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ASSESSING E-GOVERNMENT SYSTEMS SUCCESS: A VALIDATION OF THE DELONE AND MCLEAN MODEL OF INFORMATION SYSTEMS SUCCESS

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ABSTRACT

With the proliferation of the Internet and World Wide Web applications, people are increasingly interacting with government to citizen (G2C) e-government systems. It is, therefore, important to measure the success of G2C e-government systems from citizens' perspective. While information systems (IS) success models have received much attention among researchers, little research has been conducted to assess the success of e-government systems. Whether traditional IS success models can be extended to investigating e-government systems success needs to be addressed. This study provides the first empirical test of an adaptation of DeLone and McLean's IS success model in the context of G2C e-government. The model consists of six dimensions: Information Quality, System Quality, Service Quality, Use, User Satisfaction, and Perceived Net Benefit. Structural equation modeling techniques were applied to data collected by questionnaire from 119 users of G2C e-government systems in Taiwan. Except the link from System Quality to Use, the hypothesized relationships between the six success variables were significantly or marginally supported by the data. The findings of this study provide several important implications for e-government research and practice. This paper concludes by discussing limitations that could be addressed in future studies.

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 [42]. Many governments have realized the importance of Information and Communication Technologies (ICT) to bring efficiency and transparency to the functioning of the governments [34]. Now several government agencies around the world have embraced the digital revolution and placed a wide range of materials on the web, from publications to databases to actual government services online for the use of citizens [46]. 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, other agencies, and entities. The construction and management of e-government systems is becoming an essential element of modern public administration [42]. In order to ensure e-government success, it is important to assess the success and effectiveness of e-government and take necessary actions based on theses assessment [17]. However, little is known about the success and effectiveness of public Web site systems [42].

There are three general types of e-government systems, including government to government (G2G), government to citizen (G2C), and government to business (G2B) services. Though e-government has clear benefits for businesses and government themselves, citizens actually received the widest array of the benefits from e-government [23]. Thus, the focus of this study is on G2C systems. As Larsen & Rainie [26] suggest, typical G2C services include information for research, government forms and services, public policy information, employment and business opportunities, voting information, tax filing [43], license registration or renewal, payment of fines, and submission of comments to government officials. Since the key to making G2C e-government work and successful is not technology but the citizens [1], this study focuses on the measures of G2C e-government systems success from citizens' perspective.

In recent years, many citizens are demanding more and better service through the Internet. Government organizations should make an e-government systems success/effectiveness assessment and see whether they are capable of doing the task and delivering services as expected [17]. In order for Web-based applications to be effectively used in the

e-government environment, a better understanding of what factors best measure the success of e-government systems needs to be developed. 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 is widely investigated throughout IS research community. Theorists, however, are still grappling with the question of which constructs best measure IS success [35]. DeLone and McLean [6] comprehensively reviewed the different IS success measures and proposed a six-factor IS success model as a taxonomy and framework for measuring the complex dependent variable in IS research. The categories of the taxonomy are System Quality, Information Quality, Use, User Satisfaction, Individual Impact, and Organizational Impact. Recently, DeLone and McLean [7] discussed many of the important IS efforts that have applied, validated, challenged, and proposed enhancements to their original model, and then proposed an updated DeLone and McLean IS success model depicting the relationship between System Quality, Information Quality, Service Quality, Use, User Satisfaction, and Net Benefit. DeLone and McLean (henceforth, "D&M") do not provide empirical validation of the updated model and, in fact, suggest further development and validation is needed for their model. Actually, the G2C e-government service process fits nicely into the D&M updated IS success model and its six success dimensions. Thus, continued research is needed to investigate and test a comprehensive model of e-government systems success based on the D&M model.

While IS success models have received much attention among researchers, little research has been conducted to assess the success of e-government systems. Whether traditional information systems success models can be extended to investigating e-government systems success needs to be addressed. Thus, the main purpose of this study is to develop and validate a multidimensional G2C e-government systems success model based on the DeLone and McLean's [7] IS success model. This paper is structured as follows. First, this study reviewed the development of IS success models. Second, based on prior studies, an e-government systems success model and a comprehensive set of hypothesis were proposed. Next, the methods, measures, and results of this study were then presented. Finally, theoretical and managerial implications and directions for future research were discussed. The validated e-government systems success model can be served 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.

IS SUCCESS MODELS

DeLone and McLean [6] comprehensively reviewed the different IS success measures and concluded with a model of interrelationships between six IS success variable categories: System Quality, Information Quality, IS Use, User Satisfaction, Individual Impact, and Organization Impact (see Figure 1). The model makes two important contributions to the understanding of IS success. First, it provides a scheme for categorizing the multitude of IS success measures that have been used in the literature. Second, it suggests a model of temporal and causal interdependencies between the categories [37] [30]. Since 1992, a number of studies have undertaken empirical investigations of the multidimensional relationships among the measures of IS success [12] [15] [16] [20] [24] [27] [35] [36] [38]. Seddon & Kiew [38] tested part of the D&M's [6] model through a structural equation model. They replaced *Use* with *Usefulness* and added a new variable called *User Involvement*, and their results partially supported D&M's [6] model.

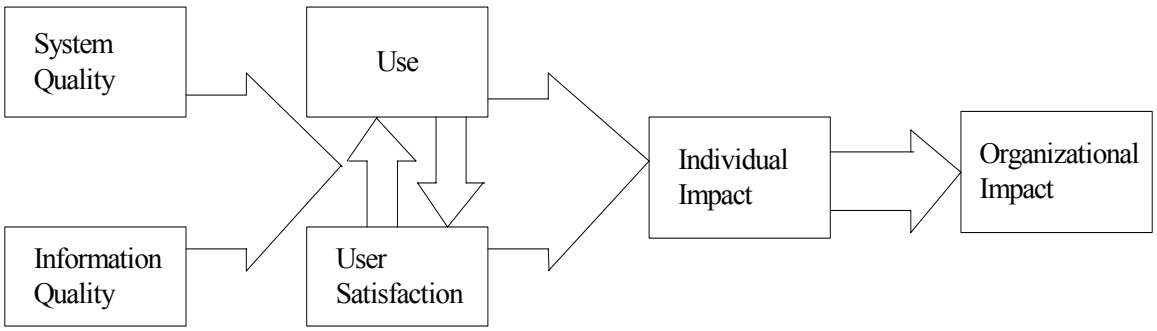


FIGURE 1: DeLone and McLean's IS Success Model [6]

Based on the DeLone and McLean's [6] model, Seddon [37] proposes an alternative model that focuses on the causal (variance) aspects of the interrelationships among the taxonomic categories, and separates the variance model of IS success from the variance model of behaviors that occur as a result of IS success. Seddon's IS success model includes three classes of variables: (1) measures of information and system quality, (2) general perceptual measures of net benefits of IS use (i.e., Perceived Usefulness and User Satisfaction), and (3) other measures of net benefits of IS use. Seddon [37] also claims that IS Use is a behavior, not a success measure, and replaces D&M's [6] IS Use with Perceived Usefulness, which serves as general perceptual measures of net benefits of IS Use, to adapt his model to both

volitional and nonvolitional usage contexts. Rai et al. [35] empirically and theoretically assessed DeLone and McLean's [6] and Seddon's [37] models of IS success in a quasi-voluntary IS use contexts, and found both models exhibit reasonable fit with the collected data.

DeLone and McLean [7] propose an updated D&M IS Success Model (see Figure 2) and evaluate its usefulness in light of the dramatic changes in IS practice, especially the advent and explosive growth of e-commerce. They agree with Seddon's premise that the combination of variance and process explanations of IS success in one model can be confusing, but argue that Seddon's reformulation of the D&M's [6] model into two partial variance models unduly complicates the success model and defeats the intent of the original model. Based on the prior studies, DeLone and McLean [7] propose an updated model of IS success by adding "service quality" measures as a new dimension of IS success model and grouping all the "impact" measures into a single impact or benefit category called "net benefit".

Although some researchers claim that service quality is merely a subset of the model's systems quality, the changes in the role of IS over the last decade argue for a separate variable – the "service quality" dimension [7]. On the other hand, while researchers have suggested several IS impact measures, such as individual impacts [6] [41], work group impacts [32], organizational impacts [6] [29], interorganizational impacts [4], consumer impacts [3], and societal impacts [37], DeLone and McLean [7] move in the opposite direction and group all the "impact" measures into a single "net benefits" variables in order to avoid complicating the model with more success measures. Given that system usage continues to be used as a dependent variable in a number of empirical studies [14] [15] [16] [20] [21] [35] [40] [47] and takes on new importance in Internet-based system success measurements where system use is voluntary, "system usage" and alternative "intention to use" are still considered as important measures of IS success in the updated D&M model. Within the G2C e-government context, citizens use an Internet-based application to search information and conduct transactions (e.g., tax filing and payment of fines), making the Internet-based application an IS phenomenon that lends itself to the updated D&M IS Success Model. DeLone and McLean [7] also suggest further development, challenge and validation is needed for their model. Thus, we assume that D&M's updated IS Success Model can be adapted to the measurement challenges of the G2C e-government context.

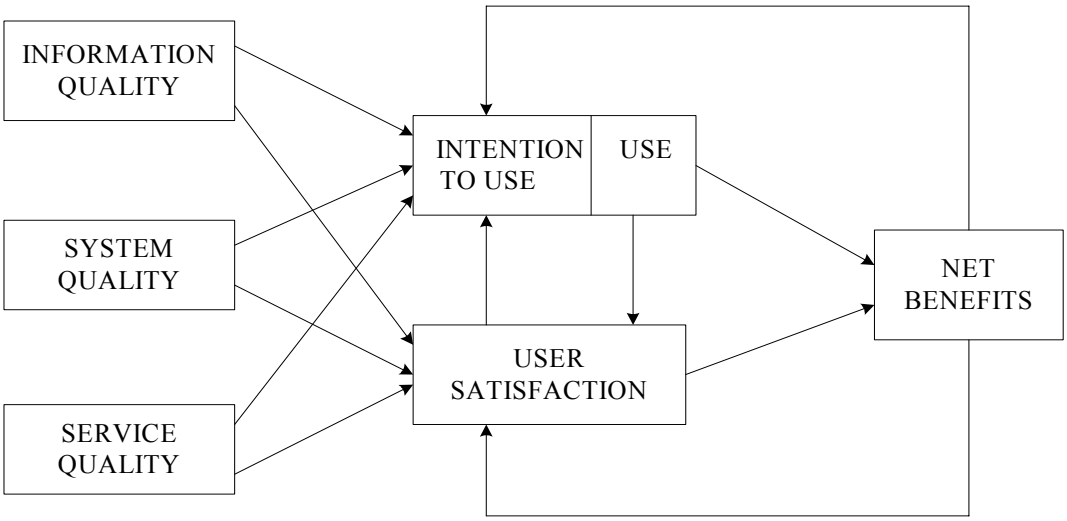


FIGURE 2: DeLone and McLean's Updated IS Success Model [7]

RESEARCH MODEL AND HYPOTHESES

According to DeLone and McLean [7], this study proposes a comprehensive, multidimensional model of e-government systems success (see Figure 3), which suggests that Information Quality, System Quality, Service Quality, Use, User Satisfaction, and Perceived Net Benefit are success variables of e-government systems. As mentioned earlier, system usage continues to be used as an IS success variable in a number of empirical studies and continues to be developed and tested by IS researchers [5] [9] [11] [14] [15] [20] [21] [28] [30] [31] [35] [40]. DeLone and McLean [7] contend that Use and Intention to Use are alternative in their model, and that Intention to Use may be worthwhile in the context of mandatory usage. However, citizens' use of G2C systems is fully voluntary and system use is an actual behavior, which has been considered as the variable closer in meaning to success than behavioral intention to use. Thus, this study adopts Use instead of Intention to Use as an e-government systems success measure.

Most researchers agree with DeLone & McLean's [7] suggestion that Service Quality, properly measured, deserves to be added to System Quality and Information Quality as components of IS success. Seddon [37] and DeLone & McLean [7] have also come to a compromise on the use of "net benefit" as IS success measures. However, "the challenge for the researcher is to define clearly and carefully the stakeholders and context in which net benefit are to be measured" [7,

p.23]. Different stakeholders may have different opinions as to what constitutes a benefit to them [39]. Since the focus of this study is on measuring G2C systems success from citizens' perspective, "net benefit" in this study refers to the citizen-perceived net benefit evaluation toward using a specific G2C system. Citizens and taxpayers may feel that they are not getting benefit for their money. They would like this benefit reflected in terms of cost/time savings and better e-government systems performance. Thus, "perceived net benefit" appears to be an important success measure of G2C systems.

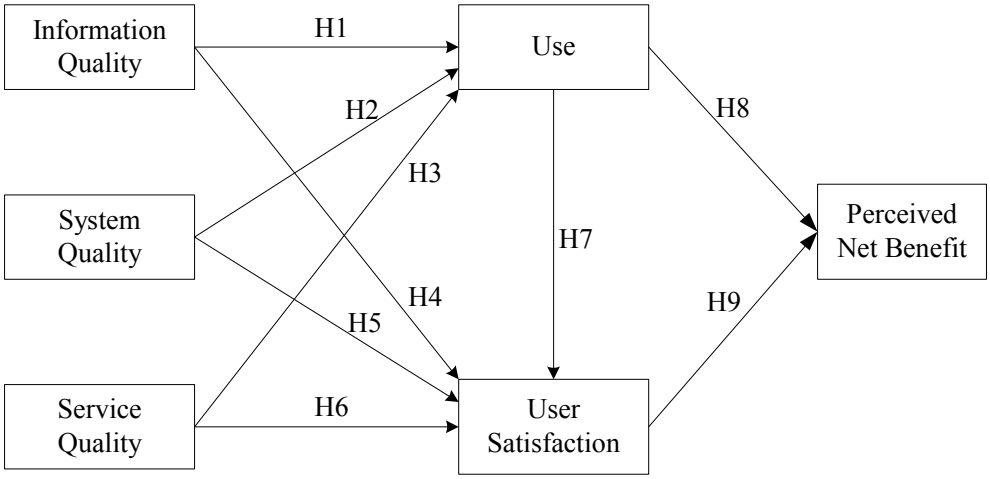


FIGURE 3: Research Model

The hypothesized relationship between Use, User Satisfaction and the three quality variables is based on the theoretical and empirical work reported by DeLone & McLean [7]. As DeLone & McLean [7] suggest, Use and User Satisfaction are closed interrelated. Positive experience with "use" will lead to greater "user satisfaction" in the D&M model. Because of usage and user satisfaction, certain net benefit will occur. DeLone & McLean [7] also assume that the positive (negative) net benefit from the perspective of the stakeholder of the system will influence and reinforce (decrease) the subsequent "use" and "user satisfaction". To avoid model complexity and reflect the cross-sectional nature of this study, the feedback links from Net Benefit to both Use and User satisfaction were excluded from the current research.

As DeLone & McLean [7] note, the IS success is a multidimensional and interdependent construct and it is therefore necessary to study the interrelationships among, or to control for, those dimensions. Also, the success model certainly needs further development and validation before it could serve as a basis for the selection of appropriate IS measure. Thus, the following nine hypotheses were tested:

H1: Information Quality will positively affect Use in the G2C e-government context.
H2: System Quality will positively affect Use in the G2C e-government context.
H3: Service Quality will positively affect Use in the G2C e-government context.
H4: Information Quality will positively affect User Satisfaction in the G2C e-government context.
H5: System Quality will positively affect User Satisfaction in the G2C e-government context.
H6: Service Quality will positively affect User Satisfaction in the G2C e-government context.
H7: Use will positively affect User Satisfaction in the G2C e-government context.
H8: Use will positively affect Perceived Net Benefit in the G2C e-government context.
H9: User Satisfaction will positively affect Perceived Net Benefit in the G2C e-government context.

RESEARCH DESIGN AND METHOD

Measures of the Constructs

To ensure the content validity of the scales, the items selected must represent the concept about which generalizations are to be made. Therefore, items selected for the constructs were mainly adapted from prior studies to ensure content validity. Two items, selected from Doll and Torkzadeh's [8] ease of use scale and adapted to specify the G2C e-government system, were used to measure System Quality in this study. Three items for the Information Quality construct were adapted from Doll and Torkzadeh [8] to capture the two attributes of information quality of a G2C system: content and timeliness. Three items, selected from Wang and Tang's [44] EC-SERVQUAL scale, were used to measure Service Quality construct. Use was measured by two-item measures adapted from the previous IS use measures [19] [35]. Traditionally, User Satisfaction has been measured indirectly through Information Quality, System Quality, Service Quality, and other variables [2] [8] [10] [25] [22]. However, the concept of e-government systems

success has been adapted, based on the DeLone and McLean's [7] model of IS success, to develop causal relationship between indirect measures of User Satisfaction (i.e., System Quality, Information Quality, and Service Quality) and overall level of User Satisfaction. Thus, the items to measure User Satisfaction were taken from the previous measures of overall level of user satisfaction or Web customer satisfaction [8] [33] [35] [45]. Perceived Net Benefit was assessed by two-item measures adapted from Etezadi-Amoli & Farhoomand's [12] user performance scale. Each item was adapted to specifically reference e-government systems. Likert scales (1~7), with anchors ranging from "strongly disagree" to "strongly agree" were used for all questions. After the pre-testing of the measures, these items were modified to fit the e-government context studied.

Data Collection Procedure

Data used to test the research model were gathered from a sample of experienced users of various G2C e-government applications. To increase the generalizability of the results, the respondents were spread across 6 popular G2C systems in Taiwan: Taiwan railway (www.railway.gov.tw), Electronic motor vehicle & driver IS (www.mvdis.gov.tw), Tax filing (tax.nat.gov.tw), Virtual employment services center (www.ejob.gov.tw), E-government portal (www.gov.tw), Tourism bureau (www.taiwan.net.tw). Respondents were first asked whether they had ever used the above-mentioned e-government systems; if they replied in the affirmative, they were asked to participate in the survey. The questionnaire requested the respondents to relate to the last time they used the e-government system and to answer the remaining questions accordingly. That is, respondents were asked to write down the name of the last e-government system they used. The respondents were instructed in the questionnaire to answer the questions by assessing that system. For each question, respondents were asked to circle the response which best described their level of agreement. A total of 119 usable responses were obtained. Approximately, 58% of the respondents are male. Detailed descriptive statistics relating to the respondents' characteristics are shown in Table 1.

TABLE 1: Characteristics of the respondents

Characteristic	Number	Percentage
Gender		
Female	50	42.0
Male	69	58.0
Age		
<20	6	5.0
21-30	91	76.5
31-40	19	16.0
41-50	2	1.7
>51	1	0.8
Education		
High school	4	3.4
Undergraduate	57	47.9
Graduate	58	48.7
Industry		
Student	49	41.2
Manufacturing	17	14.3
Service	31	26.1
Government agencies	6	5.0
Education & research	16	13.4
G2C system used		
Taiwan railway (www.railway.gov.tw)	39	32.8
Electronic motor vehicle & driver IS (www.mvdis.gov.tw)	15	12.6
Tax filing (tax.nat.gov.tw)	27	22.7
Virtual employment services center (www.ejob.gov.tw)	21	17.6
E-government portal (www.gov.tw)	9	7.6
Tourism bureau (www.taiwan.net.tw)	8	6.7

RESULTS

Measurement Model

A first-order confirmatory factor analysis using LISREL 8.3 was conducted to test the measurement model. The similarity of the original and model-reproduced covariance matrix is referred to as the fit of the model. Seven common model-fit measures were used to assess the model's overall goodness of fit: the ratio of χ^2 to degrees-of-freedom (*df*), goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), normalized fit index (NFI), comparative fit index (CFI), root mean square residual (RMSR), and root mean square error of approximation (RMSEA). As shown in Table

2, all the model-fit indices exceeded their respective common acceptance levels suggested by previous research, thus demonstrating that the measurement model exhibited a fairly good fit with the data collected (χ^2=90.28 with *df*=62, GFI = 0.91, AGFI = 0.84, NFI = 0.92, CFI = 0.97, RMSR = 0.085, RMSEA = 0.062). Therefore, we could proceed to evaluate the psychometric properties of the measurement model in terms of reliability, convergent validity, and discriminant validity.

TABLE 2: Fit indices for measurement and structural models

Fit Indices	Recommended value	Measurement model	Structural model
χ^2/df	≤3.00	1.46	1.43
GFI	≥0.90	0.91	0.91
AGFI	≥0.80	0.84	0.85
NFI	≥0.90	0.92	0.92
CFI	≥0.90	0.97	0.97
RMSR	≤0.10	0.085	0.090
RMSEA	≤0.08	0.062	0.060

Reliability and convergent validity of the factors were estimated by composite reliability and average variance extracted (see Table 3). The composite reliabilities can be calculated as follows: (square of the summation of the factor loadings)/{(square of the summation of the factor loadings)+(summation of error variables)}. The interpretation of the resultant coefficient is similar to that of Cronbach's alpha, except that it also takes into account the actual factor loadings rather than assuming that each item is equally weighted in the composite load determination. Composite reliability for all the factors in my measurement model was above 0.80. The average extracted variances were all above the recommended 0.50 level [18], which meant that more than one-half of the variances observed in the items were accounted for by their hypothesized factors. Convergent validity can also be evaluated by examining the factor loadings from the confirmatory factor analysis. Following Hair et al.'s [18] recommendation, factor loadings greater than 0.50 were considered to be very significant. All of the factor loadings of the items in the research model were greater than 0.70. Thus, all factors in the measurement model had adequate reliability and convergent validity.

To examine discriminant validity, we compared the shared variances between factors with the average variance extracted of the individual factors [13]. This analysis showed that the shared variance between factors were lower than the average variance extracted of the individual factors, confirming discriminant validity (see Table 3). In summary, the measurement model demonstrated adequate reliability, convergent validity, and discriminant validity.

TABLE 3: Reliability, average variance extracted and discriminant validity

Factor	Composite reliability	Information quality (IQ)	System quality (SQ)	Service quality (SV)	Use (U)	User satisfaction (US)	Perceived Net Benefit (NB)
IQ	0.90	0.74					
SQ	0.87	0.27	0.77				
SV	0.86	0.19	0.35	0.67			
U	0.87	0.15	0.10	0.14	0.77		
US	0.88	0.47	0.45	0.35	0.31	0.79	
NB	0.80	0.23	0.16	0.11	0.31	0.29	0.67

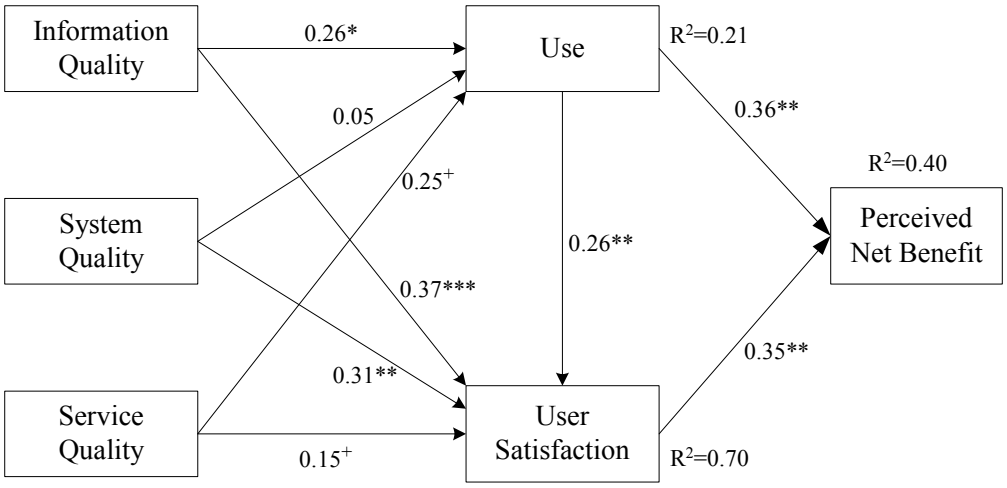
Diagonal elements are the average variance extracted. Off-diagonal elements are the shared variance.

Structural Model

A similar set of fit indices was used to examine the structural model (see Table 2). Comparison of all fit indices with their corresponding recommended values provided evidence of a good model fit (χ^2=93.11 with *df*=65, GFI = 0.91, AGFI = 0.85, NFI = 0.92, CFI = 0.97, RMSR = 0.090, RMSEA = 0.060). Thus, we could proceed to examine the path coefficients of the structural model.

Properties of the causal paths, including standardized path coefficients, p-values, and variance explained for each equation in the hypothesized model are presented in Figure 4. As expected, Information Quality had a significant influence on both Use and User Satisfaction. Thus, H1 and H4 were supported (γ =0.26 and γ =0.37, respectively). The influences of Service Quality on Use and User Satisfaction were not significant at p<0.05, but significant at p<0.1. Thus, H3 and H6 were marginally supported (γ =0.25 and γ =0.15, respectively). System Quality had a significant impact on User Satisfaction, but had no significant effect on Use. H5 was supported (γ =0.31) while H2 was rejected (γ =0.05). Consequently, Information Quality exhibited a stronger effect than System Quality and Service Quality in influencing Use and User Satisfaction respectively. In addition, Use had a significant influence on both User Satisfaction and Perceived Net Benefit. H7 and H8 were supported (β =0.26 and β =0.36, respectively). Finally, User Satisfaction appeared to be a significant determinant of Perceived Net Benefit. H9 was supported (β =0.35).

Altogether, this model accounted for 40 percent of the variance in Perceived Net Benefit with Use exerting the stronger direct effect on Perceived Net Benefit than User Satisfaction. 70 percent of the variance in User Satisfaction was explained by Information Quality, System Quality, Service Quality, and Use while 21 percent of the variance in Use was explained by Information Quality, System Quality, and Service Quality. The direct and total effect of User Satisfaction on Perceived Net Benefit was 0.35. However, the direct and total effects of Use on Perceived Net Benefit were 0.36 and 0.45, respectively. Thus, Use exhibited stronger direct and total effects on Perceived Net Benefit than those of User Satisfaction. Among the three quality-related constructs, Information Quality had the strongest total effect on Perceived Net Benefit. The direct, indirect, and total effects of Information Quality, System Quality, Service Quality, Use, and User Satisfaction on Perceived Net Benefit were summarized in Table 4.



+p<0.1, *p<0.05, **p<0.01, ***p<0.001

FIGURE 4: Hypotheses Testing Results

TABLE 4: The direct, indirect, and total effect of dominants on Perceived Net Benefit

	Direct effect			Indirect effect			Total effect		
	U	US	NB	U	US	NB	U	US	NB
IQ	0.26	0.37			0.07	0.25	0.26	0.44	0.25
SQ	0.05	0.31			0.01	0.13	0.05	0.32	0.13
SV	0.25	0.15			0.06	0.16	0.25	0.21	0.16
U		0.26	0.36			0.09		0.26	0.45
US			0.35						0.35

DISCUSSIONS

This study presented and validated a model of e-government systems success based on the DeLone & McLean's [7] updated IS success model, to capture the multidimensional and interdependent nature of G2C e-government systems success. The results indicated that Information Quality, System Quality, Service Quality, Use, User Satisfaction, and Perceived Net Benefit were valid measures of e-government system success. Except the link from System Quality to Use, the hypothesized relationships between the six success variables were significantly or marginally supported.

This research provides several important implications for e-government system success research and management. According to the proposed model, Perceived Net Benefit has been considered as a closer measure of e-government systems success than the other five success measures. Perceived Net Benefit should develop if the formation of perceived quality, system use, and user satisfaction is appropriately managed. Thus, management attention might more fruitfully focus on the development of these psychological and behavioral processes. In order to increase the citizen-perceived net benefit, e-government authorities need to develop G2C e-government systems with good information quality, system quality, and service quality, which, in turn, influence citizens' system usage behavior and satisfaction evaluation, and then perceived net benefit of the systems. System Use was found to have the strongest direct and total effects on Perceived Net Benefit in the model, indicating the importance of system use in promoting citizen-perceived net benefit. While simply saying that more use will yield more benefits, without considering the nature of this use, is insufficient [7], system use is a necessary condition of yielding benefits to the citizens.

The findings clearly supported that the total effects of Information Quality on Use, User Satisfaction and Perceived Net Benefit are substantially greater than those of System Quality and Service Quality. That is, beliefs about Information Quality, within the G2C e-government context, are more dominant in influencing Use, User Satisfaction and Perceived Net Benefit than beliefs about System Quality and Service Quality. This means that e-government authorities should

pay much more attention to promoting the information quality of e-government systems.

With the advent and development of e-government systems research, measuring multiple e-government system success variables continues to be of importance. The model provides a richer portrayal of the dynamics surrounding quality measures, satisfaction evaluation, usage, and user perceived net benefits. The results showed that citizens perceived the benefit of a G2C system because they have used it and felt satisfied with its quality of information, system and service. While system usage and user satisfaction are commonly acknowledged as useful proxy measures of system success [2] [22] [8] [9] [11], this study suggest that user-perceived net benefit can be considered as the variable closer in meaning to success than system usage and user satisfaction. This research also confirmed that Use, User Satisfaction and Perceived Net Benefit are complementary yet distinct constructs, and that Use is partially mediated through User Satisfaction in influencing Perceived Net Benefit of an e-government system.

It is worth noting that the effect of System Quality on Use was not significant. This may be because citizens have higher computer self-efficacy and Internet experience in the Internet age, the system quality or ease of use of an e-government system is not critical for citizens in determining whether to use the system or not. Thus, respondents showed more concern on information quality (e.g., usefulness) and service quality (e.g. transaction safety) than on system quality (e.g., ease of use). Given that the usage of G2C e-government systems is completely voluntary, and that the target user group consists of a large number of people with diversified backgrounds, the findings of this study suggest that in order to attract more people to use G2C systems and make them satisfied with the systems, it is not enough to make the system easy to interact with. It is of paramount importance to develop G2C systems that can provide high-quality information and service for people, including sufficient and up-to-date information, security and privacy protection, personalization, etc.

This empirical result also emphasizes the importance of assuming a multidimensional, interdependent analytical approach. It is imperative for e-government authorities to lay stress on various system success levels. Information Quality, System Quality and Service Quality belong to the system development level while System Use, User Satisfaction and Perceived Net Benefit belong to the effectiveness-influence level. Establishing strategies to improve only one success variable is therefore an incomplete strategy if the effects of the others are not considered. The results of this study encourage e-government managers to include measures of Information Quality, System Quality, Service Quality, System Use, User Satisfaction, and Perceived Net Benefit into their present valuation techniques of e-government system success. The current study has provided reliable and valid measures of these constructs. As the concise success measures with good psychometric properties are periodically administered to a representative set of citizens, e-government managers can enhance their understanding of the levels of the citizen-perceived net benefit and its antecedents, and take necessary corrective actions to improve them. Researchers can also use the validated model as the foundation for developing comprehensive e-government systems success measures and theories, exploring relationships between the proposed constructs, and comparing e-government success empirical studies.

CONCLUSION AND LIMITATIONS

This research was in response to the call for continuous challenge and test of IS success models in different contexts [7] [35]. Based on the DeLone & McLean's [7] updated IS success model, we proposed and validated a comprehensive, multidimensional model of e-government systems success, which considers six success measures: Information Quality, System Quality, Service Quality, Use, User Satisfaction, and Perceived Net Benefit. Except the link from System Quality to Use, the hypothesized relationships between the six success variables were significantly or marginally supported by the data. The findings of this study provided several important implications for e-government research and practice.

Even though the rigorous procedure allowed us to develop and validate a model of e-government system success, this empirical study has several limitations that could be addressed in the future research. First, investigation of e-government systems success model is relatively new to e-government researchers. The discussed findings and their implications were obtained from one single study that examined some particular e-government systems and targeted a specific citizen group in Taiwan. Thus, caution needs to be taken when generalizing my findings and discussion to other e-government categories or user groups. It is imperative to validate the proposed model with different user populations in different e-government contexts, especially in G2B and G2G contexts. In addition, the sample size used in this study is another limitation. A cross-cultural validation using a large sample gathered elsewhere is required for greater generalization of the proposed model. Second, this study did not incorporate all Net Benefit measures, raises some concerns. This study merely measured the Net Benefit construct from a citizen-perceived perspective. Thus, developing and testing of the Net Benefit measures on the governmental or societal level (e.g., return on investment) is a useful direction to further examine the validity of this model. However, future researchers still need to define clearly and carefully the stakeholders and context in which Net Benefits are to be measured [7]. Finally, since this study was conducted with a snapshot research approach, the feedback links from Net Benefit to Use and User satisfaction were excluded from this study. Additional research efforts are needed to evaluate the validity of the investigated model. Longitudinal evidence might enhance our understanding of the causality and interrelationships between variables of e-government systems success.

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