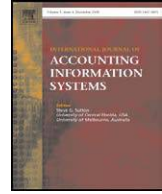




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# Information technology acceptance in the internal audit profession: Impact of technology features and complexity

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### ABSTRACT

Although various information technologies have been studied using the technology acceptance model (TAM), the study of acceptance of specific technology features for professional groups employing information technologies such as internal auditors (IA) has been limited. To address this gap, we extended the TAM for technology acceptance among IA professionals and tested the model using a sample of internal auditors provided by the Institute of Internal Auditors (IIA). System usage, perceived usefulness, and perceived ease of use were tested with technology features and complexity. Through the comparison of TAM variables, we found that technology features were accepted by internal auditors in different ways. The basic features such as database queries, ratio analysis, and audit sampling were more accepted by internal auditors while the advanced features such as digital analysis, regression/ANOVA, and classification are less accepted by internal auditors. As feature complexity increases, perceived ease of use decreased so that system usage decreased. Through the path analysis between TAM variables, the results indicated that path magnitudes were significantly changed by technology features and complexity. Perceived usefulness had more influence on feature acceptance when basic features were used, and perceived ease of use had more impact on feature acceptance when advanced features were used.

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## 1. Introduction

Technology features have different meanings in different contexts. In general, technology features are the attributes, characteristics, or functions of a technology.<sup>3</sup> Typically, features are used as criteria when users select hardware or software. For example, the features of hardware include various attributes of hardware such as speed of processor, size of memory, size of hard drive, resolution of monitor, etc. In this case, technology features mean the building blocks or components of a technology (Griffith and Northcraft, 1994; Griffith, 1999). The meaning of software features emphasizes the functions provided in the software. For instance, features of audit software such as data queries and sampling are important when evaluating audit software packages. In this case, technology features mean vendor-created software tools designed to complete tasks on behalf of the user (Harrison and Datta, 2007).

We are interested in the usage of groups of features, especially of Generalized Audit Software (GAS) for internal audit (IA) professionals. GAS allows auditors to undertake data extraction, querying, manipulation, summarization, and analytical tasks (Boritz, 2002; Debreceeny et al., 2005). Internal auditors are rapidly increasing the use of GAS in their profession (Bagranoff and Vendrzyk, 2000; Protiviti Inc., 2005). Audit staff require background in data analytic technologies to perform their audit tasks (Bagranoff and Vendrzyk, 2000), and nearly two-thirds of internal auditors expect that IT audits will increase in their organizations (Protiviti Inc., 2005). However, GAS is still not utilized consistently through audit departments although widely available (ACL, 2006).<sup>4</sup> The usage rates of fraud detection software, internal control evaluation software, electronic commerce control software, and continuous monitoring software are relatively low (Glover and Romney, 1998).<sup>5</sup> The increased importance of GAS among IA professionals motivates us to research how groups of features of GAS affect the internal auditors' behaviors of technology acceptance.

Previous studies have demonstrated that technology features change user behavior towards technology (Hiltz and Turoff, 1981; DeSanctis and Poole, 1994; Griffith and Northcraft, 1994; Kay and Thomas, 1995; Griffith, 1999; Jaspersen et al., 2005; Harrison and Datta, 2007). However, there has been no technology feature research with the TAM. Most TAM research has focused on a technology such as word processing (Davis et al., 1989; Adams et al., 1992), personal computing (Igbaria et al., 1997), data retrieval system (Venkatesh and Morris, 2000), and accounting system (Venkatesh and Davis, 2000; Venkatesh et al., 2003). Therefore, the features of a technology have been given limited attention in TAM research. In addition, most technology feature studies have focused on developing a theory without providing empirical data (DeSanctis and Poole, 1994; Griffith and Northcraft, 1994; Griffith, 1999; Jaspersen et al., 2005) except for few studies (Hiltz and Turoff, 1981; Kay and Thomas, 1995; Harrison and Datta, 2007).

To fill this gap, we added feature specificity to the TAM and empirically evaluated this model using a sample of 185 internal auditors of the IIA. We identified the technology features of GAS important for internal auditing work: database queries, ratio analysis, audit sampling, digital analysis, regression/ANOVA, and data mining classification. We then classified these features based on their complexity. Database queries, ratio analysis, and audit sampling are considered as basic technologies and digital analysis, regression/ANOVA, and data mining classification are considered as advanced technologies by internal auditors. We tested the perceived usefulness, perceived ease of use, and system usage with different technology features and complexity. Through the comparison of TAM variables by features and complexity, we found that the basic features were higher in system usage, perceived usefulness, and perceived ease of use than the advanced features. Through the path analysis of TAM variables, we also found that perceived usefulness was more important when basic features were used, while perceived ease of use had a stronger impact on system usage when advanced features were used.

This study substantially contributes to TAM research by adding technology features and empirically evaluating this model. The TAM is a useful model to understand the user acceptance of a technology. Expanding the TAM with technology features helps IT researchers to understand user acceptance of a technology at a finer level. This study provides empirical evidence to strengthen past studies involving

<sup>3</sup> Technology is defined as "specific tools, machines, or techniques for instrumental action." (Griffith 1999, 474).

<sup>4</sup> Twenty eight percent of internal audit departments have less than 20% of their audit staff using data analytics technology. In contrast, 21% of internal audit departments have 80% of audit staff using data analysis technology.

<sup>5</sup> Two fifths of audit departments do not use fraud detection technology, and less than 25% of auditors use internal control evaluation, electronic commerce control, and continuous monitoring technology.

technology features. Moreover, this study contributes to the IT utilization of IA professionals through classification of technology features into basic and advanced features of audit software. The feature studies of internal audit software promote the use of IT in the internal audit profession.

In addition to feature specificity extensions, we adapted the extended the TAM to technology acceptance for business analysts, in this case internal auditors. We examined prior literatures of external variables and identified 15 external variables significantly important for the user behavior of technology acceptance. We grouped them into organizational factors, social factors, and individual factors based on the classification of previous research. Different than a general population of end users, technology acceptance of internal auditors is influenced by organizational factors through perceived ease of use and influenced by individual factors through perceived usefulness.

The remainder of this paper consists of four sections. The [Theory and hypotheses development](#) section reviews the theoretical background of the TAM and technology features research and presents the hypothesis and research model. The [Research methodology](#) section introduces the sample and survey instrument and briefly explains our data analysis procedure. The [Result](#) section analyzes the data, and the [Discussion](#) section discusses limitations of our research and gives directions for future study.

## 2. Theory and hypothesis development

In this section, we provide theoretical background of TAM and technology features, and propose hypotheses supported by the theoretical background. The first subsection reviews TAM and external variables research and presents hypotheses involving TAM in the IA context. The second subsection presents prior research of technology features and discusses the hypothesis involving technology features.

### 2.1. Technology acceptance model

The TAM, suggested by [Davis \(1986\)](#), explains the determinants of computer acceptance in general and traces the impact of external factors on internal beliefs, attitudes, and intentions ([Davis et al., 1989](#)). The TAM consists of system usage, behavioral intention to use, attitude toward using, perceived usefulness, perceived ease of use, and external variables. System usage is the primary indicator of technology acceptance ([Davis et al., 1989](#); [Thompson et al., 1991](#); [Adams et al., 1992](#); [Straub et al., 1995](#); [Szajna, 1996](#)) and measured by frequency and time ([Davis et al., 1989](#)). The primary internal beliefs for technology acceptance behaviors include perceived usefulness<sup>6</sup> and perceived ease of use<sup>7</sup>. Perceived usefulness and perceived ease of use have positive associations with technology acceptance ([Davis et al., 1989](#)). Therefore, we hypothesized the positive relationship between perceived usefulness and technology acceptance, and perceived ease of use and technology acceptance in the internal audit profession.

**H1.** Perceived usefulness has a positive effect on technology acceptance by internal auditors.

**H2.** Perceived ease of use has a positive effect on technology acceptance by internal auditors.

We also hypothesized the relationship between perceived usefulness and perceived ease of use. Perceived ease of use not only has a direct effect on technology acceptance but also indirect effect on technology acceptance through perceived usefulness ([Davis et al., 1989](#)).

**H3.** Perceived ease of use has a positive effect on perceived usefulness.

In the extensions of the original TAM, there has been considerable research on external variables that affect technology acceptance. The constructs of system usage, perceived usefulness, and perceived ease of use are obvious, but the constructs of external variables are not clear. Therefore, we carefully reviewed

<sup>6</sup> Perceived usefulness was defined as “the degree to which a person believes that using a particular system would enhance his or her job performance” ([Davis et al., 1989, 320](#)).

<sup>7</sup> Perceived ease of use was defined as “the degree to which a person believes that using a particular system would be free of effort” ([Davis et al., 1989, 320](#)).

prior TAM literature to identify external variables. As shown in Appendix 1, fifteen external variables were derived from extended TAM research (Davis et al., 1989; Igbaria et al., 1997; Venkatesh and Davis, 2000; Venkatesh et al., 2003). However, fifteen variables are too many to test, so we grouped all variables into three categories referring to previous studies: organizational factors, social factors, and individual factors (Igbaria et al., 1997; Venkatesh and Davis, 2000; Venkatesh et al., 2003).

Organizational factors were considered as external variables by Igbaria et al. (1997). They examined intraorganizational factors and extraorganizational factors. The intraorganizational factors include internal support, internal training, and management support. The extraorganizational factors include external support and external training. Management and external support have more influence on technology acceptance than internal support and training in small firms (Igbaria et al., 1997). Both organizational factors have positive effects on technology acceptance through perceived usefulness and perceived ease of use (Igbaria et al., 1997).

Facilitating conditions were also considered as organizational factors in other research. Thompson et al. (1991) did not find the effect of facilitating condition on PC utilization. Through the UTAUT (Unified Theory of Acceptance and Use of Technology) model, Venkatesh et al. (2003) found the direct effect of facilitating condition on usage behavior, which was moderated by gender, age, experience, and voluntariness. In internal auditing, training is more influential on technology acceptance because auditors strongly feel that additional training would be beneficial for their job (Braun and Davis, 2003), and they do not use technologies if the company lacks qualified staff familiar with software or IT staff (ACL, 2006).

**H4a.** Organizational factors have a positive effect on perceived usefulness by internal auditors.

**H4b.** Organizational factors have a positive effect on perceived ease of use by internal auditors.

Social factors are also considered as external variables. Thompson et al. (1991) were interested in social factors which had a strong influence on PC utilization. Malhotra and Galletta (1999) tried to understand the role of social influences in the TAM and found that identification and internalization had a strong positive relationship with attitude toward using while compliance had a weaker negative relationship with attitude toward using. Subjective norm is influenced by both peer and superior (Mathieson, 1991; Taylor and Todd, 1995). The effect of subjective norm on technology acceptance had conflicting results. Davis et al. (1989) reported no significant relationship between social norms and usage because of the weak psychometric properties of their social norms scale and particular IS context. Mathieson (1991) found no significant effect of subjective norm on intention while Taylor and Todd (1995) found a significant effect on intention. Venkatesh and Morris (2000) showed that subjective norm had a strong influence on technology usage decisions; however the effect of subjective norm was diminished over time.

Through the TAM2, Venkatesh and Davis (2000) explained a large impact of social influence process (subjective norms, voluntariness, and image) on technology acceptance. Social influence process significantly affects the technology acceptance through perceived usefulness (Venkatesh and Davis, 2000). Subjective norms are positively related to intention and moderated by experience and voluntariness, and also negatively associated with perceived usefulness and moderated by experience. Subjective norms positively influence image and image positively affects perceived usefulness. Through the UTAUT model, Venkatesh et al. (2003) confirmed that social influence was a direct determinant of intention to use.

**H5a.** Social factors have a positive effect on perceived usefulness by internal auditors.

**H5b.** Social factors have a positive effect on perceived ease of use by internal auditors.

Individual factors are the third set of external variables. Individual factors are not standard in previous research as they have been also known as cognitive factors (Venkatesh and Davis, 2000) and personal factors in Social Cognitive Theory (Compeau and Higgins, 1995). Individual factors such as job relevance, output quality, and result demonstrability were demonstrated to be significant determinants of technology acceptance and influence the technology acceptance through perceived usefulness (Venkatesh and Davis, 2000). Result demonstrability positively influences perceived usefulness. Based on this relationship, we hypothesized a positive relationship between individual factors and perceived usefulness and also a positive relationship between individual factors and perceived ease of use.

**H6a.** Individual factors have a positive effect on perceived usefulness by internal auditors.

**H6b.** Individual factors have a positive effect on perceived ease of use by internal auditors.

## 2.2. Technology features

Technology features are broadly defined but our usage is specific to software packages such as generalized audit software. The broad definition of technology features includes hardware attributes as stated by Griffith and Northcraft (1994). Technology features are the building blocks or components of the technology (Griffith and Northcraft, 1994; Griffith, 1999). Thus technology is “a combination of features: distinct parts, aspects, and qualities,” (Griffith, 1999, 476). However, the definition of technology features used in this research is close to the definition of Harrison and Datta (2007). Technology features are “vendor-created software tools designed to complete tasks on behalf of the user.” (Harrison and Datta, 2007) In this case technology, that is an application, is “a bundle of features.” (Harrison and Datta, 2007) A feature-based approach provides a different unit of analysis (Griffith, 1999) compared to studying technology as a whole. GAS consists of a set of features for financial, operational and special audits (Boritz, 2002; ISACA, 1998; Debrecey et al., 2005). Internal auditors use various features for data extraction and analysis, fraud detection, internal control evaluation, electronic commerce control, and continuous monitoring (Glover and Romney, 1998).

Few studies have examined IT usage at a feature level. Hiltz and Turoff (1981) found that experienced users with a computer-based communication system increased the range of features considered valuable in the application, and the specific features of a system affected changes in the behavior and attitudes of users. DeSanctis and Poole (1994) separated an advanced information technology into structural features to understand the role of advanced information technologies when systems change organization. Kay and Thomas (1995) found that users of Sam editor, a Unix-based text editor, adopted more commands when their experience increases, and the features being adopted late were more complex and powerful. Griffith (1999) considered technology features as triggers for initial user understanding of technologies and suggested the feature-based theory of sensemaking triggers (FBST). Jaspersen et al. (2005) emphasized the features of IT applications to understand the post-adoptive behaviors of IT adoption and use. Harrison and Datta (2007) compared the user perceptions of feature level usages and application level usages and found that users perceive a software application as a sum of features.

The features of a technology have been grouped in different ways. Griffith (1999) used two dimensions to divide technology features: core versus tangential; concrete versus abstract. Core features are the defining features of the technology while tangential features are not the main defining feature of a technology. Hence the usage of tangential features is optional. Concrete and abstract features are divided based on the amount of verifiable fact. Concrete features are easy to verify, and abstract features are difficult to verify only with special knowledge or tools. Jaspersen et al. (2005) divided feature sets into core features and ancillary features. The core features of a technology characterize the technology as a whole and the ancillary features are unused or unknown features to users and the use of those features are optional.

Technology complexity is another dimension to classify technology features. There has been little research in technology complexity. Rogers and Shoemaker (1971, 154) defined complexity as “the degree to which an innovation is perceived as relatively difficult to understand and use.” Meyer and Curley (1991, 456) defined technological complexity as “the depth and scope of the programming effort, the user environment, and related technical efforts involved in building such systems and in implementing them in production environments.” Meyer and Curley (1991, 1995) used the following variables to measure complexity: diversity of platforms, diversity of technologies, database intensity, network intensity, scope of the knowledge base programming effort, diversity of information source, diffusion of the expert system, and systems integration effort. Tornatzky and Klein (1982) found a negative relationship between the complexity of innovation and adoption. Thompson et al. (1991) also found a negative relationship between the perceived complexity of a PC and the utilization of PCs.

Considering all dimensions of technology features, core or concrete features are less complex. Thus, they were more accepted by internal auditors because the complexity of technology features negatively affects the use of technology (Tornatzky and Klein, 1982). Tangential, abstract, or ancillary features are generally more complex so that they are less accepted. As technology features becomes more complex,

perceived ease of use will decrease (Thompson et al., 1991). As perceived ease of use decreases, so will the corresponding technology usage. As technology features become less complex, perceived ease of use will increase, so the technology acceptance will increase. Thus, we hypothesized the relationship between technology acceptance and technology feature complexity as shown in hypothesis H7.

**H7.** As technology features become more complex, internal auditors are less likely to use those features due to a decrease in the perceived ease of use.

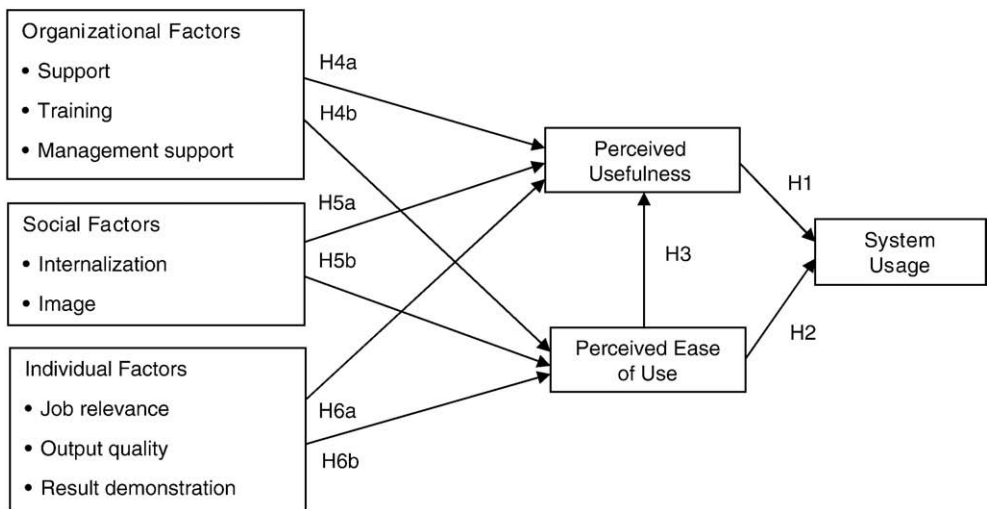
Taken together, Fig. 1 incorporates system usage, perceived usefulness, perceived ease of use, organizational factors, social factors, and individual factors. Organizational factors are defined as support or training given by the company including support, training, and management support. Social factors are defined as the influence of people around IT users including internalization and image. Individual factors are defined as cognitive factors that related to outcomes of IT including job relevance, output quality, and result demonstrability.

**3. Research methodology**

*3.1. Sample*

Data for this study were collected using a questionnaire survey. In July 2008, an announcement about the online survey was posted through GAIN system of national IIA. The announcement explained the purpose of the research project and provided informed consent about the internal auditors' willingness to participate in the study. A total 185 internal auditors responded out of a population of 1600 registered users (11.6% response rate). The sample size, 185, is close to the sample size of prior TAM research (Venkatesh and Davis, 2000; Venkatesh et al., 2003). In addition, it is more than five times the number of variables being analyzed in our structural equation model (Hatcher, 1994).

Here is a brief summary of the characteristics of the respondents. Most internal auditors were from the United States. The average revenue of companies was between 500 million and 1 billion dollars. The average number of employees was between 1001 and 5000. The primary industry of respondents was financial services/banking/real estate. The major job title of respondents was audit staff. The average size of internal audit activity was 7–15. The average audit experience is 6–10 years, and the average general business experience is 11–15 years. The majority of respondents have a bachelor's degree.



**Fig. 1.** Technology acceptance model for internal auditors.

### 3.2. Research instrument

In order to measure constructs, we used self-reported measures and multiple-act indicators. The measurement items are adopted from previous TAM research and modified to meet the needs of this research (Appendix 2). Through the pilot test with 70 internal auditors in the IIA, we found that management support was redundant in both organizational factors and social factors. In this study, we grouped management support items into organizational factors, and other human influence except management support was categorized into social factors. To reduce the number of questions for respondents, we removed the least influential variables in TAM: attitude toward using (Adams et al., 1992; Szajna, 1996) and behavioral intention to use (Adams et al., 1992; Straub et al., 1995).

System usage was adopted from Davis et al. (1989). Frequency and time are used to measure system usage. Frequency to use technologies (Raymond, 1985) is measured using a 7-point scale ranging from “not at all” to “several times each day.” The actual amount of time spent on technology per day (Lee, 1986) is measured using a 7-point scale ranging from “almost never” to “more than 4 hours.” In the case that features are not available to internal auditors, we separated the answer of N/A (not available) in each question. Perceived usefulness and perceived ease of use were extracted from the original TAM and other extended TAMs (Taylor and Todd, 1995). They are measured by two indicator variables with the 7-point Likert scale ranging from “strongly disagree” to “strongly agree.”

Organizational factors were extracted from the model of Igbaria et al. (1997), and they are measured by four indicator variables. One variable is from support questions, one from training questions, and two from management support questions. Social factors, consisting of four indicator variables, were extracted from the TAM2 (Venkatesh and Davis, 2000) and other modified TAMs (Thompson et al., 1991). Three variables were adopted from the model of Thompson et al. (1991) while one was adopted from internalization questions and three from image questions (Venkatesh and Davis, 2000). Individual factors are measured by four indicator variables. Two variables are from job relevance questions, one from output quality questions, and one from result demonstrability questions (Venkatesh and Davis, 2000). All variables are measured with the 7-point Likert scale ranging from “strongly disagree” to “strongly agree.”

### 3.3. Procedures

Through the pilot test, we selected six different features from audit software: database queries, ratio analysis, audit sampling, digital analysis, regression/ANOVA, and data mining classification. Appendix 3 shows the description of each feature. Less complex features such as database queries, ratio analysis, and audit sampling are considered as the basic features of audit software. Basic features, taught in most accounting and business curriculums, involve less mathematical background and prerequisite knowledge. More complex features such as digital analysis, regression/ANOVA, and data mining classification are considered as advanced features of audit software. Advanced features, typically not part of business curriculum and training for internal auditors, involve an understanding of non-parametric statistics and information theories.

Data collected from the survey were analyzed using four stages of assessments. First, the reliability and validity of the measures were examined. The internal consistency reliability was tested using Cronbach alpha coefficients of the measures. The convergent and discriminant validity of the measures were tested using the correlation between measures and the principal component analysis. Second, the structural equation model was used to test the causal relationship of TAM variables in the internal audit profession. Third, in order to analyze technology acceptance by features, the structural equation model of each feature was also applied. Fourth, to compare technology acceptance by feature complexity, *t*-tests were used. SPSS and AMOS were used through the whole procedures. External variables were excluded in the third and fourth stages because we did not expect interaction between external variables and features.

## 4. Results

### 4.1. Test of measurement

We assessed the properties of the measurement model. The result of reliability test is reported in Table 1. The data show that all measures are high in the internal consistency reliability with Cronbach's

**Table 1**  
Reliability test.

Construct	Cronbach's alpha	N of items
System usage (SU)	.900	2
Perceived usefulness (PU)	.961	2
Perceived ease of use (PEOU)	.944	2
Organizational factor (OF)	.856	4
Social factor (SF)	.852	4
Individual factor (IF)	.859	4

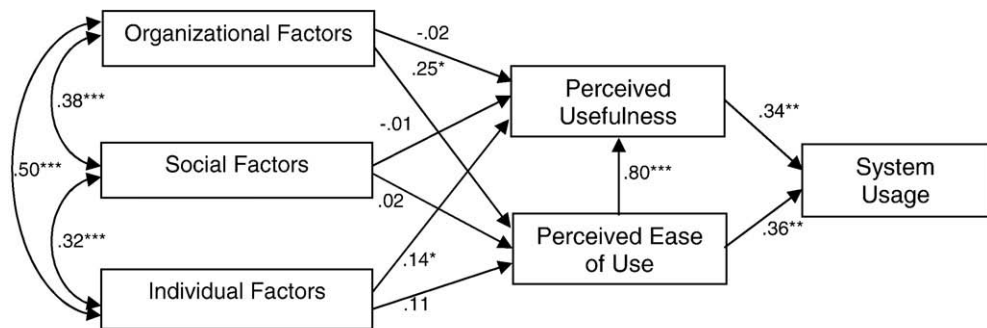
Alpha coefficients exceeding .80, which indicates appropriate internal consistency of measurement items (Fornell and Larcker, 1981).

The results in Appendix 4 demonstrate the convergent and discriminant validity of the TAM measures. For distinct constructs, the correlations among the items associated with the measure should be stronger than their correlations with the items representing other measures (Igarria et al., 1997). Items are highly correlated within a construct (system usage 0.820; perceived usefulness 0.924; perceived ease of use 0.896) and comparatively low correlated with items from other constructs, ranging from 0.532 to 0.770.

The convergent and discriminant validity of the external variables were tested to clarify the relationship among organizational factors, social factors, and individual factors. As shown in Appendix 5, the principal component analysis with varimax rotation was used. The rotated component matrix presents a clearer pattern of the construct. The first factor is highly correlated to individual factors, the second factor is highly correlated to organizational factors, and the third factor is highly correlated to social factors.

4.2. Structural equation model

Fig. 2 presents significant structural relationships among organizational factors, social factors, individual factors, perceived ease of use, perceived usefulness, and system usage. Consistent with H1 and H2, perceived usefulness has a positive effect on technology acceptance of internal auditors ( $\beta = .34, p < .01$ ), and perceived ease of use has a positive effect on technology acceptance of internal auditors ( $\beta = .36, p < .01$ ). Consistent with H3, perceived ease of use has a strong effect on perceived usefulness ( $\beta = .80, p < .001$ ). Inconsistent with H4a, organizational factors have no effect on perceived usefulness. Consistent



\*\*\* Regression weight is significant with less than 0.001.  
 \*\* Regression weight is significant with less than 0.01.  
 \* Regression weight is significant with less than 0.05.

Fig. 2. Structural equation result.



with H4b, organizational factors have a positive effect on perceived ease of use ( $\beta = .25, p = .013$ ). Inconsistent with H5a and H5b, social factors do not have influence on either perceived usefulness or perceived ease of use. Consistent with H6a, individual factors have a positive effect on perceived usefulness ( $\beta = .14, p = .019$ ). Inconsistent with H6b, individual factors have no effect on perceived ease of use.

#### 4.3. Technology feature acceptance

The difference of technology feature acceptance is easily shown using the structural equation model of each feature. Table 2 summarizes the regression weight and its significance level from the structural equation analysis. In database queries, perceived usefulness significantly affects the system usage ( $\beta = .43, p < .001$ ) while perceived ease of use has no effect on system usage. In ratio analysis and audit sampling ( $\beta = .71, p < .001$ ;  $\beta = .66, p < .001$ ), same phenomena happen to database queries. In digital analysis, perceived ease of use more affects on system usage ( $\beta = .52, p < .001$ ) while perceived usefulness has no effect on system usage. In regression/ANOVA and data mining classification, both perceived usefulness ( $\beta = .37, p < .01$ ;  $\beta = .49, p < .001$ ) and perceived ease of use ( $\beta = .35, p < .01$ ;  $\beta = .30, p < .05$ ) affect on system usage. Refer to Appendix 6 to see the comparison of means by different features.

#### 4.4. Technology acceptance by feature complexity

To examine technology acceptance by feature complexity, we used the *t*-test. Table 3 shows the result of *t*-test of basic features and advanced features by *FREQ*, *TIME*, *PU1*, *PU2*, *PEOU1*, and *PEOU2*. The result indicates that the technology acceptances of basic and advanced features are significantly different. System usage, perceived usefulness, and perceived ease of use are high in basic features and low in advanced features. This result is consistent with H7. As technology features become more complex, internal auditors are less likely to use those features due to a decrease in the perceived ease of use. Refer to Appendix 7 for the comparison of means by feature complexity.

### 5. Discussion

This study began with questions about technology features that would influence user behavior of technology acceptance. Through the analysis of six different features, we found that a negative relationship between feature complexity and technology acceptance in the internal audit profession. As feature complexity increases, feature usage decreases due to a decrease of perceived ease of use. Technology features have a large impact on technology acceptance in the internal audit profession as influencing system usage, perceived usefulness, and perceived ease of use. System usage, perceived usefulness, and perceived ease of use are high in basic features and low in advanced features. As such, we expect that technology features will have a large influence on technology acceptance in other professions.

We also found that the relationship of TAM variables is changed by technology features. Perceived ease of use has more impact on the usage of advanced features than perceived usefulness. Perceived usefulness has more impact on the usage of basic features than perceived ease of use. This analysis provided insights

**Table 2**  
Structural equation results of technology feature acceptance.

Path	Features					
	Database queries	Ratio analysis	Audit sampling	Digital analysis	Regression/ANOVA	Classification
PU → SU	.43***	.71***	.66***	.23	.37**	.49***
PEOU → SU	.23	-.05	-.01	.52***	.35**	.30*
PEOU → PU	.81***	.91***	.85***	.88***	.83***	.87***

\*\*\*Regression weight is significant with less than 0.001.

\*\*Regression weight is significant with less than 0.01.

\*Regression weight is significant with less than 0.05.

**Table 3**

T-test of basic and advanced features.

	Paired differences				<i>t</i>	df	Sig. (2-tailed)	
	Mean	Std. deviation	Std. error mean	95% Confidence interval of the difference				
				Lower				Upper
Pair 1 FREQ_B	1.411	1.292	.095	1.223	1.599	14.817	183	.000
Pair 2 TIME_B	1.366	1.214	.090	1.189	1.544	15.183	181	.000
Pair 3 PU1_B	2.617	2.280	.169	2.285	2.950	15.528	182	.000
Pair 4 PU2_B	2.698	2.344	.174	2.355	3.041	15.526	181	.000
Pair 5 PEOU1_B	.528	2.198	.163	2.207	2.850	15.522	181	.000
Pair 6 PEOU2_B	2.735	2.203	.163	2.414	3.056	16.793	182	.000

into technology acceptance by feature complexity. When adopting new technologies, feature complexity is important for internal auditors to accept these technologies. If internal auditors are not comfortable with the use of advanced features, they are much less likely to use that technology, even when it is beneficial to their organization. Accordingly, advanced feature training should focus on alleviating user concerns about using technology in addition to its usefulness.

In order to understand technology acceptance of internal auditors, we developed the revised TAM with external variables. The relationships among the primary TAM constructs were significant in the IA profession consistent with findings for general users. However, the impact of external variables was somewhat different in the IA profession. Organizational factors affect the technology acceptance of internal auditors through perceived ease of use while organizational factors affect the technology acceptance through perceived usefulness and perceived ease of use among general users. Social factors did not influence the technology acceptance of internal auditors while the technology acceptance of general users is significantly affected by social factors. Individual factors affect the technology acceptance of internal auditor through perceived usefulness in the same way as general users. We assumed that the experience of our respondents<sup>8</sup> decreased the effect of social factors because social factors were influenced by users' IT experience. Understanding the relationship of these external variables within IA professionals and establishing the correct balance of external variables is essential to further technology acceptance of internal auditors and foster a progressive atmosphere in the internal audit profession.

This study has some limitations. We asked internal auditors to evaluate system usage, perceived usefulness, and perceived ease of use at a feature level and organizational factors, social factors, and individual factors at a technology level because we assumed that external variables are not affected by features. So, we averaged the six features to calculate the system usage, perceived usefulness, and perceived ease of use of the technology. It resulted in the clear relationship of system usage, perceived usefulness, and perceived ease of use by feature or feature complexity, but it resulted in the weaker impact of external variables on the technology acceptance of internal auditors. Moreover, the features that we selected do not represent all technologies, so simply averaging chosen features would not be the same to evaluation of overall audit software.

We are interested in a number of extensions to our research. To identify more external variables that affect the technology acceptance of internal auditors, other external variables such as computer self-efficacy, affection, anxiety, etc, should be added to our research model. Future studies should design advanced feature training to help improve users' perception of ease of use as well as perceived usefulness because the technology acceptance and perceived ease of use are the critical paths when advanced features are used. This study should be replicated in other professions to verify the impact of technology features on technology acceptance in general.

<sup>8</sup> The average audit experience is 6–10 years, and the average general business experience is 11–15 years.

## Appendix 1. External variables of TAM

Variables in TAM	Definition of variables
Compliance	“when an individual accepts influence because he hopes to achieve a favorable reaction from another person or group” (Kelman, 1958, 53).
Identification	“when an individual accepts influence because he wants to establish or maintain a satisfying self-defining relationship to another person or group” (Kelman, 1958, 53).
Internalization	“when an individual accepts influence because the content of the induce behavior – the ideas and actions of which it is composed – is intrinsically rewarding.” (Kelman, 1958, 53).
Subjective norm	“degree to which an individual believes that people who are important to her/him think she/he should perform the behavior in question” (Fishbein and Ajzen, 1975, 302).
Image	“the degree to which use of an innovation is perceived to enhance one's ... status in one's social system” (Moore and Benbasat, 1991, 195).
Social influence	“the degree to which an individual perceives that important others believe he or she should use the new system” (Venkatesh et al., 2003, 451).
Job relevance	“individual's perception regarding the degree to which the target system is applicable to his or her job” (Venkatesh and Davis, 2000, 191).
Output quality	“how well the system performs those tasks” (Venkatesh and Davis, 2000, 191).
Result demonstrability	“tangibility of the results of using the innovation” (Moore and Benbasat, 1991, 203).
Internal support	“the technical support by individuals (or group) with computer knowledge who were internal to the small firm” (Igbaria et al., 1997, 288).
Internal training	“the amount of training provided other computer users or computer specialists in the company” (Igbaria et al., 1997, 288).
Management support	“the perceived level of general support offered by top management in small firms” (Igbaria et al., 1997, 289).
External support	“the technical support by individuals (or group) with computer knowledge who were external to the small firm” (Igbaria et al., 1997, 288).
External training	“the amount of training provided by friends, vendors, consultants, or educational institutions external to the company” (Igbaria et al., 1997, 288).
Facilitating condition	“provision of support for users of PCs may be one type of facilitating condition that can influence system utilization” (Thompson et al., 1991, 129). “the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system.” (Venkatesh et al., 2003, 453).

## Appendix 2. Measurement items

### System usage

FREQ: On average, how frequently do you use the following feature for job-related work? (Seven Likert scale ranged from “not at all” to “several times each day” and N/A).

TIME: On average, how much time do you spend per day using the following feature for job-related work? (Seven Likert scale ranged from “almost never” to “more than 4 hours” and N/A).

### Perceived usefulness

PU1: Using the following feature improves my job performance. (Seven Likert scale ranged from “strongly disagree” to “strongly agree” and N/A).

PU2: I find the following features useful in my job. (Seven Likert scale ranged from “strongly disagree” to “strongly agree” and N/A).

### Perceived ease of use

PEOU1: Learning to use the following feature is easy for me. (Seven Likert scale ranged from “strongly disagree” to “strongly agree” and N/A).

PEOU2: I find the following feature is easy to use. (Seven Likert scale ranged from “strongly disagree” to “strongly agree” and N/A).

Organizational factors (seven Likert scale ranged from “strongly disagree” to “strongly agree”).

OF1: Specialized instruction and education concerning internal audit technology is available to me.

OF2: Management is aware of the benefits that can be achieved with the use of internal audit technology.  
 OF3: Management always supports and encourages the use of internal audit technology for job-related work.

OF4: To what extent have you had training for internal audit technology?

Social factors (seven Likert scale ranged from “strongly disagree” to “strongly agree”)

SF1: I use the internal audit technology because of the proportion of coworkers who use that technology.

SF2: People in my organization who use internal audit technology have more prestige than those who do not.

SF3: People in my organization who use the internal audit technology have a high profile.

SF4: Having the internal audit technology is a status symbol in my organization.

Individual factors (seven Likert scale ranged from “strongly disagree” to “strongly agree”).

IF1: In my job, usage of internal audit technology is important.

IF2: In my job, usage of internal audit technology is relevant.

IF3: The quality of the output I get from internal audit technology is high.

IF4: The results of using internal audit technology are apparent to me.

### Appendix 3. Feature description

Features	Definition	Audit example	Software
1. Database queries	The primary mechanism for retrieving information from a database	Identify all payments over \$1000.	<ul style="list-style-type: none"> <li>• Querying (MS Access)</li> <li>• Querying (AS/400)</li> <li>• Extraction (IDEA)</li> </ul>
2. Ratio analysis	The calculation and comparison of ratios which are derived from the information in a company's financial statements or from other financial or non-financial information.	Divide current assets by current liabilities and determine whether the company has enough money to cover short term debts.	<ul style="list-style-type: none"> <li>• Financial Ratio Analysis/Trend Analysis (MS Excel)</li> <li>• Functions (IDEA)</li> </ul>
3. Audit sampling	The application of audit procedures to less than 100 % of the items within a population to obtain audit evidence about a particular characteristic of the population.	Determine how the sample should be selected and how large the sample should be using monetary unit sampling/PPS, classical variables sampling, attribute sampling, etc.	<ul style="list-style-type: none"> <li>• Attribute Sampling (IDEA, ACL)</li> <li>• PPS Sampling (IDEA, ACL)</li> </ul>
4. Digital analysis	The audit technology that uses digit and number patterns to detect fraud, errors, biases, irregularities, and processing inefficiencies based on Benford's Law.	Identify abnormalities in digit and number patterns, round number occurrences, duplication of numbers, etc.	<ul style="list-style-type: none"> <li>• Benford's Law (ACL)</li> <li>• DATAS (IDEA)</li> </ul>
5. Data mining: regression/ANOVA	Regression: A statistical technique used to discover a mathematical relationship between two or more variables using a set of individual observations. ANOVA: a statistical technique whether there are differences between the average value, or mean, across several population groups.	Identify the customer characteristics associated with various outcomes and determine factors most highly related to loan profitability.	<ul style="list-style-type: none"> <li>• Regression/ANOVA (SAS, SPSS)</li> </ul>
6. Data mining: classification	A data mining technique to predict membership of an individual observation in a predefined group using neural network, decision tree, etc. Typically the group has two values such as positive/negative or bankrupt/non bankrupt.	Explore large amounts of data, build a classification model, and apply the model to new data in order to generate prediction of memberships.	<ul style="list-style-type: none"> <li>• Classification (DBMiner)</li> </ul>

#### Appendix 4. Validity test of TAM measures

		FREQ	TIME	PU1	PU2	PEOU1	PEOU2
Correlation	FREQ	1.000	***.820	***.553	***.569	***.540	***.569
	TIME	***.820	1.000	***.532	***.549	***.542	***.544
	PU1	***.553	***.532	1.000	***.924	***.755	***.747
	PU2	***.569	***.549	***.924	1.000	***.748	***.770
	PEOU1	***.540	***.542	***.755	***.748	1.000	***.896
	PEOU2	***.569	***.544	***.747	***.770	***.896	1.000

\*\*\*Regression weight is significant with less than 0.001.

#### Appendix 5. Validity of external variables

A rotation converged in 5 iterations.

	Component		
	1	2	3
OF1	.208	.802	.111
OF2	.167	.830	.200
OF3	.177	.845	.095
OF4	.376	.650	.166
SF1	−.197	.447	.537
SF2	.135	.095	.924
SF3	.212	.153	.888
SF4	.082	.132	.856
IF1	.761	.251	.204
IF2	.876	.071	.099
IF3	.794	.327	.106
IF4	.834	.140	−.038

Extraction method: principal component analysis.  
 Rotation method: Varimax with Kaiser normalization.  
 A rotation converged in 5 iterations.

#### Appendix 6. Comparison of different features

TAM variables		Database queries	Ratio analysis	Audit sampling	Digital analysis	Regression/ANOVA	Classification
FREQ	Mean	2.95	1.93	2.90	1.28	1.07	1.23
	Std. dev.	1.863	1.369	1.776	1.274	1.011	1.140
TIME	Mean	2.80	1.71	2.58	1.01	.87	1.09
	Std. dev.	2.127	2.503	2.137	2.816	2.637	2.759
PU1	Mean	5.54	4.41	5.51	2.65	2.31	2.61
	Std. dev.	2.127	2.503	2.137	2.816	2.637	2.759
PU2	Mean	5.70	4.59	5.62	2.91	2.33	2.61
	Std. dev.	2.115	2.521	2.160	2.944	2.711	2.821
PEOU1	Mean	5.13	4.62	5.31	2.66	2.28	2.53
	Std. dev.	2.090	2.565	2.067	2.697	2.504	2.598
PEOU2	Mean	5.01	4.57	5.27	2.38	2.01	2.27
	Std. dev.	2.070	2.521	1.989	2.546	2.339	2.458

## Appendix 7. Comparison of basic features and advanced features.

TAM variables	Basic features		Advanced features	
	Mean	Std. dev.	Mean	Std. dev.
FREQ	2.61	1.331	1.19	1.012
TIME	2.36	1.318	.99	1.100
PU1	5.15	1.830	2.53	2.444
PU2	5.32	1.841	2.62	2.480
PEOU1	5.02	1.867	2.49	2.362
PEOU2	4.95	1.851	2.22	2.194

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