the attitude of a remote superior, as well as the impact of longer budgetary periods, on intention to adopt voluntary audit technology. They find that longer budgetary periods reduce budgetary pressure on audit engagements, such that auditors are more willing to adopt voluntary audit software, and that a remote superior's attitude toward the technology is a significant influence. Finally, when these external motivators were absent, risk propensity and perceptions of budgetary pressure both affect the intention to adopt technology.

These four studies begin to address the important question of why technology is underutilized in the financial audit but many questions remain. Because of the limited extant research regarding the adoption of IT in audit contexts, we must rely primarily on results from significantly different pools of users, primarily nonprofessionals, to develop expectations. However, there are many ways in which audit professionals differ from the typical user considered in prior validations of the Technology Acceptance theories. For example, in voluntary adoption settings, the auditor is typically both the installer and the user, absorbing the risk, and many times the cost, of installation. In contrast, in typical MIS research studies, the software has already been installed successfully and the question is simply whether people will use it. Furthermore, auditors must consider the implications of repeat audit engagements, as well as the legal implications of poor performance on an audit (e.g. Lowe et al. 2002) in their technology acceptance decisions, which are completely outside of the MIS context. Finally, an auditor’s decision to use optional software may have serious evaluation implications, given the pressure of the up-or-out personnel promotion policies employed by most large public

accounting firms, which are based heavily on budget attainment (Brazel, Agoglia and Hatfield 2004); such environments have not been considered in existing MIS research. Thus, prior MIS research in this area has not considered situations where the user is the adopter, bearing the risk and cost of installation, on repetitive similar yet different client contexts, in situations rife with performance, budgetary, and time pressures, and containing significant legal implications for the individual, the firm and the client in the event of failure. The enormity of these differences from the typical MIS environment suggests the need for careful tailoring of these models to the external audit context.

Chau and Hu (2002) propose a framework for analysis of technology acceptance by medical professionals. The framework indicates that a doctor's decision to accept technology can be explained or predicted by factors pertaining to the individual context, the technological context, and the implementation context. Their model was validated with a sample of physicians' in the evaluation of their intention to accept telemedicine technology. Chau and Hu's (2002) results suggest that physicians largely base their acceptance decisions on the usefulness of the technology, rather than ease of use. Of primary importance to the physicians was the compatibility of the technology with their practices, and peer influence was mostly unimportant. Specifically, behavioral intention was influenced by perceived technology control, attitude, and perceived usefulness. Perceived technology control was determined by perceived ease of use. In addition to its direct influence on behavioral intention, perceived usefulness also influenced behavior indirectly through its impact on attitude. Finally, compatibility influenced perceived usefulness.

While Chau and Hu's (2002) study is important in its contribution, in that it is the only study that extends the full Technology Acceptance Model to a professional context, its validation in the medical profession limits its direct application to the public accounting profession. Among the many differences in the medical and audit contexts, probably most important is that medical professionals tend to be self-employed while auditors (below the partner-level) are employees of public accounting firms. Additionally, while medical professionals may make the adoption decision, they will in all likelihood not be the ones actually implementing the software; in contrast, audit in-charges who make the decision to adopt software will likely also be the implementers of that software. As mentioned previously, other unique characteristics of public accounting include severe evaluation pressure, up-or-out promotion policies, team-work, multiple audit engagements, and severe budget pressure on each engagement. Both types of professionals, however, must consider the legal implications of their behavior. The hypotheses developed in the next section are based on the UTAUT, as modified by the findings of Chau and Hu (2002) and other accounting research, as well as the characteristics of public accounting.

Hypothesis Development

Performance Expectancy

In the UTAUT model, the performance expectancy construct measures the extent to which technology acceptance would impact an individual's job performance. In the original TAM model, this is labeled as perceived usefulness. A primary measure of performance in the audit context is budget attainment, which could be significantly impacted by technology implementation on an audit engagement. In addition,

technology has the potential to enhance audit effectiveness as well, though it is often underutilized in certain areas such as fraud detection (Janvrin et al. 2008). Based on the performance expectancy-behavioral intention link of the UTAUT model, it appears that auditors who believe a new technology will enhance their job performance should indicate positive intentions to use the technology. In fact, the usefulness of technology was the single most significant predictor of technology acceptance for physicians (Chau and Hu 2002), prior studies in organizations (Venkatesh et al. 2003) and in accounting (Bedard et al. 2003, Loraas and Wolfe 2006). Therefore, we expect the performance expectancy link in the UTAUT to be a strong predictor of intention for auditors.

H1: Performance expectancy is positively associated with intention to adopt audit technology.

Effort Expectancy

This construct captures the ideas of ease of use and complexity and is a significant predictor of behavioral intention for initial technology use in the UTAUT. Chau and Hu (2002) report limited effects of this construct for physicians and believe this may be due to the strong IT support they typically have access to, as well as the higher-than-average learning ability of this type of professional. Similarly, audit firms have well-developed software training programs for audit professionals and strong IT support groups. Additionally, auditors' business and accounting education typically involves one or more computer courses. However, there is a very important difference between the medical professional's decision to adopt technology and that of an in-charge auditor - as mentioned previously, the medical professional will direct another to implement the software, while the auditor will likely both make the decision to adopt and

be responsible for actually implementing the software. Thus, the effort involved with the adoption should be much more salient to the auditor than the medical professional. Indeed, both Pennington et al. (2006) and Bedard et al. (2003) found ease of use to influence user intentions in accounting settings. Therefore, consistent with prior tests of the TAM and UTAUT models in MIS and accounting settings, but contrary to Chau and Hu's (2002) physicians, we expect EE to significantly affect intention for auditors.

H2: Effort Expectancy is negatively associated with intention to adopt audit technology.

Social Influence

Social influence operates through three mechanisms - *internalization* and *identification* alter the individual's belief structure, and *compliance* alters intention (Venkatesh et al. 2003). Prior studies have typically focused on technology designed for common user groups whose members include managers at various levels, knowledge workers and other end users (Chau and Hu 2002)[5]. Venkatesh et al. (2003) found that social influence was not significant in voluntary contexts, but becomes important when use is mandated. Chau and Hu (2002) find no significant effects of peer influence on either attitude toward the technology or intention to use. Consistent with the Venkatesh et al.'s (2003) findings, physicians are likely making technology decisions on a voluntary basis. In addition, social influence of physicians is primarily peer influence. However, research shows that the influence effect is greater when those exerting influence have

[5] While the UTAUT contends that social influence is only significant in mandatory contexts (Hartwick and Barki 1994; Venkatesh et al. 2003), psychology and accounting research has not found such a distinction. The difference may lie with the source of social influence – superiors versus peers. The mandatory/voluntary distinction appears to be relevant only with peers (Chau and Hu 2002), while we operationalize SI as influence from those higher in the organization.

the ability to reward the desired behavior or punish non-behavior (Warshaw 1980). In public accounting, social influence comes from both peers and superiors. In this context, Loraas and Wolfe (2006) found that perceived support from others and encouragement from supervisors was associated with intention to use technology. Similarly, Curtis and Payne (2008) varied the attitude of a remote superior and found this to have an overriding influence on intention to use software on an audit engagement. Due to the strong evaluative pressure in public accounting, we expect social influence to be a significant predictor of intention for auditors.

H3: Social influence is positively associated with intention to adopt audit technology.

Facilitating Conditions

Facilitating conditions (FC) represents organizational and technical support and is typically significant in both voluntary and mandatory settings in the initial usage period, but its influence on *usage* intentions disappeared after this. In studies in the MIS domain, where adoption relates merely to the use of the software and does not entail the difficulties of implementing the software, FC is nonsignificant in predicting intention (Venkatesh et al. 2003). In our context, however, the individual must not only use the software in their audit, but typically also implement it. Thus, it is reasonable to assume that support from technical people and training on the software will be more important in this context than in the more classic context of technology acceptance. Therefore, we expect FC to significantly affect intention for auditors.

H4: Facilitating conditions is positively associated with intention to adopt audit technology.

Individual Characteristics

Venkatesh et al. (2003) considered several demographic or individual difference variables in their model development. They found that age, gender and experience moderated the influence of the four primary model components on behavioral intention. Specifically, PE was moderated by gender and age such that the effect was stronger for men and particularly younger men; EE was moderated by gender, age and experience, such that the effect was stronger for women, particularly older women, and particularly at early stages of experience; SI was moderated by gender, age, and experience such that effect will be stronger for women, particularly older women, and particularly in early stages of experience; and finally, FC was moderated by age and experience[6]. Given the effects of these variables, we will control for gender, age and experience in our test of the UTAUT for auditors and explore interactions.

H5: Individual characteristics are related to intention to use such that
- **a. Males are more likely than females**
- **b. Age is negatively related**
- **c. Experience is positively related**

[6] The UTAUT as shown in Figure 1 also provides for Voluntariness of Use as a moderator of social influence. However, since our audit setting is strictly a voluntary use of technology we do not measure this variable.

RESEARCH METHOD

Participants

A total of 79 supervisor level (in-charge) auditors from one Big-4 accounting firm participated in the experiment. Nine instruments were incomplete and excluded from further analysis, leaving a total of 70 usable instruments. In-charge auditors are deemed to have the appropriate level of experience and knowledge to make technology acceptance decisions because they run the audit day-to-day and are most likely to identify instances where short-term sacrifices could result in long-term gains of efficiency or effectiveness. In fact, the efficiency/effectiveness trade-off is largely manifested at the in-charge level (Sweeney and Pierce 2004). Furthermore, implementation of optional technology is typically a joint decision between the audit manager and the in-charge auditor (Houston 1999).[7] Therefore, we have no reason to expect the results to be any different for more experienced participants (Peecher and Solomon 2001).

Materials and Procedures

The experiment was administered at a firm training class. One of the researchers was present, along with firm instructors and several research assistants. After a brief introduction by the researcher, paper-and-pencil versions of the research instrument were distributed to the participants. No time limits were imposed and the participants returned the instruments to the researcher upon completion.

[7] This was confirmed through discussions with managers and partners in the participants' firm. Additionally, in a survey at the in-charge training class where this data was collected, 15 managers report that the in-charge would have input into the technology acceptance decision.

The case study was developed specifically for this study[8] and is contained in the appendix. It began by describing a hypothetical audit engagement, including budget information. Next, the opportunity to implement new software for testing payroll and disbursements is described along with its impact on current and future years' budgets and overall audit quality. The new software requires a modest outlay of additional hours in the first year, but will potentially provide time savings of the same amount in future years. A modest time savings was used in the study so as not to induce a demand effect. Because Loraas and Wolfe (2006) found that explicit supervisory support for technology tends to dominate over individual perceptions of the technology, our scenario explicitly states that the attitudes of others in the firm are not known.

After reading the case information, participants were asked to answer three questions relating to their intention to use the technology. Following this was the questionnaire that contained demographic questions and scale questions measuring the variables described in the following section.

Measurement of Variables

Venkatesh et al. (2003) developed their original model from an exploratory factor analysis of similar constructs taken from a large selection of previous technology acceptance theories. Thus, their questions were taken directly from previously validated questionnaires. Because our instrument was to be used in a very different context, questions from the Venkatesh et al. (2003) instrument were selected for their

[8] The case study was initially pilot tested with a separate group of 35 auditors during an in-house training session. Based on the results obtained, minor changes were made to the instrument primarily to improve comprehension of questions.

applicability to the practice of public accounting and modified for the context[9]. Measures were derived in this way to elicit the four direct determinants of the UTAUT in a public accounting context - performance expectancy (PE), effort expectancy (EE), social influence (SI), and facilitating conditions (FC) (see Table 1 for both the original questions and the audit-modified versions). Five or six questions for each of the direct determinants were derived and factor analysis was employed to select three or four for each scale. All scale questions were measured on a 7-point scale with endpoints of *disagree completely* and *agree completely*. Similarly, revisions were made to the three Venkatesh et al. (2003) behavioral intention questions in order to measure our dependent variable - intention to use audit technology (BI). Responses were captured on a 10-point scale with endpoints of *very unlikely* and *very likely*. Open ended questions were included to measure participants' age, gender, and experience with large clients[10].

(insert Table 1 here)

RESULTS

Demographics and Descriptive Statistics

Demographic and descriptive statistics are shown in Table 2. On average, participants were 26.5 years old. They had experience working on 2.6 large audits. The sample is 57% male.

[9] Questions were modified either to reflect the use of a software package rather than an information system, or to reflect the public accounting domain.

[10] We included the measure of Large Client experience on the advice of a partner in the firm. He suggested that audits of large clients are more prone to the use of technology, making this a more technology-relevant experience measure than total years of experience in public accounting. Indeed, in post hoc analyses, public accounting experience was not significant in this model, nor was a count of the different technology tools the participants had employed in audits.

Table 2 also shows participants' mean responses to the four predictors of behavioral intention to use the technology presented in the case study. The means and maximum possible values are: performance expectancy (PE) 13.8/21.0, effort expectancy (EE) 18.3/28.0, social influence (SI) 15.8/28.0 and facilitating conditions (FC) 18.5/28.0[11]. Pearson correlations are shown in Table 2. Note that PE, EE, and SI are all significantly and positively correlated with intention to use (Use), but FC is not. Similar to the Venkatesh et al. (2003) studies, these four predictors are also correlated with each other, indicating the importance of testing these variables simultaneously in the model to isolate the unique variance explained by each.

(insert Table 2 here)

[11] Note in Table 1 that the measures are coded such that a high score on PE indicates high performance expectancy, on EE indicates low effort expectancy, on FC indicates high level of facilitation, and on SI indicates a high level of perceived social influence.

Validation of the Measurement Scales

While our four predictors of behavioral intention were derived from a highly-replicated, and thus highly validated, model, individual questions were altered in order to be employed in a new context. Therefore, it was considered necessary to confirm the validity of individual questions in contributing to their relative constructs. To analyze internal consistency and the unidimensionality of the scales we used exploratory factor analysis (Maximum Likelihood extraction method and Varimax rotation with Kaiser Normalization) and Cronbach's alpha reliability scores. In our factor analyses, individual items were dropped when they failed to achieve at least a .40 loading on any factor (Raubenheimer 2004) which resulted in dropping the following items: PE 4, PE 5, PE 6, EE 5, SI 3, SI 5, FC 3, FC 6 (see Tables 1 and 4).

The final rotated factor matrix is shown in Table3. All items loaded highest on their respective factors. Additionally, with the exception of SI6 and FC1 all items loaded moderate to high using the criteria of .40 as low and .60 as high (Garson 2008a). For PE, EE, SI and FC, the total variance explained is 73%, 67%, 61% and 54% and the resulting Cronbach's alpha are .81, .83, .77, and .72, respectively. All alpha reliability scores are higher than the theoretically acceptable minimum of .70 (Nunnally 1978).

(insert Table 3 here)

Test of Model

Given the small sample size we used multiple regression to test the model since larger sample sizes are typically needed for structural equation modeling (Garson 2008b). The scale items shown in Table 3 were summed to create the variables PE, EE, SI and FC. These four predictors were included in the regression model, along with the

UTAUT moderators of age, gender and large audit experience. The results are shown in Table 4. As expected, PE is a strong predictor for intention to use the new audit technology ($p = .007$). Also as expected, EE is significant ($p = .025$) for these auditors. Given the strong evaluative pressure in public accounting, we expected SI to be significant but it is not ($p = .218$). FC is also a significant predictor of intention ($p = .045$).

Although the UTAUT posits age, gender and experience as moderators of the predictors, we find no direct effects for age or gender, and they did not significantly interact with any other components of the model. The number of large-client audits was marginally related to intention to adopt the technology ($p = .088$) and did not interact with other predictors. We considered all interactions and found only EE and FC to significantly interact. The nature of this interaction is illustrated in Figure 2. It appears that when effort expectancy is low, facilitating conditions are relatively unimportant; however, when effort expectancy is high facilitating conditions have a significant impact on intention to adopt the audit software.

(insert Table 4 and Figure 2 here)

DISCUSSION

We apply the commonly accepted theory of technology acceptance, from the MIS literature, to the issue of technology use in public accounting. The UTAUT model, which is a compilation of the many deviations of this basic theory, proposes that the use of previously implemented technology is dependent upon performance expectancy, effort expectancy, facilitating conditions, and social influence. In a setting that varies in many facets from the typical MIS context, we find support for the application of the model to the audit environment, but also observe important differences. Specifically, performance expectancy (PE) was a significant determinant of intention to adopt audit technology. Because this factor is the most significant determinant of software acceptance in most software acceptance studies, this result is not surprising. Given the significant focus on effectiveness and efficiency in the audit profession, as well as the influence of legal implications for effectiveness failures, it follows that auditors would not adopt software that does not contribute significantly to the overall audit.

Effort expectancy (EE) was a significant determinant of intention to adopt audit technology. EE has been found to influence software acceptance in prior tests of the UTAUT. In our context, the required effort is even greater than typical MIS scenarios (auditor must not only learn how to use the software, but also implement it). Additionally, in an audit context, effort equals time, and time can mean budget overrun. Thus, in an environment where "making budget" is a critical component of performance evaluations (Brazel et al. 2004), it seems reasonable that this factor should have a significant influence on an auditor's intention to adopt audit technology.

Facilitating conditions (FC) was a significant determinant of intention to adopt audit technology. This differs from the results found in prior UTAUT research and in the medical profession by Chau and Hu (2002). We believe that this finding is due to the difference between audit and the typical TAM context. In the public accounting context, the auditor is generally both the installer and user, while in most TAM contexts as well as the study conducted in the medical profession, the user has no installation responsibilities. Therefore, due to this differing level of responsibility for software implementation, this relationship seems reasonable. FC also interacted with EE such that when effort expectancy was low, facilitating conditions were not important to intention to adopt the software. However, the perception of greater assistance with the software (facilitating conditions) appears to compensate when the effort expectancy for use of the software is greater.

In our study, social influence (SI) was individually correlated with intention to adopt audit technology. However, SI was not significant in the regression analysis, in the presence of the other determinants. This is surprising since both Loraas and Wolfe (2006) and Curtis and Payne (2008) found social influence to be overriding determinants of software acceptance in the audit, when that variable was manipulated. Our scenario explicitly stated that the attitude of those in senior management was unknown. Thus, the absence of a clear signal may lead to a difference in our study as compared to the prior studies in auditing. While there are many situations where a decision-maker does know the attitudes of their superiors, there are many more where the individual must decide for themselves without the benefit of a definitive signal from others. This study suggests that, in circumstances when an influential party does not

make their desires known, auditors will consider other factors and not try to infer an attitude that has not been asserted. A possible explanation for the difference in our findings is the multicollinearity among our independent variables, because SI was highly correlated with the other three model factors. Thus, it is possible that this multicollinearity prevented its influence over adoption to emerge. In analyzing the model, the addition of any of the other three determinants eliminated the SI significance. It is equally possible that auditors' perceptions of how social influence impacts their decisions differ from reality. Thus, the perceived influence elicited in our study may differ from the influence demonstrated when influence is manipulated. This suggests that individuals may not always be aware of the factors influencing their decisions. Finally, it is possible that the difference between voluntary versus mandatory use, as asserted by prior MIS research, can explain our results. As we discussed earlier, the UTAUT model contends that social influence is only significant in mandatory contexts (Hartwick and Barki 1994; Venkatesh et al. 2003). Further research is needed to identify when and how social influence impacts the intention to adopt software in audit settings.

Given results of prior tests of technology acceptance, it may be surprising that we found so little influence of individual characteristics over the intention to adopt audit technology. However, this is similar to findings in prior studies. For example, Loraas and Wolfe (2006) and Curtis and Payne (2008) found individual characteristics to influence software adoption decisions only in the absence of external motivators. We found that neither age nor gender was significantly related to the adoption decision, and experience with large audits (where auditors would presumably get greater exposure to technology) was only marginally related to adoption intention.

We recognize some possible limitations in this study. For example, our sample was drawn from a single firm. However, others (Dowling 2008) have asserted that, since the type of technology deployed differs across audit firms (Dowling and Leech, 2007), restricting the experiment to auditors from one firm is a strength in this type of study. Firm differences might otherwise have obscured the impact of model factors. A second limitation is that our subjects are in-charge auditors. However, a current in-charge auditor will soon become a manager. While some of their perceptions may change when they become managers, there is no reason to assume that their decisions regarding software adoption would differ in a year or two. The adoption decision would still impact their engagement budget, and well as the engagement's effectiveness, and these factors are as important to managers as they are to in-charges. In addition, in-charge auditors are usually involved with these decisions (Curtis and Payne 2008). It has also been asserted the in-charge auditors are in the best position to identify actions and activities that can impact audit efficiency and effectiveness (Sweeney and Pierce 2004).

These results, taken together, provide a comprehensive picture of the intention of audit in-charges to adopt audit technology voluntarily. There are several reasons why this understanding is important. First, much of the software that can directly impact audit team efficiency and effectiveness is voluntary (Rowe 2008). Thus, firms must understand the implications of their policies and culture on the intention of audit teams to voluntarily adopt software. Additionally, CAATs have been demonstrated to facilitate the identification of fraud (AICPA 2002). Therefore, both firms and regulators should be interested in encouraging the use of such software to increase the likelihood of fraud

discovery and to lower litigation costs. Finally, firms have invested in the development of audit testing software - if they are to recoup these investments, then the software must be used. Only through understanding the barrier to audit team acceptance of this software can firms then reduce those impediments.

Table 1 – Survey Questions and Development of Instrument

Questions from Venkatesh et al. 2003	*As revised for current study*
PE - Performance Expectancy	
I would find the system useful in my job. (F)	I would find the software described in the scenario useful in my job. (PE1)
Using the system enables me to accomplish tasks more quickly. (F)	Using the software described in the scenario would enable me to accomplish tasks more quickly. (PE2)
Using the system increases my productivity. (F)	Using the software described in the scenario would increase my overall productivity. (PE3)
If I use the system, I will increase my chances of getting a raise. (O)	If I used the audit software described in the scenario, I would increase my chances of getting a raise. (PE4)
If I use the system, I will spend less time on routine tasks. (O)	Using the new software described in the scenario would reduce the time I spend on unproductive activities. (PE5)
Using the system improves the quality of the work I do. (O)	Using the new software described in the scenario would increase the quality of the audit. (PE6)
EE - Effort expectancy	
My interaction with the system would be clear and understandable. (F)	My interaction with the software described in the scenario would be clear and understandable. (EE1)
It would be easy for me to become skillful at using the system. (F)	It would be easy for me to become skillful at using the new software described in the scenario. (EE2)
I would find the system easy to use. (F)	I would find the software described in the scenario easy to use. (EE3)
Learning to operate the system is easy for me. (F)	Learning to operate the new software described in the scenario will be easy for me. (EE4)
Working on the system is so complicated, it is difficult to understand what is going on. (O)	Using the new software described in the scenario may require a lot of my mental effort. (EE5)

Table 1 – Survey Questions and Development of Instrument (continued)

Questions from Venkatesh et al. 2003	*As revised for current study*
SI - Social Influence	
People who influence my behavior think that I should use the system. (F)	People who influence my evaluation think that I should use the new audit software described in the scenario. (SI1)
People who are important to me think that I should use the system. (F)	People who are important to my career think that I should use the new audit software described in the scenario. (SI2)
The senior management of this business has been helpful in the use of the system. (O)	The senior management of my firm will be helpful in the use of the software described in the scenario. (SI3)
In general, the organization has supported the use of the system. (F)	The firm will likely want me to use the new audit software described in the scenario. (SI4)
My supervisor is very supportive of the use of the system for my job. (O)	Senior management of our firm thinks the new software described in the scenario will increase the quality of the audit. (SI5)
People in my organization who use the software have more prestige than those who do not. (F)	People in my organization who use audit software have more prestige than those who do not use it. (SI6)
FC - Facilitating conditions	
I have the resources necessary to use the system. (F)	I have the resources necessary to use the new audit software described in the scenario. (FC1)
I have the knowledge necessary to use the system. (F)	I have the training necessary to use the software described in the scenario. (FC2)
The system is not compatible with other systems I use. (O)	In all likelihood, the software described in the scenario would not be compatible with other audit software I use. (FC3)
A specific person (or group) is available for assistance with system difficulties. (F)	Assistance will be available for system difficulties if I use the new software described in the scenario. (FC4)
Specialized instruction concerning the system was available to me. (F)	Specialized instruction concerning the new audit software described in the scenario will be available to me. (FC5)

Table 1 – Survey Questions and Development of Instrument (continued)

Questions from Venkatesh et al. 2003	***As revised for current study***
I think that using the system fits well with the way I like to work. (O)	I think that using the software described in the scenario fits well with the firm's audit approach. (FC6)
BI - Behavioral Intention	
I intend to use the system in the next <n> months.	I will recommend implementing the software on this year's engagement. (BI1)
I predict I would use the system in the next <n> months.	If I made the acceptance decision, I would use the software for this engagement. (BI2)
I plan to use the system in the next <n> months.	If placed in a situation very similar to this audit scenario, I plan to recommend the implementation of the software provided (BI3)

(F) Item retained in Venkatesh et al. 2003 instrument after factor analysis
(O) Item originally in Venkatesh et al. 2003 instrument

Table 2 – Pearson Correlation Coefficients (p-values) and Descriptive Statistics

	Use	PE	EE	SI	FC	Age	Gend	Exp Large	Actual Range	Mean	Standard Deviation
Use	1.00								4.5-30	20.1	6.6
PE	.403** .001	1.00							5-20	13.8	3.4
EE	.303* .011	.535** .000	1.00						9-28	18.3	4.3
SI	.246* .040	.335** .005	.306** .010	1.00					5-24	15.8	4.4
FC	.160 .186	.291* .014	.539** .000	.462** .000	1.00				8-28	18.5	4.4
Age	-.075 .536	.032 .793	-.042 .730	.054 .656	.051 .674	1.00			23-42	26.5	3.4
Gend	-.072 .554	-.090 .459	-.014 .906	-.059 .625	.149 .219	.063 .603	1.00		0-1	.57	.5
Exp Large	.227 .058	.183 .130	.216 .072	.098 .422	.072 .554	.224 .062	-.153 .206	1.00	0-15	2.6	2.8

** = Significant at the .01 level (2-tailed)
* = Significant at the .05 level (2-tailed)

Use = Sum of Behavioral Intention Questions 1, 2, 3 (range 3-30) - higher values indicate a greater intention to adopt the software
PE = Sum of Performance Expectancy Questions 1, 2, 3 (range 3-21) - higher values indicate greater perceived performance
EE = Sum of Effort Expectancy Questions 1, 2, 3, 4 (range 4-28) - higher values indicate lower perceived effort
SI = Sum of Social Influence Questions 1, 2, 4, 6 (range 4-28) - higher values indicate greater perceived social influence
FC = Sum of Facilitating Conditions Questions 1, 2, 4, 5 (range 4-28) - higher values indicated greater perceived facilitation
Age = Age in Years
Gend = 0 for female and 1 for male
ExpLarge = “How many audits over 2,500 hours have you worked on in your career? (count multiple years with the same client as multiple clients.)"

Table 3 – Rotated Factor Matrix*

	Factor			
	1 (PE)	**2 (SI)**	**3 (EE)**	**4 (FC)**
PE1	**.559**	.290	.362	.102
PE2	**.835**	-.004	.085	.114
PE3	**.823**	.138	.128	.034
EE1	.368	.177	**.508**	.320
EE2	-.031	-.015	**.830**	.257
EE3	.449	.168	**.590**	.144
EE4	.353	.037	**.686**	.231
SI1	.147	**.772**	-.118	.263
SI2	.116	**.889**	.301	.145
SI4	.322	**.513**	.110	.295
SI6	.009	**.453**	.013	.004
FC1	.268	.269	.161	**.497**
FC2	-.107	.377	.327	**.495**
FC4	-.042	.139	.203	**.747**
FC5	.268	.030	.183	**.522**

* Maximum Likelihood extraction method and Varimax Rotation with Kaiser Normalization (converged in 6 iterations)

PE = Performance Expectancy Questions
EE = Effort Expectancy Questions
SI = Social Influence Questions
FC = Facilitating Conditions Questions

Table 4 – Regression Results for Intention to Use Technology

Variable	Beta Coefficient	t value	p value*
PE	.676	2.564	.007
EE	1.291	2.011	.025
SI	.152	0.783	.218
FC	1.051	1.730	.045
Age	-.228	-1.030	.154
Gend	-.060	-0.039	.485
ExpLarge	.382	1.372	.088
EE x FC	-.063	-1.952	.056

* Significance for variables with directional hypothesis (PE, SI, FC, EE, Age, Gend, ExpLarge) are depicted as 1-tailed, others are 2-tailed

PE = Sum of Performance Expectancy Questions 1, 2, 3 (range 3-21) - higher values indicate greater perceived performance

EE = Sum of Effort Expectancy Questions 1, 2, 3, 4 (range 4-28) - higher values indicate lower perceived effort

SI = Sum of Social Influence Questions 1, 2, 4, 6 (range 4-28) - higher values indicate greater perceived social influence

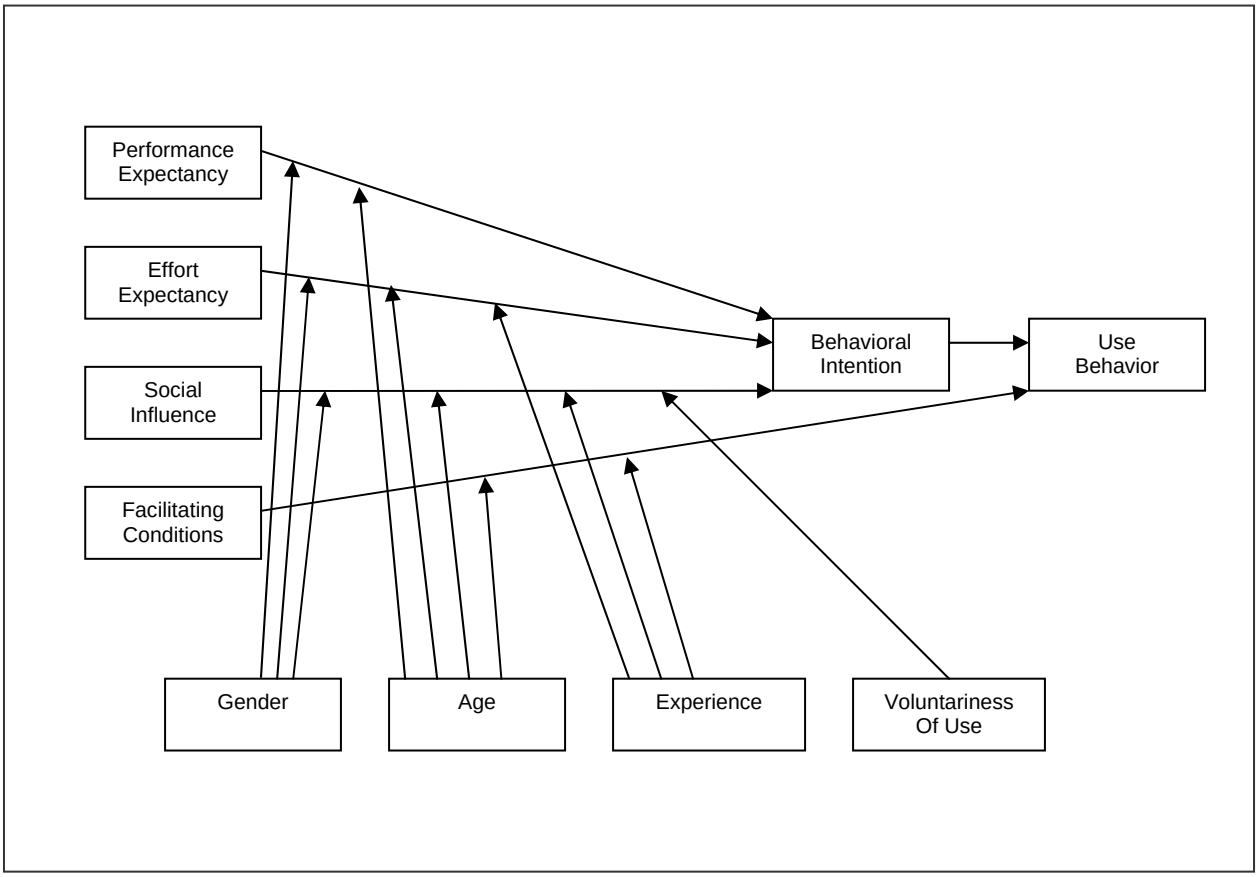
FC = Sum of Facilitating Conditions Questions 1, 2, 4, 5 (range 4-28) - higher values indicated greater perceived facilitation

Age = Age in Years

Gend = 0 for female and 1 for male

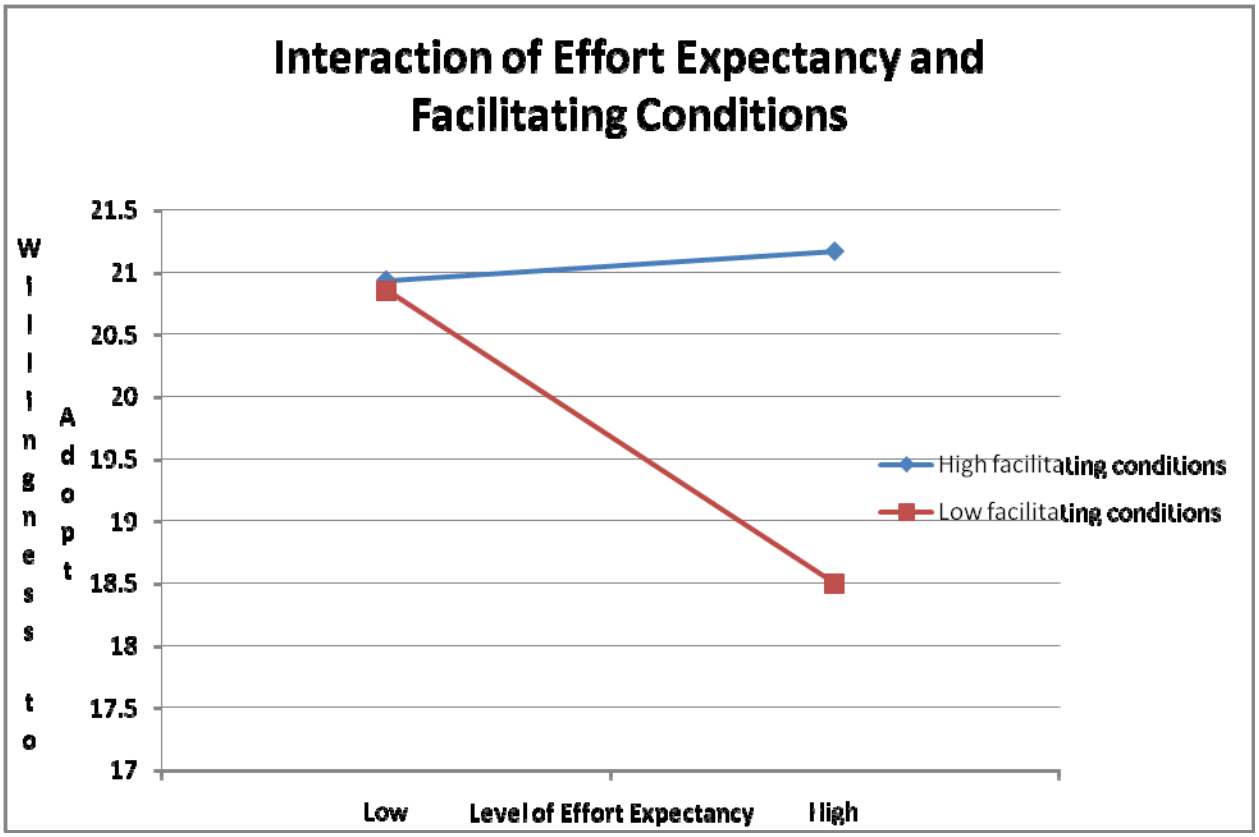
ExpLarge = "How many audits over 2,500 hours have you worked on in your career? (count each year on a client as an individual audit)"

Figure 1 – Unified Theory of Acceptance and Use of Technology (UTAUT)*



*Reproduced from Venkatesh et al. (2003)

Figure 2


Interaction of Effort Expectancy and Facilitating Conditions
Willingness to Adopt
21.5
21
20.5
20
19.5
19
18.5
18
17.5
17
Low
Level of Effort Expectancy
High
High facilitating conditions
Low facilitating conditions

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Appendix

Audit Scenario

You are the returning in-charge auditor for an annual financial statement audit.

You will be evaluated for budget attainment at the end of each year.

The annual budget for the financial statement audit (excluding Sarbanes Oxley internal control review) is 1,500 total hours, with a $200 average hourly billing rate. This will provide total annual revenue from this engagement of $300,000.

After the current year engagement letter is signed (based on this budget), you learn the firm has introduced new software for testing payroll and disbursements which promises future audit efficiency. If the new audit technology is employed on the audit, both the staff person assigned to audit payroll and the in-charge must learn to use the software. You estimate that the budgetary impact of the new software is a *current year additional cost of 50 hours (not included in the previous budget). There will be no improvements in efficiency this year, but the software should provide* a *savings in future years of 50 hours a year*. This will *replace existing tests, but is not expected to improve overall audit quality*. This audit engagement has met budget in prior years.

There is *no information* regarding whether the engagement partner or the practice office managing partner support use of the software.

It is not clear whether this software will be used on other clients in your office. It is probable that the current engagement team will be reassigned to this engagement next year.

Assume that your recommendation will be instrumental in the final software adoption decision.