E-government adoption in Cambodia: a partial least squares approach

Sinawong Sang

National ICT Development Authority (NiDA), Phnom Penh, Kingdom of Cambodia, and

Jeong-Dong Lee and Jongsu Lee

Technology Management, Economics, and Policy Program (TEMEP), Seoul National University, Seoul, Republic of Korea

Abstract

Purpose – The purpose of this paper is to investigate factors influencing end-user acceptance and use of government administration information system (GAIS).

Design/methodology/approach – A conceptual structural model of end-user acceptance and use of the GAIS was developed with technology acceptance model as a theoretical background and tested using a structural equation modeling with partial least squares (PLS) approach on a data collected from a survey among 112 public officers in 12 ministries in Cambodia.

Findings – The results indicate that the factors influencing end-user adoption of the GAIS are significantly affected by perceived usefulness, relative advantage, and trust. Perceived usefulness of the GAIS is directly affected by subjective norm, image, output quality, and perceived ease of use.

Practical implications – The results are of practical significance to all those interested in this area, mainly the government policy makers and practitioners in Cambodia's public services.

Originality/value – The paper is the first to investigate end-user adoption of the GAIS. It is unique to Cambodia. It adds to the limited literature in e-government in Cambodia. Simultaneously, the PLS approach use in this study is quite unique with government information system research. As such, it contributes to the methodology development in the government information system research field.

Keywords Government, Information systems, Innovation, Communication technologies, User studies, Cambodia

Paper type Research paper

1. Introduction

The public sector plays a very important role in social and economic development by supporting high levels of welfare for citizens, ensuring socio-economic cohesion and supporting the functioning of a competitive market environment (Commission of the European Communities, 2003). It is engage in a wide range of activities from education, healthcare, and social security to protecting consumers and strengthening the environment (Commission of the European Communities, 2003). Therefore, one country's economic strength requires a proper functioning of its public sector.

In Cambodia, however, its public sector still faces a variety of challenges to effective governance, including corruption, poor public administration, and lack of adequate transparency and accountability in the exercise of public decision making and the delivery of public services (Sang, 2008). To cope with these challenges, the government has

introduced e-government system, in a form known as government administration information system (GAIS) in its organizational structure, practices, and capacities.

Revenue generation, along with better government image (IM) and services, is the main objective of the GAIS. The GAIS involves four practical applications: an electronic approval system (EAS), a vehicle registration system (for cars and motorbikes), a resident registration system, and a real estate registration system. The purpose of the EAS is to allow ministries to exchange documents both internally and externally. It incorporates all traditional manual functions to allow easy use of the system. This application would cut down unnecessary delays and result in better public services. The vehicle registration system is used for managing basic vehicle data such as registration, ownership transfer, safety inspection, identification number, applicable taxes, vehicle certificates, and statistics. The resident registration system is used for managing basic resident data such as family composition, children of school age, change in family status due to marriage, divorce, birth or death, and other statistics, as well as information for ID card issuance, election administration, foreign residents, and applicable taxes. The real estate registration system is used for managing basic land records such as division and merger, ownership transfer, common land, applicable taxes, real estate certificates, and statistics.

The GAIS was designed and implemented with total participations from each individual ministry, the state secretariats and the Phnom Penh municipality through its representative/s in the working group with the National ICT Development Authority Secretariat as the focal point. The infrastructures for the four applications include the local area network and wide area network for 27 ministries, state secretariats and the Phnom Penh municipality. All 27 government ministries at the national level and the municipality of Phnom Penh are now fully connected. The connection allows all government offices to communicate electronically and to access to the internet and email at their convenience. The real estate, resident, and vehicle registration systems are in operation and are widely used. These computerized registration systems help facilitate the registration process and make people lives easier because they do not have to stand and wait in line wasting their precious time which could turn into other profitable activities. However, the EAS does not yet enjoy wide use, even though the EAS has many useful functions, including EAS, mail, bulletin board, user and organization chart, document management, and administration tool. Only a few technical documents or reports have been sent using the EAS. Users still prefer the traditional manual administrative means (Phu, 2003; Sang *et al.*, 2009). Therefore, the government needs research that identifies the factors that influence end-user acceptance of the GAIS. The objective of this paper, therefore, was designed to address the following question: What factors contribute to end-user acceptance of the GAIS?

The remainder of this paper is organized as follows. It begins with theoretical background, followed by conceptual model and research hypotheses. Next, it describes the research methodology and presents the analytical results of the study. Then, it discusses these results. Finally, it concludes by examining implications and suggestions for future research.

2. Theoretical background
To determine the factors that affect individuals' decision adopt and use information technology, many theories and models have been developed. These theories and models

are diverse and no single theoretical approach has yet found favor (Imran and Grego, 2007). Theories and models that have gained much popularity in the literature due to its success in determining the acceptance and use of information technology are (Venkatesh and Davis, 2000): the technology acceptance model (TAM) (Davis, 1989; Davis *et al.*, 1989) and the Diffusion of Innovations theory (DOI) (Rogers, 1995). However, these theories have been developed and tested mainly in the context of developed or western countries and few studies have been done in the context of developing countries (Imran and Grego, 2007), and in particular, it has not been studies in Cambodia. More specifically, the study of factors affecting individual user acceptance and adoption of e-government services have been examined in many developed countries such as the USA (Bélanger and Carter, 2008; Carter and Bélanger, 2005; Carter and Weerakkody, 2008), the UK (Carter and Weerakkody, 2008), and Slovenia (Kunstelj *et al.*, 2009). However, the study is limited in developing countries (Imran and Grego, 2007), and no study in Cambodia.

In this study, therefore, the theoretical grounding comes from the TAM (Davis *et al.*, 1989) and the DOI (Rogers, 2003). According to TAM, whether or not an individual end-user is inclined to accept and use a given system is dependent on two particular beliefs: perceived usefulness and perceived ease of use (PE) (Davis *et al.*, 1989). These two beliefs influence one's attitude towards system usage, which influences one's behavioural intention to use a system, which, in turn, determines actual system usage (Figure 1). The causal relationships have been validated empirically in many studies of user acceptance in different settings: for example, to test the acceptance of: online shopping (Gefen *et al.*, 2000; van Slyke *et al.*, 2004), mobile computing (Wu *et al.*, 2007), e-commerce (Pavlou, 2003), and e-government services (Carter and Bélanger, 2005).

The external variables that impact the perceived usefulness and PE are not completely explored in TAM. Thus, Venkatesh and Davis (2000) proposed the extended TAM (TAM2) by adding more important determinants of perceived usefulness, that is, subjective norm, IM, job relevance, output quality, result demonstrability, and PE, as well as two moderators, experience and voluntariness (Figure 2). Subjective norm and IM capture the social influence processes. Job relevance, output quality, result demonstrability, and PE are the four determinants of perceived usefulness that represent the influence of cognitive instrumental processes. Moreover, TAM2 omits attitude toward using because of weak predictors of either behavioral intention to use (IU) or actual system usage (Venkatesh and Davis, 2000; Wu *et al.*, 2007).

Venkatesh *et al.* (2003) developed the unified theory of acceptance and use of technology (UTAUT) model through a review and consolidation of the constructs of all
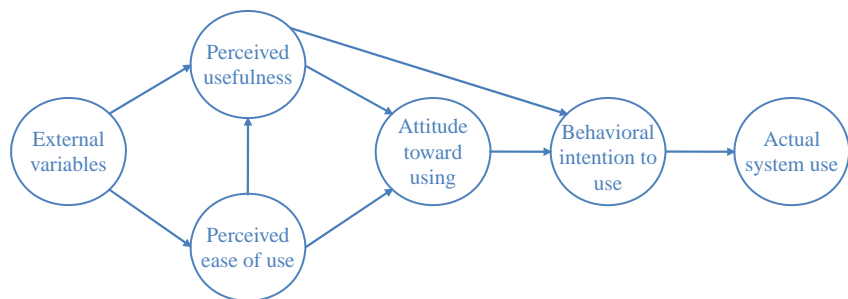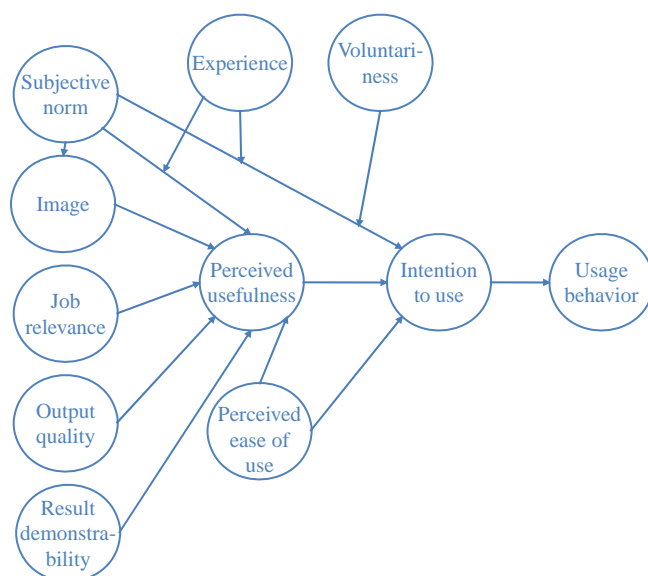

Figure 1.
Technology acceptance model

Source: Davis *et al.* (1989)

Source: Venkatesh and Davis (2000)

previous TAM related studies. The UTAUT model theorized that four core constructs (performance expectancy, effort expectancy, social influence, and facilitating conditions) are direct determinants of usage intention and behaviour (Venkatesch *et al.*, 2003). Gender, age, experience, and voluntariness of use are posited to mediate the impact of the above four core constructs on usage intention and behaviour (Venkatesch *et al.*, 2003).

Some researchers have modified TAM by adding DOI theory as a factor affecting the IU technology (Agarwal and Prasad, 1998; Carter and Bélanger, 2005; Tornatzky and Klein, 1982). As shown in Figure 3, five factors affect the rate of individual adoption of innovations include: relative advantage, compatibility, complexity, triability, and observability (Rogers, 2003). However, research has suggested that only the relative advantage, compatibility and complexity are more consistently related to innovation adoption (i.e. more important than others in predicting IU a technology) (Carter and Bélanger, 2005; Agarwal and Prasad, 1998; Tornatzky and Klein, 1982). Moreover, it has been suggested that the complexity construct in the DOI is often considered as a PE construct in the TAM and the relative advantage construct is represented by perceived usefulness in the TAM (Agarwal and Prasad, 1997; Carter and Weerakkody, 2008; Moore and Benbasat, 1991).

In addition to the DOI's determinants, some researchers have also modified TAM by including trust (TR) construct as a factor influencing the IU technology (Carter and Bélanger, 2005; Carter and Weerakkody, 2008). In the context of e-government adoption, TR has two important components: TR of the government and TR of the internet (Carter and Bélanger, 2005; Carter and Weerakkody, 2008; Pavlou, 2003). Lack of TR in online transactions (TR of the internet) has been identified a main obstacles in e-government adoption (Carter and Bélanger, 2005; Horst *et al.*, 2007), since transactions over the internet entail a great deal of uncertainty and risk (Bélanger and Carter, 2008). Therefore,
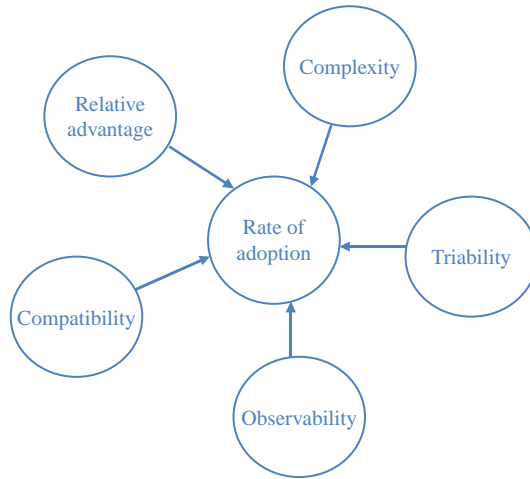
Figure 3.
Diffusion of innovations

Source: Rogers (2003)

the government needs to establish TR in the online services they provide or will be providing (Warkentin *et al.*, 2002).

3. Conceptual model and research hypotheses

In this study, we do not employ the UTUAT model because the study does not focus on the moderators such as gender, age, experience, and voluntariness that the UTUAT is theorized. Therefore, instead of using the UTUAT model, we build our model by integrating key relevant constructs from the TAM, TAM2, DOI, and TR literature to investigate factors that influence end-user acceptance of the GAIS.

We do not include the construct of voluntariness. Voluntariness is the degree to which individuals feel they have the choice to use the innovation or not (van Slyke *et al.*, 2004). Since the use of the GAIS is an individual option and is not likely to be mandated, nor is there any expectation that it would be mandated in the future, voluntariness would be unlikely to show any variability, and is therefore inappropriate to include in this study. In this connection, subjective norm had no direct effect on intention. This is because subjective norm significantly and directly affect intention only when usage is a mandatory (Venkatesh and Davis, 2000). Moreover, we omitted the construct of result demonstrability because it was found non-significant in the previous study (Chismar and Wiley-Patton, 2003). In addition to this, we also omitted the construct experience since it was intended to measure the adoption of existing technology (i.e. the GAIS).

We include TR construct because it is a central defining aspect of many economic and social interactions in which uncertainty is present (Pavlou, 2003; Warkentin *et al.*, 2002). Lack of TR in online transactions has been identified as one of the major obstacles in the adoption of e-government services (Carter and Bélanger, 2005; Ebrahim and Irani, 2005), since transactions over the internet entail a great deal of uncertainty and risk (Bélanger and Carter, 2008).

We ignored the triability construct (i.e. "the degree to which an innovation may be experimented with on a limited basis" (Rogers, 2003, p. 266)) and observability (i.e. "the degree to which the results of an innovation are visible to others" (Rogers, 2003, p. 266))

since the previous study found no strong correlations between them and user's intention toward IT adoption (Agarwal and Prasad, 1998). The conceptual model illustrating the research hypotheses is shown in Figure 4. The relevant constructs are discussed below.

Perceived usefulness
Davis *et al.* (1989) posited that perceived usefulness is a main significant factor influencing acceptance of information system in TAM. Davis (1989, p. 320) defined perceived usefulness as "the degree to which a person believes that using a particular system would enhance his or her job performance". In the context of the GAIS, for example, users will find the GAIS useful if it helps them to find the information that they want or helps them to perform administrative transactions. Thus, a high level of usefulness is likely to increase user acceptance of the GAIS. As such, we propose the following hypothesis:

 H1. There will be a positive relationship between perceived usefulness and IU the GAIS.

Subjective norm
Fishbein and Ajzen (1975, p. 302) defined subjective norm as "a person's perception that most people who are important to him think he should or should not perform the behaviour in question". In other words, particularly in the context of Cambodia, if top management is committed to providing support and a positive environment that encourages participation in the GAIS, then most users will perceive the system as useful. As such, we propose the following hypothesis:

 H1a. There will be a positive relationship between subjective norm and perceived usefulness of the GAIS.

Image
Moore and Benbasat (1991, p. 195) defined IM as "the degree to which use of an innovation is perceived to enhance one's [...] status in one's social system." In the
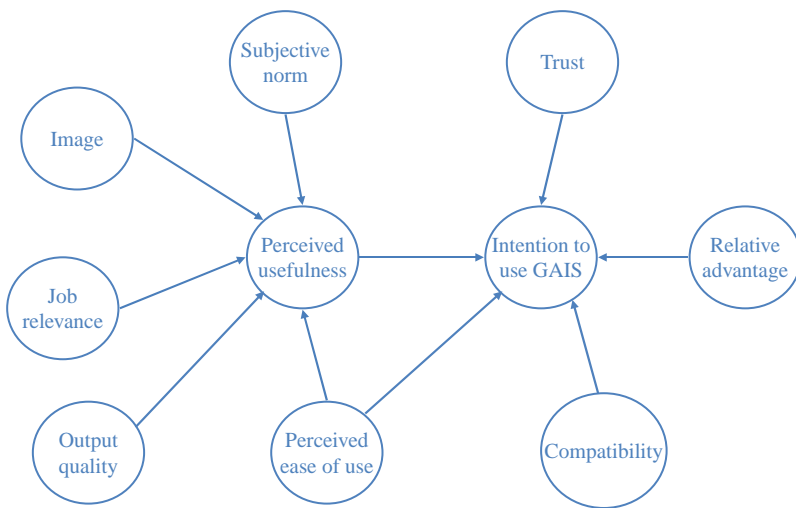

Figure 4.
The research model of user acceptance of the GAIS

Cambodian public sector context, users who adopt a new innovation like the GAIS may impress others who have not adopted it. This may enhance the adopters' social status. Hence, a user who has a higher need for social recognition and a clear understanding of the GAIS is likely to perceive the usefulness of the system. As such we propose the following hypothesis:

H1b. There will be a positive relationship between IM and perceived usefulness of the GAIS.

Job relevance
In e-government adoption, job relevance is found to be significant (Vathanophas *et al.*, 2008). Venkatesh and Davis (2000) defined job relevance as "an individual's perception regarding the degree to which the target system is applicable to his or her job performance." In general, if one system is clearly relevant to a person's job, they will view it as more useful than another system which is not. In the GAIS context, users will perceived the system as helpful if the system matches to their job goal with the consequences of system use. Thus, a high level of job relevance is likely to increase user perception of the GAIS. As such, we propose the following hypothesis:

H1c. There will be a positive relationship between job relevance and perceived usefulness of the GAIS.

Output quality
Venkatesh and Davis (2000, p. 191) defined perceived output quality as "the degree to which an individual believes that the system performs his or her job tasks well". It measures how well the system performs tasks. In connection to this, a system that performs well is likely to be seen as more useful than a system which does not. As such, we propose the following hypothesis:

H1d. There will be a positive relationship between output quality and perceived usefulness of the GAIS.

Perceived ease of use
Davis (1989, p. 320) defined PE as "the degree to which a person believes that using a particular system would be free of physical and mental efforts." In the context of the GAIS, therefore, users will perceive the GAIS as easy to use when they find it clear and understandable and when they do not have to expend a lot of mental effort to interact with it (in, for example, web site content, information surfing, and online administrative processes). Thus, ease of use is likely to strengthen users' intentions to use the GAIS as well as a perception of the usefulness of the system. As such, we propose the following hypotheses:

H1e. There will be a positive relationship between PE and perceived usefulness of the GAIS.

H2. There will be a positive relationship between PE and IU the GAIS.

Trust
One of the main important factors in the adoption of e-government services is TR (Bélanger and Carter, 2008; Ebrahim and Irani, 2005; Warkentin *et al.*, 2002), because

when public officers browse governmental web sites or perform administrative transactions, they expect the information on the web site to be accurate, reliable, and timely. TR is defined as "an expectancy that the promise of an individual or group can be relied upon" (Rotter, 1971). In the GAIS context, the issue of TR is very important, since the GAIS involves approval signatures, the protection of personal information that the government collects about individuals, and the protection of GAIS sites from attack and misuse. Hence, TR encompasses the intention to make end-users, particularly public officers to receive information, to provide information, and to request the GAIS services. Moreover, the need for TR in the maintenance of accurate public information in the GAIS will increase because government agencies may be required by law to share information with other agencies or with public officers (Wang and Liao, 2008). "Visible statements outlining how a site insures visitors' privacy and security are valuable assets for encouraging people to use e-government services and information" (West, 2008, p. 7). As such, we propose the following hypothesis:

H3. There will be a positive relationship between TR and IU the GAIS.

Compatibility
Rogers (2003, p. 266) defined perceived compatibility as "the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopter." Tornatzky and Klein (1982) found that compatibility was consistently related to innovation adoption. By applying this finding into the GAIS context, we hypothesize:

H4. There will be a positive relationship between compatibility and IU the GAIS.

Relative advantage
This construct is considered as an important predictor for determining the rate of adoption (Dwivedi and Irani, 2009; Rogers, 2003). It is defined as "the degree to which an innovation is perceived as better than the idea it supersedes" (Rogers, 2003, p. 265).

Even though some previous researches (Plouffe *et al.*, 2001; Venkatesch *et al.*, 2003) have found that the construct of perceived usefulness in the TAM can be considered as the construct of relative advantage in the DOI, a distinction is necessary when comparing the two constructs in some context. In the context of e-government adoption study (e.g. the GAIS), when a user is evaluating the GAIS and considering its usefulness, he or she is determining the level of agreement that the GAIS system helps perform a particular function (e.g. administrative transaction) in terms of productivity, effectiveness and performance. Simply put, perceived usefulness is the degree to which the use of the GAIS system is perceived as usefulness. However, with relative advantage the user is comparing the collective attributes between the GAIS system and the existing manual administrative system and weighting them, measuring in terms of profitability (economic), social benefits (IM and prestige), and system-related variables (feature superiority). To put it simply, relative advantage is defined as the degree to which the use of the GAIS system is perceived as better than the existing manual administration system. In sum, the construct of perceived usefulness focuses on utility of the GAIS system while the construct of relative advantage evaluates the GAIS system with the existing system (old system – manual system). Moreover, some researchers also included both constructs in their study as in the study of the adoption

of on-line trading in the Hong Kong financial market by Lau *et al.* (2001) and the study of the adoption and usage of internet banking by Podder (2005). By applying these findings into the GAIS adoption context, we hypothesize:

H5. There will be a positive relationship between relative advantage and IU the GAIS.

4. Methodology
Data collection and procedure
We collected the data for the study via a survey questionnaire that was divided into two sections. The first section captured demographic information about each participant and each participant's experience using the internet. The second section captured the subject's perception of each construct in the model. All of the items used in this survey were adapted from previous studies with minor changes the context of the GAIS. The measurements of IU, PE, and perceived usefulness were adapted from the studies of Davis (1989) and Carter and Bélanger (2005). The measurements of subjective norm, IM, job relevance, and output quality were adapted from the study of Venkatesh and Davis (2000). The measurements of relative advantage and compatibility were adapted from the study of Carter and Bélanger (2005). The measurement of TR was adapted from the studies of Carter and Bélanger (2005) and van Slyke *et al.* (2004). Each construct was measured using multiple items. The items, with the exception of some demographic data such as gender, age, level of education, position, place of using internet, and experience of using internet, were rated on a seven-point Likert scale. A list of the measurement items for each variable used for data collection is provided upon request to the author.

Since the study focused on the GAIS systems (government-to-government application setting), the target populations for the study were public officers who have experience using the internet. We administered a survey to 112 public officers within 12 ministries in Cambodia (Table I). Of the 112 surveys administered, all were complete and used in the analyses.

Method of data analysis
We test the research hypotheses based on structural equation modeling using partial least squares (PLS) approach. PLS is a second generation multivariate technique (Fornell

No.	Ministry	Participants
1	Office of the council of ministers	10
2	Secretariat of public service	10
3	Ministry of water resources	10
4	National audit authority	10
5	Ministry of agriculture	10
6	Ministry of economy and finance	10
7	Ministry of planning	10
8	Ministry of vocations and training	10
9	Ministry of national defense	5
10	Ministry of environment	5
11	Ministry of information	10
12	Ministry of posts and telecommunication	12
	Total	112

Table I.
Number of participants in each ministry

and Cha, 1994) which can simultaneously evaluate the measurement model (the relationships between constructs and their corresponding indicators), and the structural model (the relationship among constructs) with the aim to minimize error variance (Chin, 1998; Gil-Garcia, 2008). It generates loadings between reflective constructs and their indicators, weight between formative constructs and their indicators, standardize regression coefficients between constructs, and coefficients of multiple determination (R^2) for dependent variable (Gil-Garcia, 2008).

This research study chose PLS as the primary data analysis technique because of the following reasons (Barclay *et al.*, 1995; Chin, 1998; Fornell and Cha, 1994):

- PLS is a variance-based technique that is oriented towards the predictive aspects (variance explanation) of the model;
- PLS requires minimal demands in terms of sample size; and
- PLS does not assume multivariate normality and it takes into account the measurement error when assessing the structural model.

PLS model is assessed and interpreted in two stages (Barclay *et al.*, 1995):

(1) the assessment the measurement model (outer model), including individual item reliability, internal consistency, and discriminant validity; and

(2) the assessment of the structural model (inner model) The measurement model describes how each construct is measured by corresponding manifest indicators.

It is assessed by examining two type of validities:

(1) convergent validity, including individual item reliability, internal consistency; and

(2) discriminant validity.

Convergent validity indicates the degree to which theoretically similar constructs are highly correlated with each other whereas discriminant validity indicates the degree to which a given construct is different from other constructs. These two types of validity assessments ensure that we have reliable and valid measures of constructs before attempting to assess the relationships among the constructs (Barclay *et al.*, 1995). The structural model is concerned with the relationship between the construct themselves. It represents as hypotheses in the research design or theoretical framework posited by the researcher (Chin, 1998; Gil-Garcia, 2008).

The computer program used for this PLS analysis was the latest version of PLS-Graph software (i.e. version 03.00 build 1130 of 2003). We run PLS-Graph using a nonparametric test of significance known as bootstrapping method with 200 resamples to determine the significance levels for loadings, weights, and path coefficients (Chin, 1998; Gil-Garcia, 2008).

5. Results
Descriptive statistics
Table II shows the demographic profile of the survey respondents. The table shows that the survey respondents were predominantly male (81.2 percent male versus 18.8 percent female). Regarding age distribution, public officer ages between 26 and

	Category	Frequency	%
Gender	Male	91	810.2
	Female	21	180.8
Age	18-25	13	110.6
	26-35	78	690.6
	36-45	20	170.9
	46-55	1	0.9
Level of education	TAFE	4	30.5
	Bachelor	67	590.8
	Master	39	340.8
	Doctor	2	10.8
Position	Top level	5	40.5
	Middle level	41	360.6
	Low level	57	50.9
	Others	9	8
Place of using the internet	Office	73	650.2
	Home	4	30.6
	Both	20	130.4
	Others	15	170.9
Experience of using the internet	<1 year	12	10.7
	1-3 years	30	260.8
	4-5 years	28	25
	>5 years	42	370.5

Table II.
Demographic profile
of respondents

35 were dominant (69.6 percent). Regarding their highest education background, 3.5 percent had technical and further education (TAFE)[1], 59.8 percent had a Bachelor's degree, 34.8 percent had a Master's degree, and 1.8 percent had a Doctoral degree. Not surprisingly, 87.5 percent of the respondents were in the middle- and low-level position. Interesting to note was the place of using the internet. Most of them used the internet at the office (65.2 percent).

Assessment of the measurement model
We evaluate the individual item reliability by examining the loadings and cross-loadings of indicators on their respective construct. Table III lists the individual item reliability measure. All reliability measures were higher than 0.8, well above the recommended level of 0.707 (Barclay *et al.*, 1995), indicating adequate individual item reliability (i.e. more shared variance between the construct and its measures than error variance).

We measure internal consistency by computing the sum of the loadings, all squared, divided by the sum of the loadings, all squared, plus the sum of the error terms (Fornell and Lacker, 1981). Table IV shows the internal consistency reliabilities. All reliability measures were higher than the recommended level of 0.7 (Nunnally, 1978), indicating adequate internal consistency.

We assess the discriminant validity by using the average variance extracted (AVE) (Fornell and Lacker, 1981). It captures the average variance shared between a construct and its measures. This measure should be greater than the variance shared between the construct and other constructs in the model (i.e. the squared correlation between two

	IU	PE	PU	SN	IM	JR	OQ	RA	TR	CP
IU1	*0.971*	− 0.013	0.438	0.138	0.255	0.080	0.248	0.324	0.274	0.253
IU2	*0.963*	− 0.021	0.368	0.122	0.263	0.135	0.234	0.328	0.219	0.290
PE1	0.027	*0.957*	0.337	0.315	0.184	− 0.022	− 0.027	0.216	− 0.247	0.137
PE2	− 0.060	*0.904*	0.270	0.260	0.174	0.063	0.039	0.164	− 0.160	0.147
PE3	− 0.021	*0.941*	0.287	0.298	0.179	0.034	− 0.018	0.187	− 0.160	0.088
PE4	− 0.021	*0.968*	0.322	0.277	0.160	0.008	0.002	0.242	− 0.161	0.090
PU1	0.451	0.273	*0.954*	0.412	0.453	0.213	0.385	0.403	− 0.040	0.358
PU2	0.437	0.340	*0.963*	0.439	0.486	0.250	0.341	0.459	− 0.041	0.368
PU3	0.324	0.320	*0.936*	0.380	0.362	0.253	0.330	0.360	− 0.041	0.280
PU4	0.302	0.251	*0.804*	0.413	0.428	0.106	0.256	0.242	− 0.055	0.422
SN1	0.180	0.308	0.341	*0.869*	0.357	− 0.008	0.119	0.277	− 0.147	0.374
SN2	0.078	0.252	0.452	*0.928*	0.384	0.018	0.175	0.290	− 0.109	0.421
IM1	0.329	0.152	0.464	0.440	*0.911*	0.206	0.454	0.385	− 0.005	0.405
IM2	0.185	0.139	0.367	0.292	*0.870*	0.116	0.272	0.224	0.104	0.440
IM3	0.190	0.202	0.432	0.361	*0.905*	0.136	0.284	0.354	− 0.034	0.363
JR1	0.037	0.099	0.185	0.061	0.203	*0.881*	0.077	0.160	0.089	0.138
JR2	0.151	− 0.051	0.222	− 0.039	0.118	*0.919*	0.209	0.230	0.256	0.144
OQ1	0.323	0.042	0.355	0.121	0.395	0.125	*0.913*	0.218	− 0.033	0.224
OQ2	0.207	− 0.059	0.275	0.183	0.267	0.175	*0.852*	0.276	− 0.095	0.242
RA1	0.319	0.135	0.323	0.308	0.334	0.180	0.299	*0.888*	− 0.064	0.315
RA2	0.301	0.260	0.348	0.286	0.296	0.201	0.239	*0.928*	− 0.144	0.329
RA3	0.305	0.177	0.404	0.311	0.342	0.216	0.203	*0.920*	− 0.046	0.422
RA4	0.298	0.218	0.406	0.238	0.355	0.202	0.254	*0.899*	− 0.057	0.408
TR1	0.284	− 0.250	− 0.043	− 0.132	0.016	0.242	− 0.073	− 0.078	*0.966*	− 0.076
TR2	0.171	− 0.074	− 0.047	− 0.128	0.021	0.098	− 0.049	− 0.084	*0.901*	− 0.040
CP1	0.216	0.082	0.342	0.407	0.353	0.166	0.185	0.393	− 0.007	*0.885*
CP2	0.263	0.186	0.408	0.333	0.386	0.094	0.228	0.319	− 0.010	*0.841*
CP3	0.224	0.090	0.346	0.429	0.441	0.201	0.281	0.376	− 0.105	*0.853*
CP4	0.237	0.041	0.207	0.342	0.329	0.081	0.187	0.289	− 0.105	*0.803*

Notes: IU, intention to use; PE, perceived ease of use; PU, perceived usefulness; SN, subjective norm; IM, image; JR, job relevant; OQ, output quality; RA, relative advantage; TR, trust; CP, compatibility; italicized fonts represent the significant at the 0.05 level

Table III.
Loading and
cross-loading
of measure

constructs) (Barclay *et al.*, 1995). For adequate discriminant validity, the diagonal elements in the matrix should be significantly greater than the off-diagonal elements in the corresponding rows and columns (Barclay *et al.*, 1995). AVE is generated automatically using the bootstrap technique by the PLS-Graph. Table IV lists the correlation matrix for the construct. The diagonal elements in the "correlation construct" (in bold) is the square root of the AVE. Off-diagonal elements are the correlation among construct. In this study, the assessment of discriminant validity does not reveal any problems because the AVE for each construct is larger than the correlation of that construct with all other construct in the model (i.e. the diagonal elements are greater than the corresponding off-diagonal elements).

Discriminant validity is further confirmed when no item should load more highly on another construct than it does on the construct it intends to measure (Barclay *et al.*, 1995). Table III lists the loadings and cross-loadings for items used in this study; all items loaded on their construct as expected and they are loaded more highly on their construct than they loaded on any other construct.

Table IV.
Mean, standard
deviation, internal
consistencies, correlation
of constructs

|	NI	Mean	SD	IC	AVE	IU	PE	PU	SN	IM	JR	OQ	RA	TR	CP
										Correlation of constructs					
IU	2	0.966	0.966	0.966	0.935	*0.967*									
PE	4	10.139	0.970	0.970	0.889	−0.004	*0.943*								
PU	4	0.956	0.954	0.954	0.839	0.427**	0.320**	*0.916*							
SN	2	10.267	0.893	0.893	0.808	0.144	0.297**	0.466**	*0.899*						
IM	3	10.157	0.924	0.924	0.802	0.287**	0.164	0.471**	0.405**	*0.896*					
JR	2	0.927	0.895	0.895	0.811	0.121	0.004	0.223*	−0.001	0.160	*0.901*				
OQ	2	10.429	0.876	0.876	0.780	0.255**	−0.009	0.359**	0.164	0.381**	0.162	*0.883*			
RA	4	10.051	0.950	0.950	0.826	0.353**	0.201*	0.403**	0.308**	0.352**	0.210*	0.271**	*0.909*		
TR	2	10.123	0.932	0.932	0.873	0.260**	−0.201*	−0.049	−0.141	0.015	0.198*	−0.069	−0.089	*0.934*	
CP	4	10.008	0.910	0.910	0.716	0.295**	0.105	0.384**	0.438**	0.436**	0.146	0.258**	0.395**	−0.070	*0.846*

Notes: Correlation is significant at the *0.05, **0.01 levels; NI, number of items; SD, standard deviation; IC, internal consistency; AVE, average variance explained

Assessment of the structural model
The structural model indicates the causal relationships among constructs in the model. It includes estimates of the path coefficients, which indicate the strengths of the hypothesized relationship (i.e. the relationship between the dependent and independent variables), and the R^2 value, which determine the predicting power of the model (i.e. the amount of variance explained by the independent variables). Together, the R^2 and the path coefficients (loadings and significance) indicate how well the data support and hypothesized model (Chin, 1998; Gil-Garcia, 2008; Wixom and Todd, 2005). Figure 5 shows the results of the test of the hypothesized structural model from the PLS-Graph output. As expected, perceived usefulness (0.356), TR (0.271), and relative advantage (0.207) had significant influences on IU and accounted for 31.5 percent of the variance in IU the GAIS. In addition to this, subjective norm (0.258), IM (0.225), output quality (0.208), and PE (0.202) had significant influence on perceived usefulness, accounting for 39.6 percent of its variance.

6. Discussion
Support is found for *H1*, which postulated that perceived usefulness would positively influence the acceptance of the GAIS. This finding is consistent with previous studies (Carter, 2008; Carter and Bélanger, 2005). This indicates that an increase in perceived usefulness positively influences users' IU the GAIS in the public sector: that is, user will use it if they perceive its efficiency and effectiveness with respect to their job or work. The GAIS's web portal, for instance, is an important tool that allows public officers to search for information or administrative procedures they want quickly and
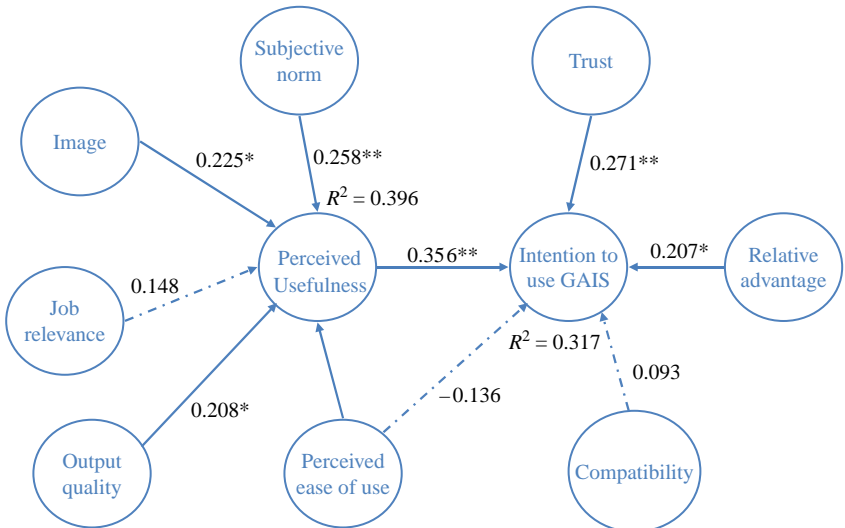
Notes: Significant tests were conducted using bootstrapping (200 samples) and path coefficient with ** are significant at the 0.01 level and those with * are significant at the 0.05 level R Square (R^2) for perceived usefulness (PU) of the GAIS is 0.396 and R Square (R^2) for intention to use (IU) of the GAIS is 0.317

accurately. Additionally, the web portal needs to be updated on a regular basis in order to prevent the proliferation of inaccurate information, broken links, and incorrect email contact information. By maintaining the portal sites and placing more materials online, governments could encourage public officers to go online and use e-government resources (West, 2008). Furthermore, each government agency should concentrate on how delivering their services online could save users time and money. In addition to this, each government agency could help its own public officers understand the importance of the GAIS by providing further training to make the system attractive to them. Training programs should stress the potential of the GAIS systems rather than concentrating on only basic skills (such as typing skills), especially because some public officers do not need to type documents by themselves.

H1a, *H1b*, *H1d*, and *H1e* are supported. That is, the four main determinants of the perceived usefulness in the model (subjective norm, IM, output quality, and PE) affect the perceived usefulness of the GAIS directly. This implies that the top management should provide support and a positive environment that encourages the participation in the GAIS. In addition to this, the public sector should overcome resistance and ensure that all departments are fully committed to the e-government (i.e. the GAIS) adoption, to obtain maximum exploitation (Irani *et al.*, 2008). When public officers perceive the GAIS as a status symbol of their organization, they consider it to be important. Furthermore, they perceive it to be useful when it does the required tasks adequately or when the quality of the output they get from the system is high. Therefore, each department or agency within a government organization that provides services through an electronic channel needs to ensure that the information they display on the web site is useful, relevant, accurate, and up-to-date, in order to provide a high level of information quality. Moreover, not only should government agencies provide a support environment; but also agencies need to provide a convenient means of online services so that user will perceive the system as useful. Government agencies, for example, should constantly elicit user feedback to improve the ease with which user navigate and interact with their web site (Carter, 2008).

Support is also significant for *H3*, which postulated that TR would positively influence the acceptance of the GAIS. This result reveals that TR in the GAIS affects user IU the GAIS considerably. This result is consistent with previous studies (Carter and Bélanger, 2005). User acceptance of the GAIS will increase if they perceive it to be trusted and secure, because they are concerned about the level of security present when performing administrative transactions or providing sensitive information online. They are only willing to participate in these interactions if a certain level of TR is present. Hence, TR and enforcement security mechanisms for the GAIS should be developed. The government agencies should have a strategy for demonstrating their ability to provide online services securely (Carter, 2008). In addition to this, a legal framework for the GAIS should be set up which includes laws for acceptance of documents in electronic format (such as downloaded documents), laws that protect against unauthorized access, and laws to enable electronic authentication.

Support is also found for *H5*, which postulated that relative advantage would positively influence the acceptance of the GAIS. This indicates that higher levels of perceived relative advantage are associated with increased user acceptance of the GAIS. This result is consistent with previous studies (Carter and Bélanger, 2005). This implies that if the GAIS provides more benefits, such as convenient access, and prompt

service, when compared to traditional means, then users will use the GAIS. In addition to this, it is necessary to maintain user interface construction abilities to increase user control, such as search capabilities, interactive media, and graphics design; and other key features, including e-mail, calendars, instant messaging, and chat areas (Ebrahim and Irani, 2005).

7. Conclusion
The purpose of this study was to investigate the factors influencing end-user adoption of the GAIS. It is significant in that there is no study that identifies factors affecting e-government acceptance in Cambodia so far. Thus, the study can be served as a starting point for the other e-government adoption researches in Cambodia. It also adds to the limited literature in e-government study in Cambodia. Additionally, it is the first study of e-government that provides the Royal Government of Cambodia with the type of empirical analysis, which will have significant implications for helping government policy decision makers design and implement policies and strategies to increase the use of e-government services in Cambodia as well as in other countries, particularly some developing countries that have similar situation. More specifically, Cambodia is still in the early stage of e-government implementation. Therefore, the study will help the Cambodian government policy makers better plan their future e-government implementation. For example, the results of this study revealed that the main factors that affect user acceptance of the GAIS are perceived usefulness, relative advantage, and TR. Thus, the government should implement policies that emphasize the usefulness, efficiency, and user TR of the GAIS. They should conduct awareness campaigns to inform public officers about the real benefits they would be gained from the system. For developers of the GAIS, they should implement a system to protect information and system resources with respect to confidentiality and integrity.

More important contribution of this study is that most technology acceptance and adoption theories have been widely studies in developed countries (Imran and Grego, 2007). However, few studies have been done in developing countries (Imran and Grego, 2007), and it has not been studied in Cambodia. Thus, this study is unique to the Cambodian context. Additionally, the study has shown the applicable of the technology acceptance and diffusion in the context of e-government adoption in Cambodia.

Further more, this study will offer a vital contribution to the existing knowledge and literature is the application of PLS. That is, the PLS approach use in the study is quite unique with government information system research. As such, it contributes to the methodology development in the government information system research domain.

Though the results can be considered statistically significant in most parts, the study has some limitations. The first limitation is that though the research model in this study explained some of the variance in public officers' perceived usefulness, relative advantage, and TR, much of the variance remains unexplained. Therefore, identifying the independent variables that account for the remaining variance is important suggestion for future research. Additional variables may include determinants such as information quality, service quality, use satisfaction, risk, culture and other socio economic constraints. The second limitation is that the sample population is devoted to the public officers and not the Cambodian population at large. Hence, the future study of the Cambodian population at large is needed in order to overcome these limitations.

Note

1. TAFE focuses mainly on practical skills and training in a wide variety of career fields. In Cambodia, TAFE institutions are those which offer a wide range of post-secondary education and training, particularly in vocational fields such as construction, secretarial skills, hospitality, and tourism.

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Appendix

Intention to use
- Assuming I have access to the GAIS systems, I intend to use it.
- Given that I have access to the GAIS systems, I predict that I would use it.

Perceived ease of use
- My interaction with the GAIS systems would be clear and understandable.
- Interacting with the GAIS systems would not require a lot of my mental effort.
- I find the GAIS systems would be easy to use.
- I find it would be easy to get the GAIS systems to do what I want to do.

Perceived usefulness (PU)
- Using the GAIS systems would improve my performance in my job.
- Using the GAIS systems in my job would increase my productivity.
- Using the GAIS systems would enhance my effectiveness in my job.
- I find the GAIS systems would be useful in my job.

Subjective norm (SN)
- People who influence my behavior (work) think that I should use the GAIS systems.
- People who are important to me think that I should use the GAIS systems.

Image
- People in my organization who use the GAIS systems would have more prestige than those who do not.

- People in my organization who use the GAIS system would have a high profile.
- Having the GAIS systems would be a status symbol in my organization.

Job relevant (JR)

- In my job, usage the GAIS systems would be important.
- In my job, usage the GAIS systems would be relevant.

Output quality (OQ)

- The quality of the output I get from the GAIS systems would be high.
- I would have no problem with the quality of the GAIS systems' output.

Relative advantage (RA)

- Using the GAIS systems would enhance my efficiency in gathering information from government agencies.
- Using the GAIS systems would enhance my efficiency in interacting with government agencies.
- Using the GAIS systems would make it easier to interact with government agencies.
- Using the GAIS systems would give me greater control over my interaction with government agencies.

Trust (TR)

- The GAIS systems could be trusted to carry out online transactions faithfully.
- In my opinion, the GAIS systems are trustworthy.

Compatibility

- I think using the GAIS systems would fit well with the way that I like to gather information from government agencies.
- I think using the GAIS systems would fit well with the way that I like to interact with government agencies.
- Using the GAIS systems to interact with government agencies would fit into my lifestyle.
- Using the GAIS systems to interact with government agencies would be compatible with how I like to do things. Figure 1 TAM (Davis *et al.*, 1989).

Corresponding author
Sinawong Sang can be contacted at: sinawong_sang@yahoo.com