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Abstract

Government promulgates directives and disseminates information through official documents. Up to the present day, official documents are processed and routed by each person-in-charge up the chain of command in a government agency. At each stop, comments, recommendations, approval or disapproval on the issues addressed in the document are written on or alongside of the document. This paper-based and manually handled mode of operation is time-consuming and error-prone, and often draws complaints from people within the government and from the general public. The advancement of information technology has offered a great opportunity for improving the effectiveness of official document processing. An Internet-based official document processing system (call it "e-official-document system" for short) will not only expedite the document processing flow, which in turn improves administration efficiency, but also result in a big saving on paper, envelop, postage, etc. Furthermore, transport of documents will no longer be affected by weather or distance, which in turn affords promptness and reliability. This study constructed a research model to measure the effectiveness of the e-official-document system deployed in Pingdong County in Taiwan, in terms of its impact on user satisfaction, individual performance and the performance of subordinate agencies.

Keywords: e-Government, e-official-document system, System effectiveness

1. Introduction

Government promulgates directives and disseminates information through official documents. Up to the present day, official documents are processed and routed by each person-in-charge up the chain of command in a government agency. At each stop, comments, recommendations, approval or disapproval on the issues addressed in the document are written on or alongside of the document. This paper-based and manually handled mode of operation is time-consuming and error-prone, and often draws complaints from people within the government and from the general public.

The advancement of information technology has offered a great opportunity for improving the effectiveness of official document processing. An Internet-based official document processing system (call it "e-official-document system" for short) will not only expedite the document processing flow, which in turn improves administration efficiency, but also result in a big saving on paper, envelop, postage, etc. Furthermore, transport of documents will no longer be affected by weather or distance, which in turn affords promptness and reliability (Ju 1998).

Now, relevant laws and regulations have been amended to facilitate the use of IT in official document processing and the deployment of e-official-document systems throughout the Government as a driving force for the all-encompassing e-Government initiative. A majority of government agencies have already installed such a system. Like any information system,

the effectiveness of an e-official-document system will certainly impact organization performance. The question is what are the determinants of a successful e-official-document system.

This study modified the IS Success Model proposed by Myers, Kappelman & Prybutok (1997) to measure the effectiveness of the e-official-document system deployed in Pingdong County in Taiwan, in terms of its impact on user satisfaction, individual performance and the performance of subordinate agencies.

2. Review of Literature

2.1 The e-official-document systems

An e-official-document system is a special-purpose information system (IS). Its basic function is to support the creation of official documents whose content structure and encoding conforms with a published standard, and to ensure secure document transmission on the Internet. The intermediate level of sophistication is the function to support computer-aided document management such as document storage, retrieval, classification, tracking and safeguard. The advanced level of sophistication is the function to support on-line document processing such as making comments, recommendations, approval and rejection on the issues addressed in the document, and to enact workflow management. At present, most of the government agencies use an e-official-document system with the intermediate-level function, and Pingdong County is one of them.

2.2 Researches on IS Success

IS success is judged from various perspectives. Several measurement model for IS success have been proposed (Ein-Dor & Segev 1978; Ives, Hamilton & Davis 1980; Hamilton and Chervany, 1981). DeLone &McLean (1992) integrated the previous empirical studies and developed an IS Success Model that consists of six measurement constructs. Pitt, Watson & Kavan (1995) then extended the IS Success Model to include service quality as another measurement construct. Based on literature review the measurement indexes of the three quality constructs are summarized below:

(1) System quality: It covers ease of use, ease of access, functionality, easy to learn, stability, processing efficiency, meeting user requirements, system reliability and system availability (Emery 1971; Swanson 1974; Hamilton & Chervancy 1981; DeLone & McLean 1992; Seddon 1997).

(2) Information quality. It covers completeness of information output, data exchangeability, content completeness, information accuracy, understandability, usability, timeliness, conciseness and up-to-date (Swanson 1974; Zmud 1978; Larcker & Lessig 1980; O'Reilly 1982; Doll & Torkzadeh 1988; Volonino & Robinson 1991; DeLone & McLean 1992; Seddon 1997).

(3) Service quality: It covers empathy, service attitude, communication skill, cordiality, understanding user's needs, trustworthy, timeliness, professionalism, and respecting users' needs and honoring a promise (Sasser et al. 1978; Gronroos 1984; Parasuraman et al. 1985; Parasuraman et al. 1988; Lehtinen 1991; Kettinger & Lee 1994; Johnson et al. 1995; Pitt et al. 1995; Zikmund 2000).

These measurement indexes will be considered in this study for assessing the system quality, information quality and service quality of the e-official-document system.

Past researches demonstrated that the system quality, information quality and service quality influence user satisfaction (Naumann et al. 1980; Magal, Carr & Watson 1988; Magal & Strouble 1991). Zhong (2001) found that effective use of an IS in an organization can

improve individual performance, and individual performance can in turn improve organization performance. Pi (1999) also found that if IS department provides good service, word will spread. This will naturally increase users' intention to use the IS, and lead to better IS performance and organization satisfaction. Based on these findings this study will examine the impact of the e-official-document system deployed in Pingdong County on its user satisfaction, individual performance and organization performance of subordinate agencies.

3. Research Framework and Hypotheses

The research model in this study was adapted from Myers, Kappelman & Prybutok's (1997) IS Assessment Model (Figure 1). Since all the government agencies in Pindong County are required to use the deployed e-official-document system, the "use" construct was excluded from our research model. Since all the using agencies under this study are at the organization level, the "workgroup impact" construct was also excluded. The modified research model is shown in Figure 2.
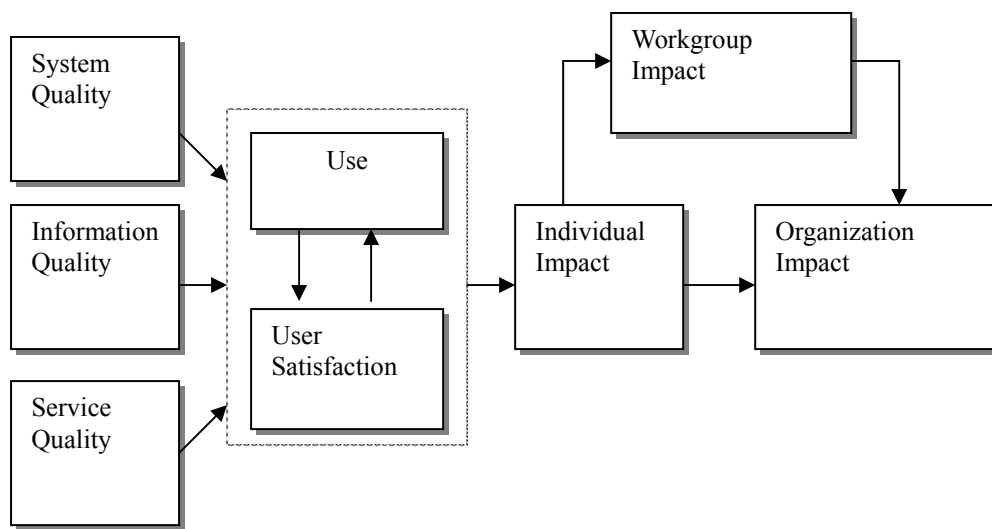

Figure 1.   A Comprehensive IS Assessment Model
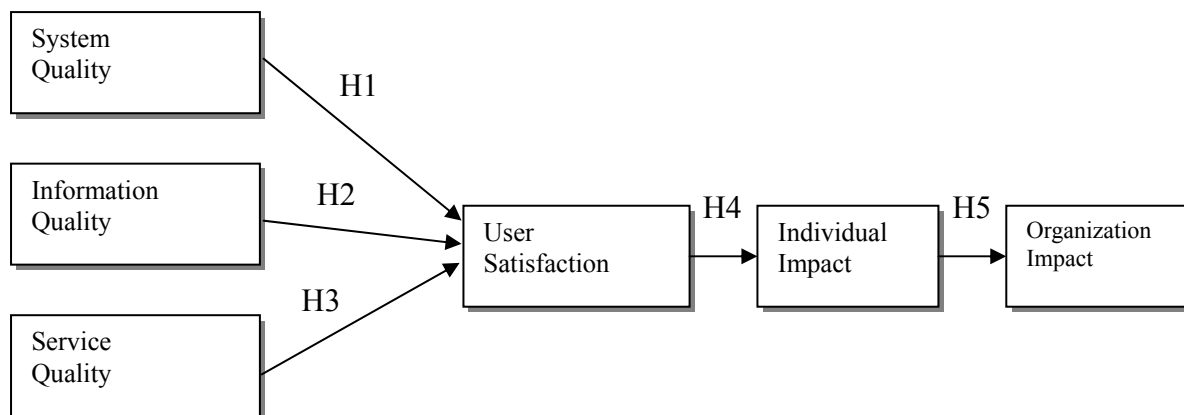
Source: Kappelman & Prybutok (1997)

Figure 2. A research model for measuring the effectiveness of e-official-document systems

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Researchers in the past claimed that IS system quality, information quality and user satisfaction are related, and various research models were proposed to validate the claim (DeLone & McLean 1992; Pitt, Watson & Kavan 1995; Myers, Kappelman & Prybutok 1997; Woordroof & Kasper 1998). From literature review we also found that IS system quality and information quality influence user satisfaction (Naumann et. al. 1980; Magal, Carr & Watson 1988; Magal & Strouble 1991). Thus, we propose that:

H1: The System Quality of an e-official-document system has a positive impact on User Satisfaction.

H2: The Information Quality of an e-official-document system has a positive impact on User Satisfaction.

Researchers in the past claimed that IS service quality and user satisfaction are related, and various research models were proposed to validate the claim (Pitt, Watson & Kavan 1995; Myers, Kappelman & Prybutok 1997). From literature review we also found that IS service quality influences user satisfaction (Magal, Carr & Watson 1988; Magal & Strouble 1991). Thus, we propose that:

H3: The Service Quality of an e-official-document system has a positive impact on User Satisfaction.

From literature review we found that IS user satisfaction and individual impact are related. (DeLone & McLean 1992; Pitt, Watson & Kavan 1995; Sanders & Garrity 1995; Myers, Kappelman & Prybutok 1997; Woordroof & Kasper 1998). Thus, we propose that:

H4: The higher the User Satisfaction with an e-official-document system is, the stronger the Individual Impact is.

Sanders & Garrity (1995) found that user satisfaction has impact on organization. From literature review we also found that the more an IS has impact on individual, the stronger its impact on organization. (DeLone & McLean 1992; Pitt, Watson & Kavan 1995; Sanders & Garrity 1995; Myers, Kappelman & Prybutok 1997; Woordroof & Kasper 1998). Thus, we propose that:

H5: The stronger an e-official-document system has impact on Individual, the stronger its impact on Organization.

4. Research Methodology and Design

The survey method was used in this study to understand the opinion of the subordinate agencies of Pingdong County on the e-official-document system in use. Official request was sent to the manager and relevant personnel who are using the e-official-document system to fill out a questionnaire. Data collected from the responses were then analyzed and the model validated using the Structural Equation Modeling (SEM) approach.

The research variables include system quality, information quality, service quality, user satisfaction, individual impact, and organization impact. The operational definition of these six constructs and their supporting references are summarized in Table 1. Instrument of 6 constructs were adapted from the prevalidated measure from previous related research (see Table 1). A pretest of the questionnaire was performed to ensure content validity and reliability within the targeted context. 5 master students in the MIS field were invited to assess wording clarity, question item sequence adequacy, and task relevance. A number of suggestions were made concerning the wording of several items and the overall structure of the questionnaire, and these suggestions were incorporated into the revised instrument. Furthermore, a pilot study involving 5 experts that work in the subordinate agencies of Pingdong County was then performed.   The purpose of the pilot study was to gain additional feed back about the questionnaire instrument.   Respondents were asked to provide any comments on the questionnaire content and structure.   The questionnaire was again

modified according to the comments gathered from the participants of the pilot test. The final questionnaire consists of 6 constructs and 47 measurement items.

Table 1 Analysis of the Research Variables

Construct	Operational Definition	Supporting References	Questions Category
System Quality	The assessment of IS per se, including ease of use, ease of learning, realization of user requirement, usefulness, system accuracy, system flexibility, system reliability, system sophistication, integration of system, system efficiency, response time, easy to operate, system error correction capability.	Emery (1971); Hamilton & Chervany (1981); Carroll (1988); Barrow (1990); DeLone & McLean (1992)	Part 1
Information Quality	The assessment of IS output, including importance, relevance, usefulness, understandability, clarity, accuracy, precision, conciseness, sufficiency, completeness, reliability, currency, exchangeability, timeliness, objectivity.	Gallagher (1974); Swanson (1974); Munro & Davis (1977); Zmud (1978); Larcker & Lessig (1980); Olson & Lucas (1982); DeLone & McLean (1992); Myers, Kappelman & Prybutok (1997); Iivari & Koskela ;	Part 2
Service Quality	The assessment of service rendered by the IS staff to the users, including problem solving capability, on-site service efficiency, service staff empathy, comparison of expected service and perceived service.	Sasser et al. (1978); Parasuraman et al (1985); Kettinger & Lee (1994); Zikmund (2000)	Part 3
User Satisfaction	The assessment of user's feeling toward the IS, including satisfaction level with user interface, software, hardware, and decision support.	Iivari & Karjalaninen (1989); Magal, Carr & Watson (1988); Magal & Strouble (1991)	Part 4
Individual Impact	The impact or contribution of the IS on individual, including quick retrieval of useful information, increase individual work performance, problem solving capability, individual productivity, creativity, individual power and influence, knowledge acquisition and sharing, save working time, expose to modern software, improve decision quality, and enhance individual influence.	DeLone & McLean (1992); Pitt, Watson & Kavan (1995); Sanders & Garrity (1995); Myers, Kappelman & Prybutok (1997); Woordroof & Kasper (1998)	Part 5
Organization Impact	The impact or contribution of the IS on organization, including reduce costs, increase productivity, increase competitive advantage, increase goal reaching, increase profitability, improve communication effectiveness, increase rapid response capability, market niche discovery, enable corporate reengineering, support corporate strategy, enhance strategic alliance, improve organization work efficiency, improve service	DeLone & McLean (1992); Pitt, Watson & Kavan (1995); Sanders & Garrity (1995); Myers, Kappelman & Prybutok (1997); Woordroof & Kasper (1998)	Part 6

Construct			
performance, improve organization image, save manpower, and reduce organization's operating costs.			

5. Data Analysis and Model Validation

5.1 Data Analysis

The survey method was used in this study to understand the opinion of all the 375 subordinate agencies of Pingdong County on the e-official-document system in use. An official order to fill out the questionnaire was sent to the manager and relevant personnel who are using the e-official-document system by the Pindong Couty. A total of 661 surveys were sent and a total of 661 surveys were returned.   The exclusion of responses from incomplete questionnaires resulted in a total of 631 usable questionnaires (a net response rate of 95.46%). Data analysis for this study was performed using EQS for windows Version 6.0. EQS is a structural equation modeling approach similar to LISREL, where the covariance structure derived from observed data is used to simultaneously fit measurement equations and structural equations specified in the model. Such covariance-based approaches are appropriate for areas with strong a priori theory, where theory testing and refinement are the research goals, as was the case in this study. Model estimation was done in EQS using the maximum likelihood (ML) approach.

The data analysis included three major components. First, descriptive statistics, such as means, standard deviations, and correlations for all variables, are examined in order to ensure that further analysis can be undertaken. Second, the measurement model was first examined for validating and refining the research instrument. CFA was utilized to assess the instruments' reliability, specifically internal consistency and construct validity, specifically convergent validity and discriminate validity. Finally, an analysis of the structural equation model for testing the associations hypothesized in our research model.

5.2 Summary Measures

5.2.1 Descriptive statistics
Table 2 shows the descriptive statistics and inter-correlations among research variables. These findings strengthen arguments raised earlier in the article about hypothesized relationships.

Table 2. Descriptive statistics and inter-correlations for the study variables

Construct	System Quality	Information Quality	Service Quality	User Satisfaction	Individual Impact	Organization Impact
System Quality	1.0000					
Information Quality	0.8028***	1.0000				
Service Quality	0.6752***	0.7031***	1.0000			
User Satisfaction	0.7779***	0.7179***	0.6619***	1.0000		
Individual Impact	0.6723***	0.6260***	0.5438***	0.7583***	1.0000	
Organization Impact	0.6004***	0.6032***	0.5173***	0.6686***	0.7330***	1.0000
Mean	23.47	31.23	37.35	21.85	20.96	20.10
Std. Deviation	0.06	1.26	2.97	0.15	1.31	0.19

Remark: *** $P<0.01$, ** $P<0.05$, * $P<0.1$

5.2.2 Instruments' internal consistency, convergent validity, and discriminate validity

CFA was utilized to assess the instruments' reliability, specifically internal consistency, and construct validity, specifically convergent validity and discriminate validity. Six goodness-of-fit indexes were used, including chi-square/degree-of-freedom, goodness-of-fit index (GFI), adjusted good-ness-of-fit index (AGFI), normalized fit index (NFI), non-normalized fit index (NNFI), comparative fit index (CFI), and root mean square residual (RMR). Table 3 shows the common fit indexes for analyzing the overall goodness-of-fit (Hair et al., 1995).

Table 4 shows the result of CFA for the measurement model. Construct validity for each scale was assessed by examining the standardized factor loadings of its hypothesized items. For acceptance construct validity, it is proposed that each item should have a minimum factor loading of 0.60 on its hypothesized construct (Nunnally, 1978). This norm was met for 44 out of 47 items for the 5 constructs (see Table 4). One item (SE1) in the Service Quality scale had loading of 0.484 and two items (SY1 & SY5) in the System Quality scale had loading lower than 0.60. These three items were dropped from subsequent analysis, by virtue of failing to meet the construct validity criterion. Five items (SY6, SY7, SY8, SY11, and SY12) of the System Quality construct were moved to the Information Quality construct.

Scale reliabilities were estimated using Cronbach alpha. The reliability of each multiple-item measures was estimated using coefficient alpha, a commonly used measure of internal consistency. All of the alpha scores approximate 0.7 or larger, indicating that the measures are reliable (Tabachnick & Fidell, 2001). Table 4 shows the Cronbach's alpha value of all the constructs.

Table 3. Common fit indexes for analyzing the overall model goodness-of-fit

Fit Indices	Recommended value
Normed Fit Index (NFI)	>=0.9
Non-normed Fit Index (NNFI)	>=0.9
Comparative Fit Index (CFI)	>=0.9
Goodness of Fit Index (GFI)	>=0.9
Adjusted goodness-of-fit index (AGFI)	>=0.8
Root Mean Square Residual (RMR)	<=0.1

Table 4. The CFA results of the measurement model

Construct		Item ID	Coefficient	Factor loading	Cronbach α Value
Quality Factors	Service Quality	SE6	.7109	.842[***]	.9502
		SE4	.7272	.842[***]	
		SE10	.7103	.836[***]	
		SE3	.6935	.832[***]	
		SE7	.7353	.832[***]	
		SE2	.7098	.826[***]	
		SE9	.7094	.815[***]	
		SE11	.7157	.808[***]	
		SE5	.7061	.806[***]	
		SE8	.7315	.761[***]	
	Information Quality	IN2	.6904	.759[***]	.9385
		IN3	.6904	.735[***]	
		IN4	.6828	.720[***]	

		IN7	.6917	.699***	
		IN1	.6686	.694***	
		IN5	.7076	.673***	
		SY6	.6439	.652***	
		IN8	.6620	.643***	
		SY12	.7114	.641***	
		IN6	.6875	.629***	
		IN9	.6915	.621***	
		SY7	.6439	.602***	
		SY8	.6889	.594***	
		SY11	.6509	.554***	
System Quality	SY9	.752	.752***	.8287
	SY10	.734	.734***	
	SY2	.713	.713***	
	SY4	.582	.582***	
	SY3	.579	.579***	
User Satisfaction	US1	.7052	.759***	.9159
	US2	.7147	.771***	
	US3	.7628	.812***	
	US4	.7823	.830***	
Individual Impact	II1	.8099	.764***	.8746
	II2	.8137	.851***	
	II3	.5405	.849***	
	II4	.4997	.593***	
	II5	.7717	.814***	
Organization Impact	OI1	.3486	.389**	.8695
	OI2	.8058	.837***	
	OI3	.7469	.784***	
	OI4	.7456	.781***	
	OI5	.7471	.786***	
	OI6	.7762	.809***	

*** p<0.001 ; ** p<0.01

5.2.3 Model verification and hypotheses test

The structural model was examined in terms of model goodness-of-fit, overall explanatory power, and postulated individual causal links. The first step in model testing was to estimate the goodness-of-fit of the hypothesized research model (Fig. 2). This is typically done using a chi square (χ^2) test; however such tests are sensitive to sample sizes and the probability of rejecting any model increases as sample size increases, even when the model is minimally false. Hence, Bentler and Bonett (1980) suggest χ^2/df ratio (df : degrees of freedom) as a more appropriate measure of model fit. This ratio should not exceed 5 for models with good fit (Bentler, 1994), and was estimated as 1.283 in our hypothesized model ($\chi^2 = 238.653$, $df = 186$).

EQS also provides additional goodness-of-fit measures such as Bentler–Bonett Normed Fit Index (NFI), Bentler–Bonett Non-Normed Fit Index (NNFI), and Comparative Fit Index (CFI). In general, in the hypothesized research model for all the indexes shown in Table 5 meets the criterion listed in Table 3. Hence, this

model fits reasonably well with the observed data.

The second step in model estimation was to examine the path significance of each association in our research model and variance explained (R^2 value) by each path. Standardized path coefficients and path significances are shown in Fig. 3. All of our hypothesized associations were strongly significant at $p<0.01$. The explanatory power of the model for individual constructs was examined using the resulting R^2 for each dependent construct shown in Table 5. Among these five hypotheses; all of them are supported statistical significant as shown in the Table 6.
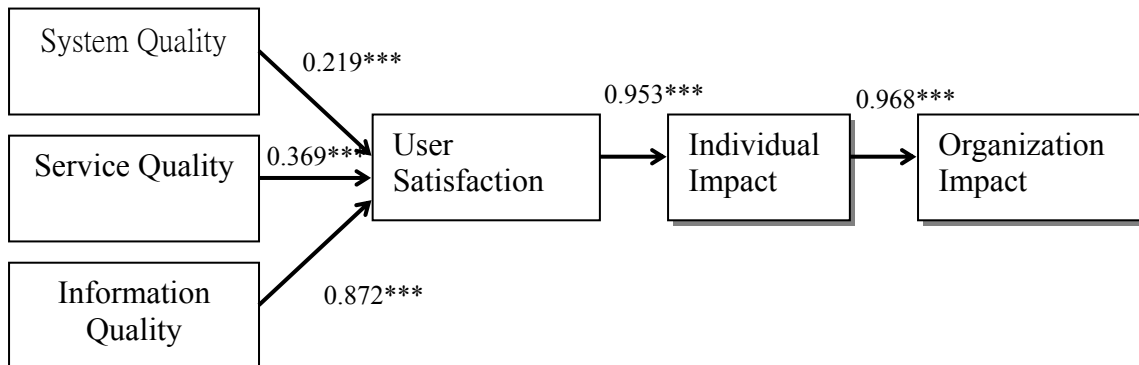

Figure 3. Result of the path analysis   (*** P < 0.01)

Table 5 Results of path analysis of the structural model

Construct		System Quality	Service Quality	Information Quality	User Satisfaction	Individual Impact	R^2
User Satisfaction	Path Coefficient	0.219	0.369	0.872			0.944
Individual Impact	Path Coefficient				0.953		0.908
Organization Impact	Path Coefficient					0.968	0.937
Model Goodness-of-fit：							

χ^2=238.653***, df=186, χ^2/df =1.283

GFI=0.945, CFI=1.002, NFI=1.000, NNFI=1.000,

AGFI=0.902, SRMR=0.053

Remark: *** p<0.01

Table 6. Results of the hypotheses testing

Hypothesis	Testing Result
H1: The System Quality of an e-official-document system has a positive impact on User Satisfaction.	Support
H2: The Information Quality of an e-official-document system has a positive impact on User Satisfaction.	Support
H3: The Service Quality of an e-official-document system has a positive impact on User Satisfaction.	Support
H4: The higher the User Satisfaction with an e-official-document system is, the stronger the Individual Impact is.	Support

H5: The stronger an e-official-document system has impact on Individual, the stronger its impact on Organization.	Support

6. Conclusions and Recommendations

On the three dimensions of quality of an e-official-document system: system quality, information quality and service quality, we have the following conclusions:

1. Information quality is the most important factor for deploying an e-official-document system in an organization, then service quality and system quality, in that order. Therefore, the higher the information quality of an e-official-document system has, the more a user will rely on the system.

2. Through literature review, we learned that the quality factor of an IS has positive impact on user satisfaction. Through the survey statistics and suggestions collected from the respondents, we found that it is also true for an e-official-document system, especially, the information quality ranked highest, then service quality, and system quality the third. This finding is consistent with our research hypothesis, that is, the quality factor of an e-official-document system is an important determinant on user satisfaction.

3. From suggestions collected from the respondents, we found that most of them are concerns with information quality trailed that of system quality, in which avoiding different units sending official documents of similar contents ranked the highest, then better software quality the second, and standardizing the file format of attachments the third. This shows that to improve information quality one needs to resolve the problem of sending documents of similar contents from different units.

4. From suggestions collected from the respondents, we found that the number of concerns with service quality trailed that of information quality, in which the need for more system training for the IS staff ranked the highest. This shows that training courses for the IS staff on using the e-official-document system should be scheduled more frequently.

5. From suggestions collected from the respondents, we found that the number of concerns with system quality, in which integration of disparate systems ranked the highest, then simplicity of user interface the second, and equipment quality the third. This shows that to improve system quality, the integration of e-official-document system and file management system must be given special attention.

On the relation of user satisfaction to individual impact, we have come to the following conclusions:

1. In this study we found that the higher the user satisfaction with an IS, the higher the individual impact. This is consistent with the research hypotheses and the findings from literature review. This shows that user satisfaction with an e-official-document system and individual impact is related.

2. In this study we found that the effects of the deployment of an e-official-document system to individual impact are ranked, in order, as follows: individual performance, support good decision-making, individual influence, individual privilege, and save decision-making time. This shows that the greatest effect on individuals from the deployment of an e-official-document system is to increase individual performance, save official document processing time, increase productivity. While making decisions one can retrieve the official documents processed before to form strategy quickly and save contemplating time. We therefore posit that using an e-official-document can not only increase individual impact in the organization, but also increase individual's privilege.

On the dimension of individual's impact on organization impact we have the following conclusions:

1. In this study we found that the greater the influence of an IS on individual impact, the greater the influence on organization impact. This is consistent with our research hypotheses and the findings from relevant literature. This shows that the influence of an e-official-document system on individual impact and organization impact are related.

2. In this study we found that levels of influence of an e-official-document system on organization impact are ranked as follows: save man-power, enhance organization image, increase service quality for the general public, and increase organization communication effectiveness, in that order. This shows that the greatest influence on organization impact from the deployment of an e-official-document system is to increase individual performance, save organization manpower so that it can be reassigned for better use, which in turn will increase productivity and service quality. Since most government agencies already adopted e-official-document exchange, organization communication efficiency and effectiveness are enhanced.

As the Government is promoting the e-Government initiative, the e-official-document system is the foundation, and the data exchangeability among government agencies is the benchmark of other ISs. A successful deployment will impact other computerization efforts later on. This study tried to understand the impact on organization after its deployment so as to provide reference to the e-Government endeavor in Pingdong County.

The contributions of this study are as follows:

1. Constructed a research model to empirically study the impact of e-official-document systems on government organizations. Past researches only examined the effectiveness of e-official-document exchange or the effectiveness of internal official document management system. This study used three quality constructs: system quality, information quality, and service quality, to construct a research model for measuring the effects of an e-official-document system on user satisfaction, individual impact and organization impact, to ensure the success of e-official-document system deployment.

2. Established the relation of user satisfaction to individual impact and organization impact. This study derived its research model through the IS success models of DeLone & McLean and Pitt, Watson & Kavan. It used the survey method to validate the research model, and to confirm the relation of user satisfaction with an e-official-document management to individual impact and organization impact. From the results of this study we learned that user satisfaction with e-official-document management is related to individual impact. Individual impact is related to organization impact as well.

Recommendations for future research are as follows:

1. With regard to research subjects

   This study targeted the employees of the government agencies in Pingdong County. In future studies we can expand the population to the general public, so to understand their opinion on service quality and performance after implementing e-official-document management, and compared with the opinion of government employees. The perception gap between the two parties can be used to improve the official document processing flow.

2. With regard to research variables

   This study used user satisfaction, individual impact and organization impact as the dependent variables. In future studies, for government administration references, we can expand it to examine the administrative effectiveness in government agencies after implementing e-official-document management.

3. With regard to research instruments

   In this study the researchers designed the questionnaire first, then mailed it to each agency and asked the executive officer to assign person-in-charge to answer the questions. Although this can directly and clearly identify the deployment of e-official-document management to user satisfaction, individual impact and organization impact, still the view

is limited. In future studies if we can add a questionnaire for the general public, and do a comparison, we should be able to have a deeper understanding of the above indexes.

4. With regard to research methods

This study used the survey method. Although it can easily obtain a great deal of quantitative data, many dimensions still need to be explored and many phenomenon cannot be obtained through question answering. In future studies, in-depth interview, observation and field inspection should be conducted to obtained more in-depth information to make the results even more comprehensive and realistic.

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