

A Study of Evaluating the National Teacher In-service Information System in Taiwan

Lung-Hsing Kuo, Hsueh-Chih Lin, Miao-Kuei Ho, Hung-Jen Yang

Abstract—With the proliferation of the Internet and World Wide Web applications, teachers are increasingly interacting with government to teacher (G2T) formal Information systems. It is therefore important to ensure the intention of using teacher in-service information systems from the teacher's perspective. While TPB models have received much attention from researchers, few studies have been conducted to assess the behavior of using information systems. The extent to which traditional IS success models can be extended to investigating Government systems success remains unclear. This study provides the first empirical test of an adaptation of TPB model in the context of In-service Information System. The model consists of three dimensions: Attitude toward using system, Subjective Norm, and Perceived Behavioral Control. Neural network modeling techniques are applied to data collected by questionnaire from 129 users of the teacher In-service Information system in Taiwan. Except for the link from system quality to use, the hypothesized relationships between the three behavior variables are significantly or marginally supported by the data. The findings provide several important implications for formal information system research and practice. This paper concludes by discussing limitations of the study which should be addressed in future research.

Keywords—G2T, Evaluation, In-service Information System, National Information System, TPB

I. INTRODUCTION

Since the late 1990s, governments at all levels have launched electronic government (e-Government) projects aimed at providing electronic information and services to citizens and businesses [1]. Many governments have realized the importance of using information and communication technologies (ICT) to provide efficient and transparent government [2]. Government agencies around the world have embraced the digital revolution and have placed a wide range of materials on the Web including publications, databases, and actual online government services [3]. E-Government can be

broadly defined as a government's use of ICT, particularly Web-based Internet applications, to enhance the access to and delivery of government information and service to citizens, business partners, employees, and other agencies and entities. The construction and management of e-Government systems are becoming an essential element of modern public administration [4].

In order to ensure e-Government success, it is important to assess the effectiveness of e-Government and to take necessary action based on these assessments [2, 5]. However, little is known about the success and effectiveness of public Web site systems [4].

There are three general types of e-Government systems and services: government to government (G2G), government to citizen (G2C), and government to business (G2B). Though e-Government has clear benefits for both businesses and governments, citizens actually receive the widest array of benefits from e-Government [6]. Thus, the focus of this study is on G2C systems. Typical G2C services include information for research, government forms and services, public policy information, employment and business opportunities, voting information, tax filing, license registration or renewal, payment of fines, and submission of comments to government officials. As the key to making G2C e-Government work successfully does not depend on the technology but the citizens [1, 7], this study focuses on the measures of G2B e-Government systems success from the teacher's perspective.

In recent years, many business groups have demanded more and better services through the Internet. As governments develop systems to deliver these services, there is a need for evaluation efforts that, among other things, assess the effectiveness of their e-Government systems. Such evaluation efforts can enable government agencies to ascertain whether they are capable of doing the required task and delivering services as expected [2]. For Web-based applications to be effective in the e-Government environment there is a need to develop and better understand the factors which best measure the success of e-Government systems. This has also created an increased need for dependable ways to measure the success of an e-Government system. However, e-Government systems success is a complex concept, and its measurement is expected to be multi-dimensional in nature.

The measurement of information systems (IS) success or effectiveness has been widely investigated throughout the IS research community. Theorists, however, are still grappling with the question of which constructs best measure IS success

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L.H. Kuo is with the National Kaohsiung Normal University, 80201 Taiwan, R.O.C. (e-mail: admi@nknuc.nknu.edu.tw)

H.C. Lin is with the Taipei College of Maritime Technology, 25172, R.O.C. (e-mail: linhsiaochih@yahoo.com.tw)

M.K. Ho is with the National Kaohsiung Normal University, 80201 Taiwan, R.O.C. (e-mail: hmq0402@gmail.com, phone: 886-7-7172930 ext. 7603, fax: 886-7-6051206)

H.J. Yang is with the National Kaohsiung Normal University, 80201 Taiwan, R.O.C. (e-mail: hjyang@nknuc.nknu.edu.tw, phone: 886-7-7172930 ext. 7603, fax: 886-7-6051206).

[8, 9]. In this study, a TPB model was considered because of a service system should provide all information required, but also objective people are willing to use or intends to use.

While IS success models have received much attention among researchers, little research has been conducted to assess the success of e-Government systems. There is a need to investigate whether traditional information systems success models can be extended to investigating e-Government systems success. Hence, the main purpose of this study is to validate the national teacher in-service information system's success based on the TPB model. This paper is structured as follows. First, the national teacher in-service information system was reviews.. Second, the TPB model and a comprehensive set of hypotheses are proposed. Third, the methods, measures, and results of the study are presented. And, finally, theoretical and managerial implications and directions for future research are discussed. The validated e-Government systems success model can serve as a foundation for positioning and comparing e-Government success research, and can provide e-Government managers with a useful framework for evaluating e-Government systems success.

II. E-GOVERNMENTS INFORMATION SYSTEM

The use of information and communication technologies (ICT) has made significant inroads into diverse aspects of social life over the last few years. The application of ICT to government – or electronic government – has been considered an important strategy for government administrative reform. Electronic government has the potential to transform fundamental relationships between government, citizens, businesses, and other stakeholders.

There are currently a large number of definitions of electronic government. For the purposes of this paper, we propose that “electronic government is the selection, implementation, and use of information and communication technologies in government to provide public services, improve managerial effectiveness, and promote democratic values and mechanisms, as well as the development of a legal and regulatory framework that facilitates information-intensive initiatives and fosters the knowledge society. The definition includes four areas of application for electronic government. The first lies in the area of public services through ICT or “e-services” . The second concerns the use of information and communication technologies to improve and innovate in government operations, internal efficiency, and efforts directed at government reform and administration or “e-management” . The third involves the use of ICT to promote citizen participation in its many manifestations and encourage democratic relationships between government, citizens, and other social actors or “e-democracy” . Finally, the fourth refers to the creation of a legal and regulatory framework that facilitates electronic government initiatives and fosters an atmosphere conducive to the information society or “e-public policy” .

In addition to establishing our conceptualization of electronic government, it is important to discuss our understanding of the evaluation process. The objective of the evaluation is to “measure the effects of a program by comparing it to its proposed outcomes so as to contribute to subsequent decision making concerning the program and to improve future programming” [10, 11]. There are several general models that fall within this paradigm, the most common of which is the CIPP model, which has four main components that can be included in evaluation projects: (1) context, (2) inputs, (3) processes, and (4) products. In the specific case of electronic government, examples of evaluation are relatively scarce in the literature, although the concern about evaluation has increased in the last few years [12, 13].

Lastly, it is important to point out that measuring and evaluating electronic government are complex and multidimensional tasks. Its complexity is derived not only from the fact that the phenomenon is itself complex, but also from the reality that many actors are involved, quite often with differing or conflicting points of view. Furthermore, an electronic government initiative can be measured or evaluated in many different ways (as an information system, against initial objectives, in terms of efficiency, etc.), considering different phases (beginning, implementation, production, etc.), and with different objectives (comparison, detection of needs, supporting decisions, understanding a phenomenon, etc.). Therefore, any evaluation model sacrifices some of its usefulness in order to meet a particular objective in exchange for becoming a better model for another objective.

The challenge taken up by this article is to have the first approximation of a measurement model that can be adapted to satisfy more than one of these objectives. Initially this model is proposed as a high level model to assess e-government at the aggregate level (region, country, province, municipality, etc.). The purpose in this case could be similar to previous high-level efforts and concentrate on comparisons between governments in their entirety. However, this model also attempts to help public managers to understand how different ministries, departments, and other sub-units are contributing to the general efforts and what they need to do in order to improve their overall performance.

A. Teacher In-service Information System

The National Teacher In-service Information System was constructed in 2003. The core functions of this system are listed in the followings;

1. Circulating Information of Teacher In-service Education Courses.
2. Keep records of teachers' in-service course credit.
3. Investigating needs of in-service education

The service is provided for the secondary, primary, and pre-school teachers in Taiwan. There are 359,511 personal accounts and 11,132 institutions accounts in this system. The courses records were 1,203,262 by the end of November 2013.

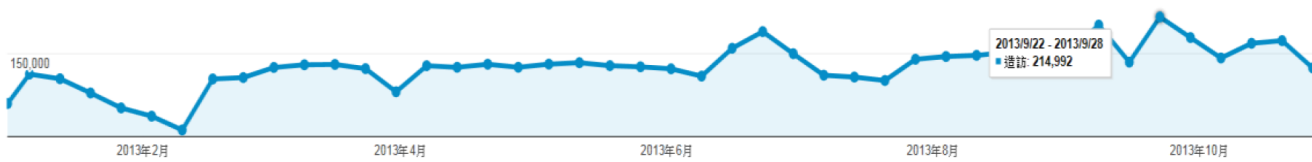


Fig. 1 Technology Universal Model, editing from ITEA[1].

B. Theory of Planned Behavior

For assessing a ICT system, the service using behavior could be the best indicator because of the reality of a e-Government information system would be meaning something only and only if people use it. The theory of planned behavior (TPB) is a parsimonious model of behavior-specific cognitive determinants [14, 15]. Central to the TPB is the idea that any behavior is determined by behavioral intentions, which are a function of three independent constructs: attitude, subjective norm, and perceived behavioral control. Attitude refers to the evaluative reactions of a person, favorable or unfavorable,

towards engaging in the target behavior. The first research hypothesis was set according to previous statement. H1: It was hypnotized that there exists significant correlation between intention and attitude toward the information system.

Subjective norm reflects individuals' perceived expectation that significant others (e.g., peers) want them to approach or avoid the given behavior (approval or disapproval of the behavior). The second hypothesis was set according to previous statement. H2: It was hypnotized that there exists significant correlation between intention and subjective norm of using the information system.

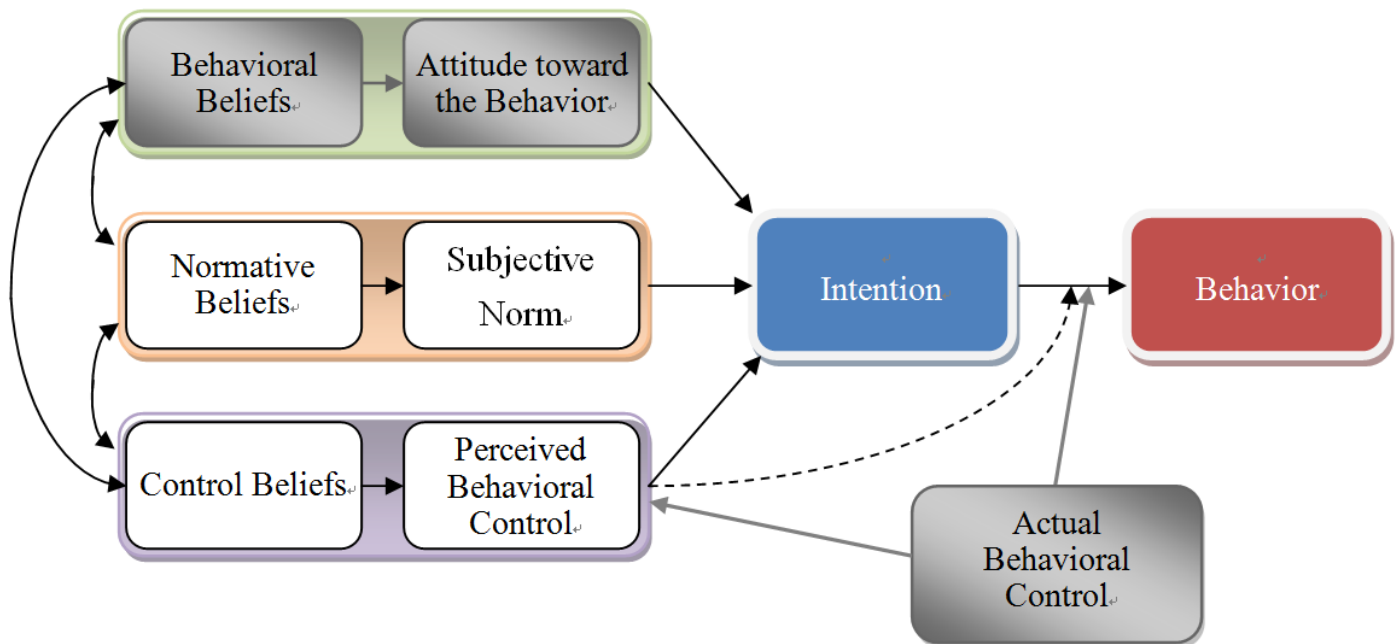


Fig. 2 Theory of Planned Behavior

In Fig 1, TPB diagram was illustrated. Beliefs in behavior, norm, and control, are the basic components of the whole model. Attitude toward the behavior, subjective norm, and perceived behavioral control are contributing to intention of the certain behavior and the intention contributes behavior. Perceived behavioral control (PBC) was added to the initial theories of reasoned action and pertains to the extent to which a person perceives personal capacities and perceives constraints regarding the target behavior. According to Ajzen [15], beyond its influence on intention, PBC is also held to determine behavior directly. The third hypothesis was set according to previous statement. H3: It was hypothesized that there exists significant correlation between intention and perceived behavioral control of using the information system.

The TPB has typically been well supported across a wide range of behaviors [16-19]. Studies have also specifically demonstrated its predictive utility for understanding the decision making processes that lead people to violate traffic rules [18]. Although some authors have conceded that individuals could differ in the relative weight placed on attitudes, subjective norms, and PBC [20] and that the weights of the TPB predictors could differ across drivers' behaviors

[21, 22], these behavior studies have limited their investigations to those independent effects postulated 20 years ago [15]. That is, in these studies, attitudes, subjective norms and PBC are considered as independent predictors of information system using behavior.

III. METHODOLOGY

For assessing the national teacher in-service information system, an investigation research method was applied. A survey instrument was design based upon the theory of planned behavior and distributed to experienced users of the system randomly selected.

A. Participants & Survey

In these lessons, learning contents were distributed in frame structure and interaction was designed to be triggered by questioning procedure. All eight lessons were listed in table with the corresponding frame and quiz information.

In this study, the survey subjects are those who own personal account of the national teacher in-service information system in Taiwan.

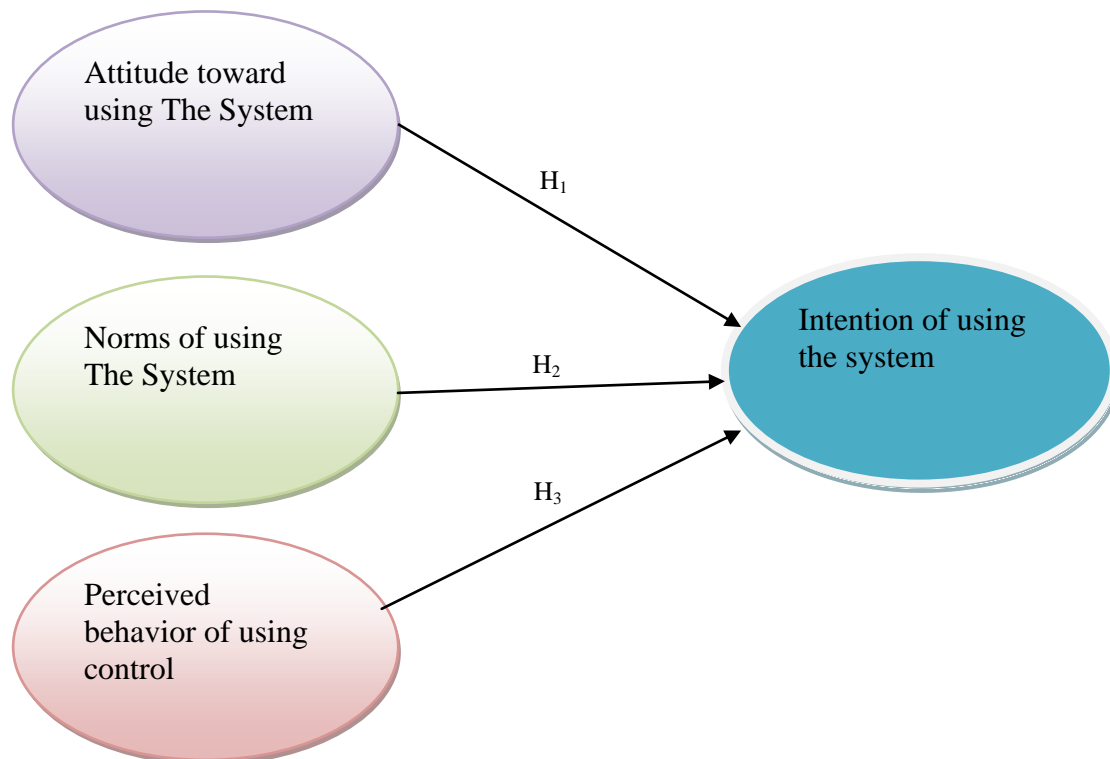


Fig. 3 TPB Model of Data Analyses

Sample size was decided according to the following situation:

1. The margin of error is 5%.
2. The confidence level is 95%.
3. The population size is 359511.
4. The response distribution is 90%.

The sample size in this study was set to 139 according to the critical value for the normal distribution.

TPB variable items were in reference to “using the national teacher in-service information system”. Participants were current user of that system. Affective attitudes were measured with three items in the statement “My using the teacher in-service information system is? 1)Good/bad, 2)joyful /

joyless, and 3)appropriate/ misappropriate”. Seven-point bipolar adjective scales are employed. Participants were asked to circle the number that best describes their personal opinions.

Participants were instructed to answer questions considering what important people in their lives think they should do with regard to use the national teacher in-service information system. These items were presented in the statement “The most important people to me definitely think I use the national teacher in-service information system is? 1) right/wrong, 2) good/bad, and 3) encourage /against. Seven-point bipolar adjective scales are employed. Participants were asked to circle the number that best describes their personal opinions.

Table 1 Descriptive statistics of survey variables

Descriptive Statistics							
	N	Minimum	Maximum	Mean	Std. Deviation	Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error
at1	129	4	7	6.11	.994	-.259	.423
at2	129	4	7	6.22	.912	1.232	.423
at3	129	4	7	6.12	.872	1.283	.423
sn1	129	5	7	6.67	.665	1.616	.423
sn2	129	5	6	5.78	.419	-.224	.423
sn3	129	4	6	5.67	.665	1.616	.423
pbc1	129	5	7	6.33	.665	-.723	.423
pcb2	129	5	7	6.22	.790	-1.284	.423
pcb3	129	4	7	6.11	.994	-.259	.423
int1	129	4	7	6.11	.994	-.259	.423
int2	129	4	7	6.11	.994	-.259	.423
int3	129	4	7	6.11	.994	-.259	.423
Valid N	129						

Participants were instructed to answer questions regarding their confidence and/or control over using the national teacher in-service information system assuming they wanted to do so. These items were presented in the statement “I am capable to use the national teacher in-service information system. 1) Yes/No, 2) True/False, and 3) agree /not agree. Seven-point bipolar adjective scales are employed. Participants were asked to circle the number that best describes their personal opinions.

Participants rated their agreement with the statement of “I intend to use the national teacher in-service information system” with the bipolar answer 1) likely/unlikely, 2) agree/disagree, and 3) true/false. Seven-point bipolar adjective scales are employed. Participants were asked to circle the number that best describes their personal opinions.

The survey was distributed to participant online whenever they login into the system. Totally 129 out of 139 invited users submitted their survey response during the investigating procedure.

B. Data Analyses

The following analyses were conducted to examine these potential covariates of intentions and three TPB variables, attitude, subjective norm, and perceived behavior control;

- Pearson’s correlations were calculated for intention and attitude, intention and subjective norm, intention and perceived behavior control
- A neural networks procedure was applied to create a

predictive model for the system using intention based on attitude, subjective norm, and perceived behavior control.

C. Findings

In general, the on-line contest was conducted on a platform that could promote a social constructionist pedagogy and assignment modules for recording learning performance as well.

Descriptive analysis of survey results

There are twelve items of the survey instruments. Four sub-categories are attitude, subjective norm, perceived behavior control, and intention.

The total number of response of each item is 129 and the mean of each item are from 5.67 to 6.67.

For exploring the tendency of each item, one- sample t-test procedures were conducted. The result listed in Table 2. All twelve items are existing significant different from the neutral value 4. Since the means are all greater than 4, it was found that teachers’ attitude toward using the national teacher in-service information system are significant positive.

Based upon the significant levels, it was found subjective norms of using the national teacher in-service information system are significant positive. According to the test result, it was found that perceived behavior controls of using the national teacher in-service information system are significant positive.

Table 2 One-sample test of each item with compare with neutral value
One-Sample Test

	Test Value = 4 (Neutral)						
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference		
					Lower	Upper	
at1	24.092	128	.000	2.109	1.94	2.28	
at2	27.705	128	.000	2.225	2.07	2.38	
at3	27.575	128	.000	2.116	1.96	2.27	
sn1	45.520	128	.000	2.667	2.55	2.78	
sn2	48.111	128	.000	1.775	1.70	1.85	
sn3	28.450	128	.000	1.667	1.55	1.78	
pbcl	39.830	128	.000	2.333	2.22	2.45	
pcb2	31.867	128	.000	2.217	2.08	2.35	
pcb3	24.092	128	.000	2.109	1.94	2.28	
int1	24.092	128	.000	2.109	1.94	2.28	
int2	24.092	128	.000	2.109	1.94	2.28	
int3	24.092	128	.000	2.109	1.94	2.28	

Based on sub-category, the statistics were calculated and presented in Table 4.

Table 3 Mean, Median, Mode, Std Deviation, Rang, Mini, Max, and Kurtosis of each sub-category

		Statistics			
		AT	SN	PBC	INTENTION
N	Valid	129	129	129	129
	Missing	0	0	0	0
Mean		18.4496	18.1085	18.6589	18.3256
Median		19.0000	19.0000	18.0000	18.0000
Mode		20.00	19.00	21.00	21.00
Std. Deviation		2.44298	1.72862	2.40603	2.98214
Kurtosis		2.589	.916	-.857	-.259
Std. Error of Kurtosis		.423	.423	.423	.423
Range		8.00	5.00	7.00	9.00
Minimum		12.00	14.00	14.00	12.00
Maximum		20.00	19.00	21.00	21.00

Statistical Test Results

There are two statistical test procedures applied in this study for exploring following hypotheses.

1. There exists a significant relationship between intention and attitude.
2. There exists a significant relationship between intention and subjective norm.
3. There exists a significant relationship between intention and PBC.
4. TPB components of attitude, subjective norm, and PBC are significant variable for predicting intention.

Table 4 Correlations of Intention and variables of attitude, subjective norm, and PBC

		AT	SN	PBC
N		129	129	129
Pearson Correlation		.935**	.898**	.992**
Sig. (2-tailed)		.000	.000	.000
N		129	129	129

** . Correlation is significant at the 0.01 level (2-tailed).

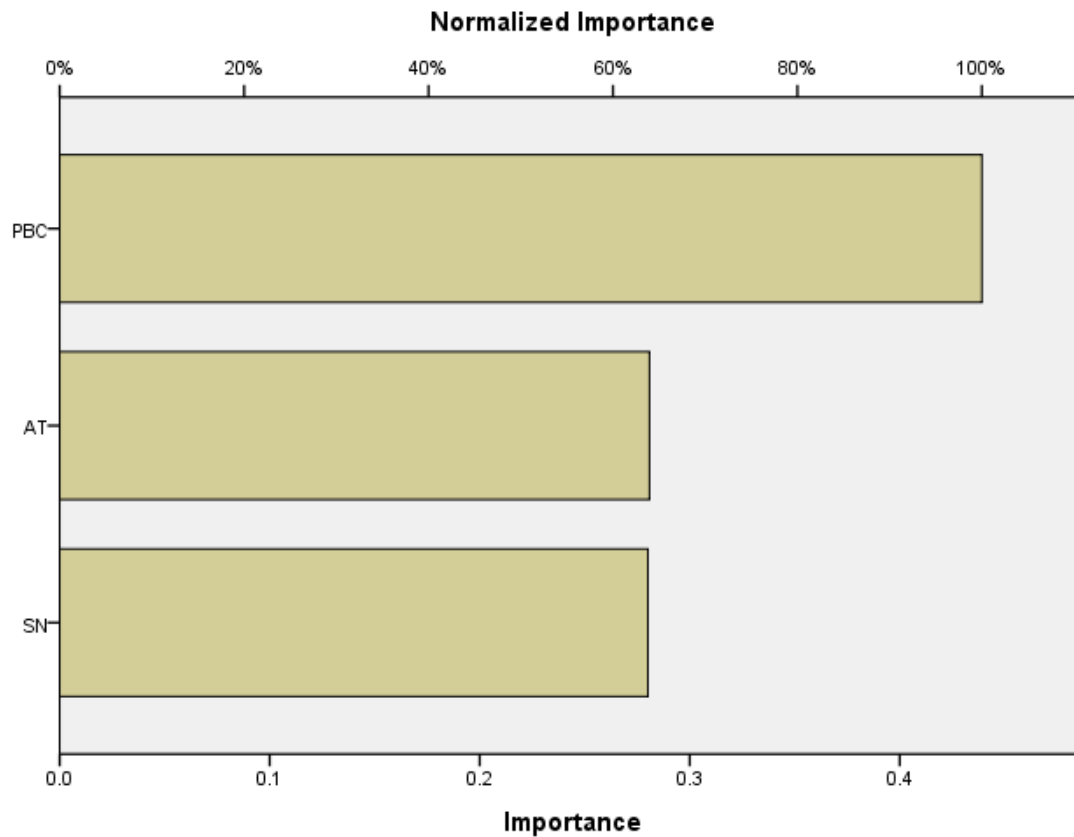


Fig. 4 Importance of Independent Variables of Attitude, Subjective Norm, and PBC

In Fig. 4, the importance of all three independent variables are illustrated.

Table 5 Independent Variable Importance

Independent Variable Importance		
	Importance	Normalized Importance
AT	.281	64.0%
SN	.280	63.8%
PBC	.439	100.0%

In Table 7, the importance of each independent variable is shown. The PBC importance in predicting intention of using the information system is 0.439, 100% normalized importance. The SN importance is 0.280, 63.8% normalized importance. The AT importance is 0.281, 64.0% normalized importance.

IV. CONCLUSION

This study provides the first empirical test of an adaptation of TPB model in the context of In-service Information System. The model consists of three dimensions: Attitude toward using system, Subjective Norm, and Perceived Behavioral Control.

Users' behavior of using information service should be an indicator for assessing that certain information service. Theory of Planned Behavior is a robust model for predicting people's behavior based on their attitude, subjective norm, and perceived behavior control. By applying survey procedure to investigate system users' attitude toward using the national teacher in-service information system, subjective norm of using the national teacher in-service information system, and perceived behavior control of using the national teacher in-service information system, the information system assessing was conducted. It was found that users of the national teacher in-service information system are with significant intention to using the system.

According to the findings in this study, it is concluded that the national teacher in-service information system owns significant high using intention of users. The overall evaluation results were illustrated in Fig. 5.

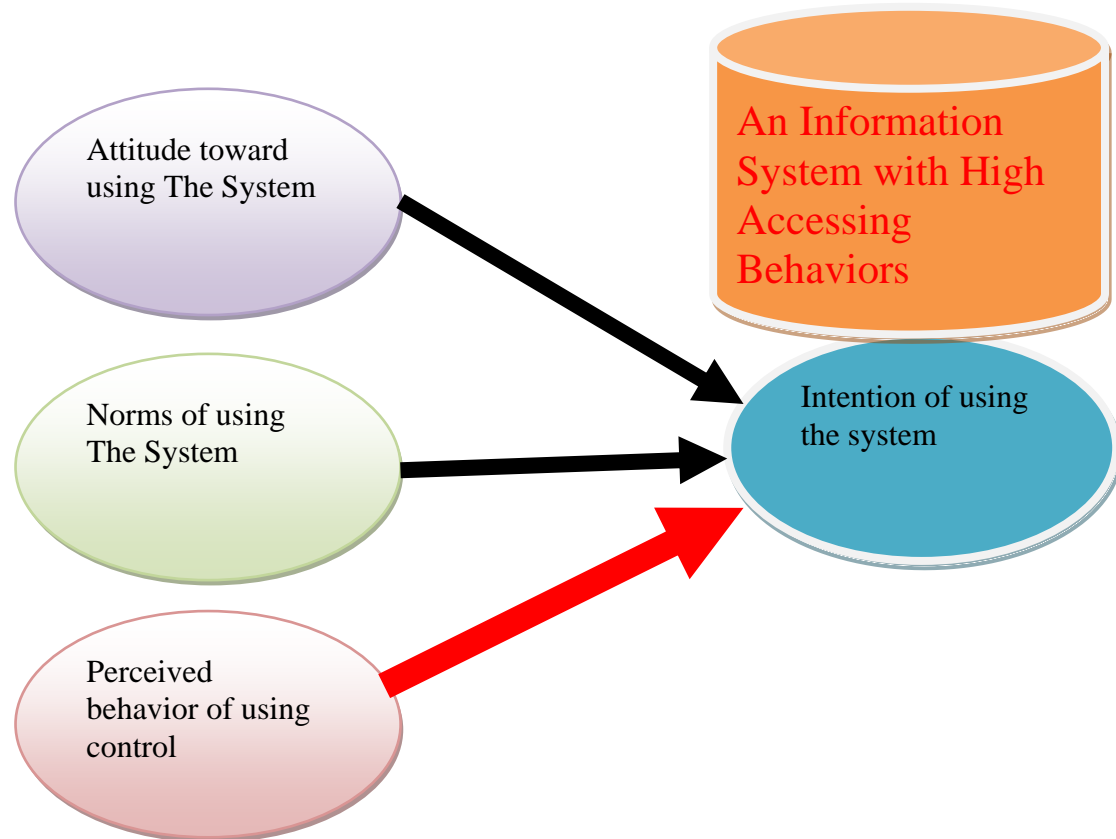


Fig. 5 Evaluation Results

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Lung-Hsing Kuo received his Master (M.E.) in Education (1990~1993) and Ph.D. in Education from (1993~1997) National Kaohsiung Normal University. He is the director of the center for teacher career and professional development in National Kaohsiung Normal University. His research interests include social Science Research Methodology, Continuing Education, Human and social,

Youth Study, Emotion development and management, Counseling and Education Issues.

Hsueh-Chih Lin received a Master (M.S.) in Industrial Technology Education from National Kaohsiung Normal University on the year of 2006. He received a Ph.D. in the department Industrial Technology Education at National Kaohsiung Normal University on the year of 2013. His research is focus on Design and technology, technology development and technology education.

Miao-Kuei Ho received her Master (M.S.) in Industrial Technology Education (2003~2005) from National Kaohsiung Normal University. She is pursuing her Ph.D. in Industrial Technology Education from National Kaohsiung Normal University now. She has been teaching elementary school since 1990. As a senior teacher, she has had ten years field research experience with NSC projects. Her research interests include technology education, educational technology, and learning theory. She also has experts in technology process skills.

Hung-Jen Yang obtained a Master (M.S.) in Technology Education from University of North Dakota and a Ph.D. in Industrial Technology Education from Iowa State University. He is currently conducting research on knowledge transfer, and knowledge reuse via information technology. His research has appeared in a variety of journals including those published by the WSEAS.