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The adoption of electronic tax filing systems: an empirical study

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Abstract

This paper discusses the factors affecting the adoption of electronic tax-filing systems. Using the technology acceptance model (TAM) as a theoretical framework, this study introduces “perceived credibility” as a new factor that reflects the user’s intrinsic belief in the electronic tax-filing systems, and examines the effect of computer self-efficacy on the intention to use an electronic tax-filing system. Based on a sample of 260 users from a telephone interview, the results strongly support the extended TAM in predicting the intention of users to adopt electronic tax-filing systems. The results also demonstrate the significant effect that computer self-efficacy has on behavioral intention through perceived ease of use, perceived usefulness, and perceived credibility. Based on the findings of this study, implications for electronic tax filing in particular and for e-government services in general are discussed. Finally, this paper concludes by discussing limitations that could be addressed in future studies. © 2002 Elsevier Inc. All rights reserved.

1. Introduction

Manual filing remains the traditional and most widespread method of submitting individual income tax returns for government revenue services, be it in Taiwan or any other country. For several years, both the United States and Canada have tried to introduce electronic filing systems to improve government operations and reduce costs. Tax authorities began applying the technology of two-dimensional (2D) bar code to income tax returns because it allows them to scan tax-filing data automatically into the computer without manual data entry.¹ As Web technology is becoming more and more popular, the introduction of Internet filing has

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brought fundamental changes to the method of filing income tax returns, with calls for additional research involving electronic government issues. In 1998, all three systems—manual, Internet, and 2D bar code—were available to taxpayers in Taiwan. Electronic tax-filing systems can then be defined as “nonmanual tax-filing systems,” which include both Internet and 2D bar-code² filing systems.

Despite all the efforts aimed at developing better and easier electronic tax-filing systems, these tax-filing systems remained unnoticed by the public or were seriously underused in spite of their availability. Therefore, there is a need to understand the acceptance by the users of the electronic tax-filing systems and identify the factors that can affect their decision to use or not use these electronic tax-filing systems. This issue is important in that the answer could help the government to plan and promote new forms of electronic tax-filing systems in the future.

There is a growing body of academic research being focused on examining the determinants of computer technology acceptance and utilization among users.³ Among the different models that have been proposed, the Technology Acceptance Model (TAM),⁴ which was adapted from the Theory of Reasoned Action (TRA),⁵ appears to be the most widely accepted among information systems researchers, perhaps because of its parsimony and the wealth of recent empirical support of it.⁶ According to TAM, adoption behavior is determined by the intention to use a particular system, which in turn is determined by perceived usefulness and perceived ease of use of that system. Although information systems researchers have investigated and replicated the TAM, and agreed that it is valid in predicting the individual’s acceptance of various corporate ITs,⁷ TAM’s fundamental constructs do not fully reflect the specific influences of technological and usage-context factors that may alter the acceptance of the users.⁸ As Davis noted, future technology acceptance research needs to address how other variables affect usefulness, ease of use, and user acceptance.⁹ However, factors affecting the acceptance of a new IT are likely to vary with the technology, target users, and the context.¹⁰ Recent research has indicated that “trust” has a striking influence on user willingness to engage in online exchanges of money and personal sensitive information.¹¹ Therefore, perceived ease of use and perceived usefulness may not properly explain the user’s intention to adopt the electronic tax-filing system. Consequently it becomes necessary to search for additional factors that can better predict the acceptance of electronic tax-filing systems.

One key benefit of using the TAM to understand system usage behavior is that it provides a framework to investigate the effects of external variables on system usage.¹² Several important external variables that have received more and more attention in the context of TAM research are individual differences, such as computer self-efficacy.¹³ Consistent with practice in the information systems research literature,¹⁴ individual differences refer to user factors that include traits such as personality and demographic variables, as well as situational variables that account for differences attributable to circumstances such as experience and training. Although there are points of similarity in prior research in terms of specific individual difference variables, considered to be germane influences on the acceptance of a new IT, it is evident from the mixed empirical results obtained in prior studies that the “process” through which individual differences influence IT acceptance are not well understood.¹⁵ Furthermore, there has been no such empirical research to explicate how individual

differences influence the usage intention of electronic tax-filing systems through TAM variables.

Therefore, the primary objective of this research is to extend the TAM in the context of electronic tax-filing systems. This study proposes a new construct (“perceived credibility”) to enhance the understanding of an individual’s acceptance behavior of electronic tax-filing systems. This research also identifies the critical individual difference variable (i.e., computer self-efficacy) that has a significant effect through the TAM framework on potential users’ intention to use an electronic tax-filing system. By explaining the usage intention from the perspective of the users, the findings of this research not only can help the government authorities to develop a better user-accepted electronic tax-filing system, but also provide insights into how to promote the new IT to potential users.

2. Background

2.1. *Technology acceptance model*

Based on theories in social psychology, such as the theory of reasoned action and the theory of planned behavior (TPB),¹⁶ the TAM has been validated as a powerful and parsimonious framework to explain the adoption of IT by the users. The TAM postulates that user adoption of a new information system is determined by their intention to use the system, which in turn is determined by their beliefs about the system. The TAM further suggests that two beliefs—perceived usefulness and perceived ease of use—are instrumental in explaining the variance in the users’ intention. Perceived usefulness is defined as the extent to which a person believes that using a particular system will enhance his or her job performance, while perceived ease of use is defined as the extent to which a person believes that using a particular system will be free of effort. Among the beliefs, perceived ease of use is hypothesized to be a predictor of perceived usefulness. Furthermore, both types of beliefs are influenced by external variables.

Previous research using the TAM has found that individual differences are important external variables. Individual difference variables play a crucial role in the implementation of any technological innovation in a wide variety of disciplines, including information systems, production, and marketing.¹⁷ Zumd’s review and synthesis of prior work, related to individual differences and management information systems successes, reveals a rich literature that has paid close attention to individual differences.¹⁸ Numerous individual difference variables have been studied, including demographic and situational variables, cognitive variables, and personality-related variables. Empirical research has also found significant relationships between individual differences and IT acceptance via TAM.¹⁹ However, the mixed empirical results obtained in prior work suggest that the “process” through which individual differences influence IT acceptance are not well understood. As Chen, Czerwinski, and Macredie noted, the effects of individual differences on the use of the new IT are yet to be found out.²⁰ Davis, Bagozzi, and Warshaw suggested that the internal psychological variables (i.e., the beliefs) that are central to TAM fully mediate the effects that all other variables in the external environment may have on an individual’s use of an innovation.²¹

Motivated by the insights from prior work on the potential existence of mediating variables, it is now possible to propose a more complete explanation of how individual differences influence the adoption of electronic tax-filing systems, via intervening TAM variables.

Although TAM has been applied to a wide range of IT,²² none has investigated the adoption behavior of electronic tax-filing systems using the TAM framework. Most of the prior studies were aimed at relatively simple ITs, such as personal computers, e-mail systems, word processing software, and spreadsheet software. However, caution needs to be taken when applying the findings developed for the earlier generations of IT to the new virtual environment. Not only is the new IT environment drastically different, the target user groups of electronic tax-filing systems usually have a more diversified education and socio-economic background than those for most other information systems. Thus, it is imperative to examine the acceptance of new technologies with different user populations in different contexts.²³ As an Internet-based technology, the usage context of electronic tax-filing systems is quite different from that of the stand-alone application software. Recent research reveals that users' perceived credibility of Web systems has a marked influence on user willingness to engage in online exchanges of money and personal sensitive information.²⁴ Most users who decline to provide personal information to Web sites report it is because they do not trust those who are collecting the data. Consequently, a new construct ("perceived credibility") is included in the extended TAM (not part of the original TAM) to enhance our understanding of an individual's acceptance behavior of electronic tax-filing systems in the Internet context.

Considering both the simplicity of TAM and the uniqueness of an electronic tax-filing system and the groups that use it, the extended TAM can be used with confidence as a theoretical framework to examine the effect of individual differences (i.e., computer self-efficacy) on users' acceptance of electronic tax-filing systems through three beliefs—perceived usefulness, perceived ease of use, and perceived credibility.

2.2. *Tax-filing systems in Taiwan*

There are three forms of tax-filing systems in Taiwan, including manual filing, 2D bar-code filing, and Internet filing systems. The electronic tax-filing systems are generally recognized as including the 2D bar-code filing and the Internet filing systems. The following section is a brief description of these forms of tax-filing systems in Taiwan.

Manual filing is the most traditional and popular method of filing individual tax returns in Taiwan. During the tax-filing period, taxpayers perform complex calculations and fill out a standard printed form either by hand or typewriter. The tax return and related documentation are submitted to the tax agency over the counter or by postal mail. The tax agency uses either manual data entry or image processing to enter the tax return data into its computers. When using the manual filing method, taxpayers need to understand the individual income tax laws, and the tax return is subject to errors through writing and/or calculations. For the tax collection department, manual filing represents a tedious task, where they have to enter the taxpayers' data into their computer system both quickly and accurately. Nevertheless, more than 70% of the 4.6 million Taiwan taxpayers used the manual filing method in 2002 (see Table 1).

Table 1
The usage of tax-filing systems in Taiwan

Year	Manual filing	2D bar-code filing	Unit: persons Internet filing
1998	4,476,202 (99.59%)	8,055 (0.18%)	10,230 (0.23%)
1999	4,554,071 (97.73%)	93,966 (2.02%)	11,577 (0.25%)
2000	4,271,189 (86.94%)	629,996 (12.82%)	11,527 (0.23%)
2001	3,965,277 (78.89%)	1,023,429 (20.36%)	37,621 (0.75%)
2002	3,282,077 (71.24%)	976,557 (21.20%)	348,156 (7.56%)

Source: The Taiwanese Government Tax Agency

2D bar-code filing was first introduced in Taiwan by the Taiwanese government in 1998. Taxpayers can download the 2D bar-code filing software over the Internet. The taxpayer then runs the software on his/her personal computer and completes a two- to three-page tax return, which can be submitted to the tax agency either by e-mail or postal mail. When the 2D bar-code tax return arrives at the tax agency, a bar-code scanner is used to input the two-dimensional bar code into the agency's computer system. As Hwang noted, the 2D bar-code system works like a paper to disk or paper to electronic data interchange (EDI) to store data and transmit it from one place to another.¹ With the 2D bar-code filing systems, errors in logical data entry and calculations are avoided because the tax-filing software automatically detects mistakes and makes corrections, thereby contributing to more accurate information being presented for assessment. At present, 2D bar-code filing systems play a crucial role in the tax return system of Taiwan. In 2002, about 21% of the Taiwanese taxpayers used the 2D bar-code filing systems to prepare their income tax return.

Internet filing was launched in Taiwan by the tax agency in 1998. Taxpayers can file their income tax returns via the Internet. Although the number of current Internet users in Taiwan reached over 7 million, less than 8% of Taiwan's taxpayers used the Internet filing systems in 2002. Reports on tax-filing systems have shown that potential users may not use the systems in spite of their availability.

After making such a large investment in building an electronic tax-filing system and improving its functions, it is critical to learn how people feel about these systems, and more importantly, what are the factors that will influence the intention to use the electronic filing system. Therefore, this study utilized the extended TAM as a theoretical framework to incorporate the critical individual difference variable, and investigate its effect on users' intention through beliefs regarding the electronic tax-filing system.

3. Research model and hypotheses

The research model tested in this study is shown in Fig. 1. In the extended model, like in many other studies using the TAM,²⁵ the "attitudes" construct was taken out so as to simplify the model. The proposed research model includes one individual difference variable (computer self-efficacy) and three beliefs variables (perceived ease of use, perceived usefulness, and perceived credibility), the selections of which are supported by prior studies in the information systems literature.

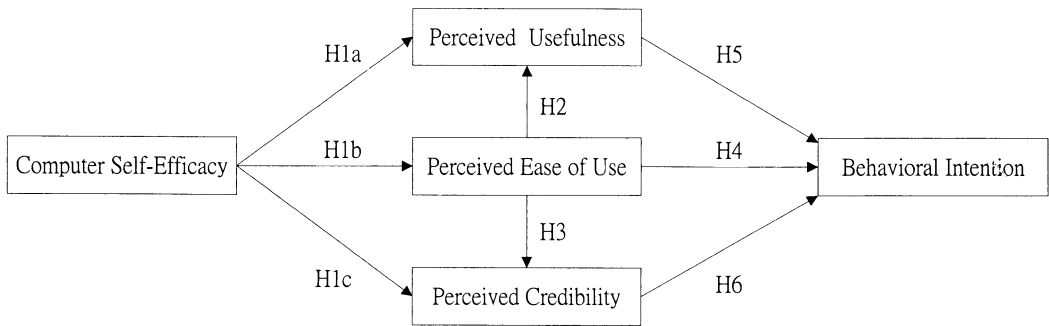


Fig. 1. The research model.

3.1. Computer self-efficacy

In general, prior research has suggested a positive relationship between experience with computing technology and a variety of outcomes such as affect toward computers and computer usage.²⁶ A related construct, called computer self-efficacy, has been examined in the IS literature.²⁷ Computer self-efficacy is defined as the judgment of one's ability to use a computer. Continuing research efforts on computer self-efficacy have been published in recent IS studies,²⁸ which confirm the critical role that computer self-efficacy plays in understanding individual responses to information technology. The proposed relationship between computer self-efficacy and perceived ease of use is based on the theoretical arguments by Davis²⁹ and Mathieson.³⁰ There also exists empirical evidence of the causal link between computer self-efficacy and perceived ease of use.³¹ Based on the social cognitive theory developed by Bandura,³² Igarria and Iivari postulated that computer self-efficacy affects an individual's computer anxiety, which, in turn, influences the perceived ease of use, perceived usefulness, and consequently the system usage.³³ However, computer experience might be positively related to the existence of concerns regarding the privacy and security of online exchanges, implying that computer self-efficacy will have a negative effect on perceived credibility of the electronic tax-filing systems. Therefore, based on the theoretical and empirical support from the IS literature, this study tested the following hypotheses:

H1a: Computer self-efficacy will have a positive effect on perceived usefulness of the electronic tax-filing systems.

H1b: Computer self-efficacy will have a positive effect on perceived ease of use of the electronic tax-filing systems.

H1c: Computer self-efficacy will have a negative effect on perceived credibility of the electronic tax-filing systems.

3.2. Perceived ease of use

Extensive research over the past decade provides evidence of the significant effect perceived ease of use has on usage intention, either directly or indirectly through its effect

on perceived usefulness.³⁴ In order to prevent the “underused” useful system problem, electronic tax-filing systems need to be both easy to learn and easy to use. ITs that are easy to use will be less threatening to the individual,³⁵ implying that perceived ease of use is expected to have a positive influence on the users’ perception of credibility in their interaction with the electronic tax-filing systems. Thus, this study hypothesized that perceived ease of use will have a positive effect on perceived usefulness, on perceived credibility, and on the behavioral intention to use the electronic tax-filing systems.

H2: Perceived ease of use will have a positive effect on perceived usefulness of the electronic tax-filing systems.

H3: Perceived ease of use will have a positive effect on perceived credibility of the electronic tax-filing systems.

H4: Perceived ease of use will have a positive effect on behavioral intention to use the electronic tax-filing systems.

3.3. *Perceived usefulness*

There is also extensive research in the IS community that provides evidence of the significant effect of perceived usefulness on the usage intention.³⁶ The ultimate reason that people exploit electronic tax-filing systems is that they find the systems useful to their tax return preparation. Therefore, this research tests the following hypothesis:

H5: Perceived usefulness will have a positive effect on behavioral intention to use the electronic tax-filing systems.

3.4. *Perceived credibility*

Besides the ease of use and usefulness beliefs, the usage intention of electronic tax-filing systems could be affected by users’ perceptions of credibility regarding security and privacy issues. The majority of computer system users are relatively ignorant about the security, or nonsecurity, of the system they use. In fact, if asked, they tend to claim that they do not care.³⁷ However, if the same people are asked to explain how they adapt their behavior according to the situation at hand, it rapidly becomes apparent that much of their behavior is based on their perceived sense of security or insecurity.³⁸ Besides, the Internet threatens the privacy of user information in new and extreme ways. This threat has pushed many users to opt out of various forms of participations on the Internet,³⁹ including providing personal sensitive information to Web sites or e-mail accounts for tax return purposes. The lack of perceived credibility is manifested in people’s concerns that the electronic tax-filing system (and/or the party behind the system) will transfer their personal tax return information to third parties without their knowledge or permission. Although this concern also exists in the physical world, this issue takes on greater urgency on-line, owing to the special characteristics of the Internet.⁴⁰ Therefore, perceived fears of divulging personal information and users’ feelings of insecurity provide unique challenges to planners to find ways in which to develop users’ perceived credibility of electronic tax-filing systems. Users are concerned about the level of security present when providing sensitive information on-line and will perform transactions only when they develop a certain level of trust.⁴¹ Therefore, perceived

credibility refers to the two important dimensions – security and privacy – that are identified in most studies as affecting the users' intention to adopt the on-line transaction systems.

Security refers to the protection of information or systems from unsanctioned intrusions or outflows. Fear of a lack of security is one of the factors that has been identified in most studies as affecting the growth and development of information systems. Thus, users' perception of the extent to which electronic tax-filing systems are able to ensure that transactions are conducted without any breach of security is an important consideration that might affect the use of the electronic tax-filing systems.

Privacy, on the other hand, refers to the protection of various types of data that are collected (with or without knowledge of the users) during the user's interaction with the electronic tax-filing system. Also, the perception of the user of the privacy policy and rules followed by the electronic tax-filing systems may affect the usage of the systems.

In general, the perceived credibility that people have in the system to conclude their transaction securely and to maintain the privacy of their personal information affects their voluntary adoption of electronic tax-filing systems. These results suggest the following hypothesis:

H6: Perceived credibility will have a positive effect on behavioral intention to use the electronic tax-filing systems.

4. Research design and method

4.1. Measures of the constructs

To ensure the content validity of the scales, the items selected must represent the concept about which generalizations are to be made.⁴² Therefore, items selected for the constructs were mainly adapted from prior studies to ensure content validity. One advantage of using the TAM to examine electronic tax-filing systems acceptance is that it has a well-validated measurement inventory. Items for the perceived ease of use and perceived usefulness were taken from the previous validated inventory, and then modified to fit the specific technology being studied. The items to measure behavioral intention were taken from previous applications of TAM.⁴³ Four items for the computer self-efficacy construct were adapted from the original instrument of computer self-efficacy as developed by Compeau and Higgins.⁴⁴ Finally, perceived credibility was measured by two statements specifically developed for this study. Likert scales (1~7), with anchors ranging from “strongly disagree” to “strongly agree” were used for all questions except for the items measuring computer self-efficacy. The anchors of the items measuring computer self-efficacy ranged from “not at all confident” to “totally confident.” Fig. 2 lists the items used in this study.

4.2. Data collection procedure

A telephone interview method was employed for the survey. A representative cross-section of the Taiwanese adult population was included in the interview sample. Respondents were screened as to whether they had ever filed an income tax return. Only those who had

Perceived ease of use

- PEU1 Learning to use the electronic tax-filing systems (2-D bar code or Internet filing) is easy for me.
- PEU2 It would be easy for me to become skillful at using the electronic tax-filing systems.
- PEU3 I would find the electronic tax-filing systems easy to use.

Perceived usefulness

- PU1 Using the electronic tax-filing systems would improve my performance in preparing income tax return.
- PU2 Using the electronic tax-filing systems would enable me to accomplish my income tax return more effectively.
- PU3 Using the electronic tax-filing systems make it easier for me to prepare income tax return.

Perceived credibility

- PC1 Using the electronic tax-filing systems would not divulge my personal information.
- PC2 I would find the electronic tax-filing systems secure in preparing income tax returns.

Behavioral intention

- BI1 Assuming that I have access to the electronic tax-filing systems, I intend to use it.
- BI2 I intend to increase my use of the electronic tax-filing systems in the future.

Computer self-efficacy

I could prepare my income tax return using the electronic tax-filing systems...

- CSE1 ...if I could call someone for help if I got stuck.
 - CSE2 ...if someone else had helped me get started.
 - CSE3 ...if I had just the built-in help facility for assistance.
 - CSE4 ...if someone showed me how to do it first.
-

Fig. 2. Items used in study.

Table 2
Fit indices for measurement and structural models

Fit indices	Recommended value	Measurement model	Structural model
χ^2/df	≤ 3.00	2.63	3.0
Goodness-of-fit (GFI)	≥ 0.90	0.92	0.90
Adjusted goodness-of-fit (AGFI)	≥ 0.80	0.87	0.85
Normed fit index (NFI)	≥ 0.90	0.96	0.96
Non-normed fit index (NNFI)	≥ 0.90	0.97	0.96
Comparative fit index (CFI)	≥ 0.90	0.98	0.97
Root mean square residual (RMSR)	≤ 0.10	0.023	0.064

previously filed an income tax return continued with the interview. The interviews were conducted over a period of three weeks by a team of 3 interviewers. All interviewers had prior experience in conducting telephone interviews. A standard interview protocol was utilized by all interviewers. Out of 335 interviews conducted, 260 interviews of those with experience of filing income tax returns were obtained for data analysis. Fifty-two percentage of the 260 respondents were female and the majority (78%) were between twenty and forty years of age.

5. Data analysis and results

5.1. Measurement model

A confirmatory factor analysis using LISREL 8.3 was conducted to test the measurement model. Seven common model-fit measures were used to assess the model's overall appropriateness of fit: the ratio of χ^2 to degrees-of-freedom (df.), goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), normalized fit index (NFI), non-normalized fit index (NNFI), comparative fit index (CFI), and root mean square residual (RMSR). As shown in Table 2, all the model-fit indices exceeded their respective common acceptance levels suggested by previous research, thus demonstrating that the measurement model exhibited a fairly good fit with the data collected. We could therefore proceed to evaluate the psychometric properties of the measurement model in terms of reliability, convergent validity, and discriminant validity.

Reliability and convergent validity of the factors were estimated by composite reliability, and by the average variance extracted (see Table 3). The composite reliabilities can be calculated as follows: (square of the summation of the factor loadings)/{(square of the summation of the factor loadings)+(summation of error variables)}. The interpretation of the resultant coefficient is similar to that of Cronbach's alpha, except that it also takes into account the actual factor loadings, rather than assuming that each item is equally weighted in the composite load determination. Composite reliability for all the factors in the measurement model was above 0.90. The average extracted variances were all above the recommended 0.50 level,⁴⁵ which meant that more than one-half of the variances observed

Table 3
Reliability, average variance extracted, and discriminant validity

Factor	CR	1	2	3	4	5
1. Computer self-efficacy	0.97	0.88				
2. Perceived ease of use	0.98	0.19	0.93			
3. Perceived usefulness	0.96	0.16	0.50	0.88		
4. Perceived credibility	0.96	−0.00	0.12	0.22	0.92	
5. Behavioral intention	0.92	0.11	0.50	0.42	0.32	0.86

CR = Composite Reliability

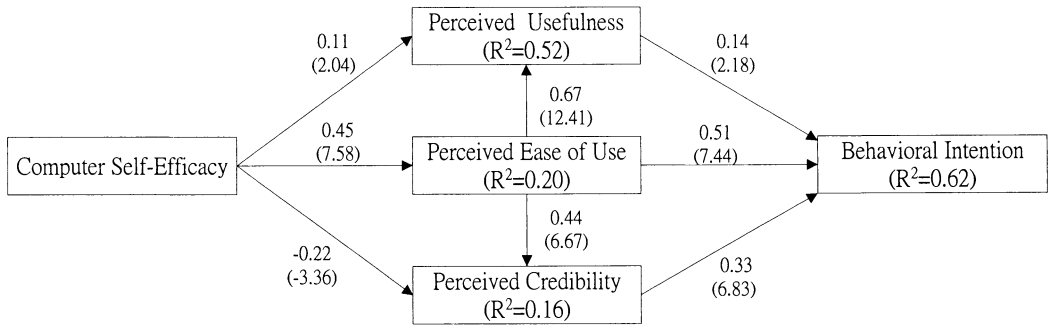
Diagonal elements are the average variance extracted. Off-diagonal elements are the shared variance.

in the items were accounted for by their hypothesized factors. Convergent validity can also be evaluated by examining the factor loadings and squared multiple correlations from the confirmatory factor analysis (see Table 4). Following Hair, Anderson, Tatham, and Black's recommendation,⁴⁶ factor loadings greater than 0.50 were considered to be very significant. All of the factor loadings of the items in the research model were greater than 0.90. Also, squared multiple correlations between the individual items and their a priori factors were high (above 0.80 in all cases). Thus, all factors in the measurement model had adequate reliability and convergent validity.

To examine discriminant validity, this study compared the shared variances between factors with the average variance extracted of the individual factors.⁴⁷ This analysis showed that the shared variances between factors were lower than the average variance extracted of the individual factors, thus confirming discriminant validity (see Table 3). In summary, the measurement model demonstrated adequate reliability, convergent validity, and discriminant validity.

Table 4
Factor loadings and squared multiple correlations of items

	Factor loadings	Squared multiple correlations
Computer self-efficacy		
CSE1	0.93	0.87
CSE2	0.96	0.91
CSE3	0.92	0.85
CSE4	0.95	0.89
Perceived ease of use		
PEU1	0.96	0.92
PEU2	0.97	0.94
PEU3	0.97	0.94
Perceived usefulness		
PU1	0.95	0.89
PU2	0.94	0.88
PU3	0.94	0.88
Perceived credibility		
PC1	0.98	0.95
PC2	0.94	0.89
Behavioral intentions		
BI1	0.92	0.85
BI2	0.93	0.87



Note: t-values for standardized path coefficients are described in parentheses.

Fig. 3. Hypotheses testing results.

5.2. Structural model

A similar set of fit indices were used to examine the structural model (see Table 2). Comparison of all fit indices with their corresponding recommended values provided evidence of a good model fit ($\chi^2/df. = 3.0$, GFI = 0.90, AGFI = 0.85, NFI = 0.96, NNFI = 0.96, CFI = 0.97, RMSR = 0.064). Thus, we could proceed to examine the path coefficients of the structural model.

Properties of the causal paths, including standardized path coefficients, t-values, and variance explained for each equation in the hypothesized model are presented in Fig. 3. As expected, hypotheses H4, H5, and H6 were supported in that perceived ease of use, perceived usefulness, and perceived credibility all had a significant positive effect on behavioral intention. Altogether, they accounted for 62% of the variance in behavioral intention with perceived ease of use ($\beta=0.51$) contributing more to intention than either perceived usefulness ($\beta=0.14$) or perceived credibility ($\beta=0.33$). In addition, hypotheses H2 and H3 were also supported. Perceived ease of use had a positive effect on both perceived usefulness ($\beta=0.67$) and perceived credibility ($\beta=0.44$). The total effect of perceived ease of use on behavioral intention was 0.75.

As for the paths from the individual difference variable to the three TAM factors, the results were significant. With t values above 2.0 being considered significant, all three hypotheses concerning the effects of computer self-efficacy on perceived usefulness, perceived ease of use, and perceived credibility were supported (H1a, H1b, H1c). Computer self-efficacy had a positive effect on both perceived usefulness and perceived ease of use, and had a negative effect on perceived credibility. The total effect of computer self-efficacy on behavioral intention was 0.28.

6. Discussion and implications

This study has several implications for electronic government services in general, and for electronic tax filing in particular. The following discussion of the implications of this

research for the development of electronic tax filing, as well as electronic government services in general, might be applied to other national governments that have tried electronic tax filing system and electronic government services.

6.1. Implications for electronic tax filing systems

This study focused on the extended technology acceptance model to illustrate the process by which the critical individual difference variable (i.e., computer self-efficacy) influenced technology acceptance. Most empirical studies of TAM examined relatively simple end-user technologies. It has never been clear whether the constructs and relationships embodied in TAM would be equally applicable to more complex technologies. Therefore, this study represents a pioneering effort by applying TAM to the emerging context of electronic government—electronic tax-filing systems. Using the technology acceptance model (TAM) as a theoretical framework, this study introduced “perceived credibility” as a new TAM factor that reflects the user’s intrinsic belief in the acceptance of electronic tax-filing systems, and examines the effect of computer self-efficacy on the intention to use the electronic tax-filing systems.

The findings of this study strongly support the appropriateness of using the extended TAM to understand people’s intention to adopt the electronic tax-filing systems. The significant effects of perceived usefulness, perceived ease of use, and perceived credibility on behavioral intention were observed, with perceived ease of use exerting a stronger influence than either perceived usefulness or perceived credibility. This study also found the new TAM variable (“perceived credibility”) to have a stronger influence on behavioral intention than the traditional TAM variable (“perceived usefulness”) in the context of electronic tax filing. Given the fact that the usage of the electronic tax-filing systems is completely voluntary, and that the target user group consists of a large number of people with diversified backgrounds, the findings of this study suggest that in order to attract more users to use electronic tax-filing systems, it is not enough to develop a useful system and make the system easy to interact with. It is of paramount importance to develop electronic tax-filing systems that provide a solid trustworthy protection regarding security and privacy for the users. This way the government authorities need not concern themselves so much with attempting to directly influence behavioral intentions. As suggested by the extended TAM, these internal psychological processes should result automatically if belief formations are managed appropriately. Thus, the attention of management might be more fruitfully focused on the “development” of belief. Especially, the government authorities should employ training and promotion approaches to develop people’s beliefs of usefulness, ease of use, and credibility, which in turn influence their behavioral intention to adopt electronic tax-filing systems.

The results of this study provide evidence of the significant effect of computer self-efficacy on behavioral intention through perceived ease of use, perceived usefulness, and perceived credibility. Consistent with the proposed hypotheses, users who have higher computer self-efficacy are likely to have more positive usefulness and ease of use beliefs, but also will have more negative credibility belief about the electronic tax-filing systems. This finding also supports prior research that has found a significant direct relationship between computer self-efficacy and perceived ease of use,⁴⁸ and extends its generalizability to

electronic tax-filing systems. While computer self-efficacy had a negative effect on perceived credibility, its total effect on behavioral intention is positive. Hence, the government authorities can increase the usage intentions of the people by promoting computer self-efficacy, and the three mediating TAM variables. In order to increase the computer self-efficacy of people, the government authorities can organize training courses on various computer and Internet applications to increase the people's familiarity with information technologies. Even if these courses are not directly related to the electronic tax-filing system itself, they can still help the people to develop positive usefulness and ease of use beliefs about the system.

6.2. Implications for electronic government services

This study provides several important implications for building and promoting effective electronic government services in general. Overall, electronic government can be defined as a government's "use of technology, particularly Web-based Internet applications, to enhance the access to and delivery of government information and service to citizens, business partners, employees, other agencies, and entities."⁴⁹ As described earlier, government authorities should pay more attention to developing the computer self-efficacy of people, usefulness, ease of use, and credibility beliefs, which in turn influence people's behavioral intention to adopt specific electronic government services. The 2002 global electronic government report conducted by the Center for Public Policy at Brown University ranked Taiwan as the first country in the availability of electronic government services.⁵⁰ This means that the implementation strategies of the Taiwanese Electronic Government Program⁵¹ launched in April 2001 (the program will run from 2001 to 2004) might be helpful for other nations that have tried to build and promote effective electronic government services. The following provides some insights for electronic government implementation based on the findings of this research and Taiwan's electronic government program.

In order to develop useful, easy-to-use, and trustworthy electronic government services, the Taiwanese government has adopted the following implementation strategies:

- Enhancement of the broadband Government Service Network (GSN) that has been developed to link all government organizations/agencies.
- Establishment of Web sites for all government agencies to enhance public disclosure of government information. The government has also increased its administrative efficiency and public services by implementing online personnel affairs (<http://www.cpa.gov.tw>), online procurement (<http://gpic.pcc.gov.tw>), government publication services (<http://gpnet.nat.gov.tw>), and online employment services (<http://www.nyc.gov.tw>).
- Establishment of an electronic government authentication and security system, implementation of a public key infrastructure, provision of online identification and certification services, strengthening trustworthiness of online information, and enhancement of online safeguards: The Government Certificate Authority (GCA, <http://www.pki.gov.tw>) has issued 200,000 certificates for a range of Internet-based services, such as

tax reporting, motor vehicle services, online disbursements, online procurement, and electronic document interchange.

- Establishment of an electronic government network security and computer incident report mechanism, and the creation of an electronic government security audit system.
- Formulation of information-related laws and standards. The government has also promoted online access to laws and regulations by compiling a national legal database (<http://law.moj.gov.tw>).
- Promotion of widespread computerization, and raising of the levels of government information applications.
- Promotion of administrative data interchange and innovative services, development of interdepartmental gateway systems, and an elimination of the need for physical transcripts.
- Enhancement of Geographic Information Systems (GIS) data interchange, and establishment of GIS databases to achieve integration and support of government decision-making.
- Promotion of G2B and G2C services, establishment of an integrated government portal service (<http://www.gov.tw>), and promotion of operating procedure reform so as to be able to provide “single window” and “one stop” services.

In addition, in order to develop the computer self-efficacy of the people, and to alleviate the digital divide between urban and rural areas, the Taiwanese government has formulated the following strategies:

- Promotion of universal e-learning for civil servants to insure all are qualified to work with electronic government applications.
- To encourage citizens to use computers and the Internet, the government has set up Internet access/service points nationwide. Moreover, the government has helped 6,500 villages and municipalities to establish their own Web sites (<http://village.gov.tw>), and has established many Internet service points in remote areas.

Supported by the development of information technology, the Taiwanese government has started taking steps toward effective electronic government. However, in order to continue the progress of electronic government, this research indicates that the Taiwanese government needs to focus on some specific areas:

- Provision of up-to-date and useful government information, and enhancement of government information dissemination, sharing and integration.
- Deepening and broadening of the electronic government services and contents, and promotion of the usefulness and convenience of these services.
- Continuing to establish user-friendly Web sites for all government agencies, and promotion of the availability and ease of use of the electronic government services.
- Formulation of information-related laws, strengthening the security and trustworthiness of electronic government services without a reduction in convenience, and enhancement of people’s concept regarding information security and privacy.
- Development of computer self-efficacy of the citizens and civil servants by training and education in schools, government, business, and society.

- Alleviating the digital divide resulting from family income, educational attainment, occupation, employment status, race, gender, age, and geography.

7. Limitations of this research

This empirical study has several limitations. First, investigations into electronic tax-filing systems adoption is relatively new to IS researchers. The discussed findings and their implications are obtained from one single study that examined a particular technology, and targeted a specific user group in Taiwan. Thus, caution needs to be taken when generalizing these findings and discussion to other technologies, groups, or governments. Second, this research did not incorporate actual usage behavior in the proposed model. However, this is not a serious limitation as there is substantial empirical support for the causal link between intention and behavior.⁵² Third, the relatively low R-square reported by the current research represents another limitation. Hence, there may be a need to search for additional variables that improve our ability to predict usage intentions more accurately. For example, variables related to social factors similar to subjective norm, and facilitating conditions similar to perceived behavioral control that are present in other behavioral models of technology acceptance, might be added to the extended TAM. Some other individual differences, such as age, level of education, Internet experience, and computer anxiety, need to be investigated in the future. Prior research has found computer anxiety to be a construct distinct from computer self-efficacy. Future research can also examine whether system characteristics, such as screen design and feedback, have any influence on the acceptance of electronic tax-filing systems. Fourth, the use of self-report scales to measure study variables suggests the possibility of a common method bias for some of the results. Future research should employ both objective and subjective measures, and examine the correspondence (or lack thereof) between them. Finally, this study was conducted with a snapshot research approach. Additional research efforts are needed to evaluate the validity of the investigated models and my findings. Longitudinal evidence might enhance our understanding of the causality and interrelationships between or among variables important to electronic tax-filing systems acceptance by individuals.

8. Conclusions

This research is a response to the call for user-oriented research in electronic government. Utilizing the extended technology acceptance model as a theoretical framework, the critical individual difference variable ('computer self-efficacy'), was proposed to have significant influence on the intention to use an electronic tax-filing system through perceived usefulness, perceived ease of use, and perceived credibility. The contributions of this study to technology acceptance research are twofold. First, it has successfully applied the extended TAM in a new information context (i.e., electronic tax filing), which is very different from the systems examined in prior studies. Perceived ease of use, perceived usefulness, and perceived credibility were found to be significant antecedents of the intention to use an electronic

tax-filing system. Second, computer self-efficacy was found to be an important determinant of perceived ease of use, perceived usefulness, and perceived credibility of the electronic tax-filing systems. The findings of this study provide important implications for developing effective electronic government services in general and effective electronic tax-filing systems in particular.

Notes

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