

Assessing Electronic Government Systems Success -An Integrated Framework-

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ABSTRACT

This research designed to theoretically address and empirically examine research issues related to the question of how the success of EG can be assessed. It argues that the technology acceptance literature and the parallel user satisfaction stream are not competing approaches to understanding IT usage and value. That is, user satisfaction and TAM represent complementary steps in a causal chain from key characteristics of system design, to beliefs and expectations about outcomes that ultimately determine usage.

Data were collected using a written survey as part of a free simulation experiment. A total of 281 usable site evaluations were obtained. Hypothesised relationships were tested through three phases, using multiple and stepwise regression analysis. The results indicate that information quality, system quality, perceived usefulness, use, and user satisfaction benefit are valid measures of EG success. The hypothesized relationships between the success variables were significantly supported. The findings provide several important implications for EG research and practice.

Keywords: Electronic Government, Information Systems Success, Technology Acceptance Model, User Satisfaction.

1. INTRODUCTION

Today's governments are becoming more reliant on their electronic government systems (EG). Yet few governments systematically attempt to measure the effectiveness of their EG, or even know how to do so (Delone and Mclean, 2003; Wang and Liao, 2007; Burroughs, 2009). Consequently, EG managers as well as information systems (IS) researchers are stressing the need to better understand the factors that contribute to the success or otherwise of EG.

A range of influences, both technical and organisational, has encouraged the wide spread adoption of EG (Hung et al., 2006 Hamner and Al-Qahtani, 2009). Government record keeping is now largely computer based, enabling companies to track their employee resources instantly (Wangpipatwong et al., 2005). EG provide better and more convenient services to citizens. Citizens can access government information and services anywhere and anytime. The time spent travelling and waiting is reduced. In addition, online

services are faster than face-to-face services. For the government, the more citizens' use EG, the more operation and management costs are reduced (Badri and Alshare, 2008). Nevertheless, there is a growing consensus that EG has in many cases failed to provide expected benefits. It has not been demonstrated whether citizens will embrace the use of EG websites and what factors influence their decision to do so. The increasing role of, and dependency on EG (and IT in general), and the 'uncertainty' of these large investments, have created a strong need to monitor and measure EG performance.

In focusing on models related to the EG success, this study reviews the extant literature related to the research problem. It commences with an overall introduction to the evaluation of the success of EG. It argues that using user satisfaction as surrogate indicator for measuring the success of EG has some theoretical difficulties, in similar vein, using Technology Acceptance Model (TAM) alone may not be sufficient to adequately capture the full meaning of effectiveness or the success of EG (Dijk et al, 2008); We posit that EG success is a joint function of system and information characteristics and acceptance. By integrating these two powerful theories, this study suggests that the TAM literature and the parallel user satisfaction stream are not competing

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approaches to understanding IT usage and value. That is, user satisfaction and TAM represent complementary steps in a causal chain from key characteristics of system design, to beliefs and expectations about outcomes that ultimately determine usage. The key consequents of EG success are user-related, recognising the citizens' important role in determining the success of governments endeavours. The relevance of applying traditional IS models such as TAM and user satisfaction in studying the success of EG can be ascertained from recent research papers which has started to draw attention that research in the IS success is fragmented, and criticized for lack of theoretical grounding (Avgerou, 2000, Larsen, 2003).

The aim of this research is to address 'how EG success can be usefully measured'. The ultimate goal is to derive a comprehensive 'EG Measurement Instrument' to (a) assess the goodness of the EG and (b) identify where organizations should focus their benefits realisation efforts and further investments.

2. THEORETICAL DEVELOPMENT

Demand for useful measures for assessing the overall benefits of IS investments has long been acknowledged (Delone and Mclean, 1992). However, there is no accepted or over all framework that arrange the important aspects of effective EG in a way to enable a full understanding of how the EG can be used effectively in organization and helping to assist EG success, The single available options is by looking through the lens of well-known theories and models of IS success, by which the success of EG can be usefully assessed.

In order to provide a solid theoretical basis for selecting influential driving factors of EG success, this study first amalgamates two significant streams of IS success: (a) the technology acceptance model (TAM) (Davis, 1989) and (b) Delone and Mclean Information success model (Delone and Mclean, 1992, 2003), to explain the success of EG. The Integrated Research Model is presented in Figure 1.

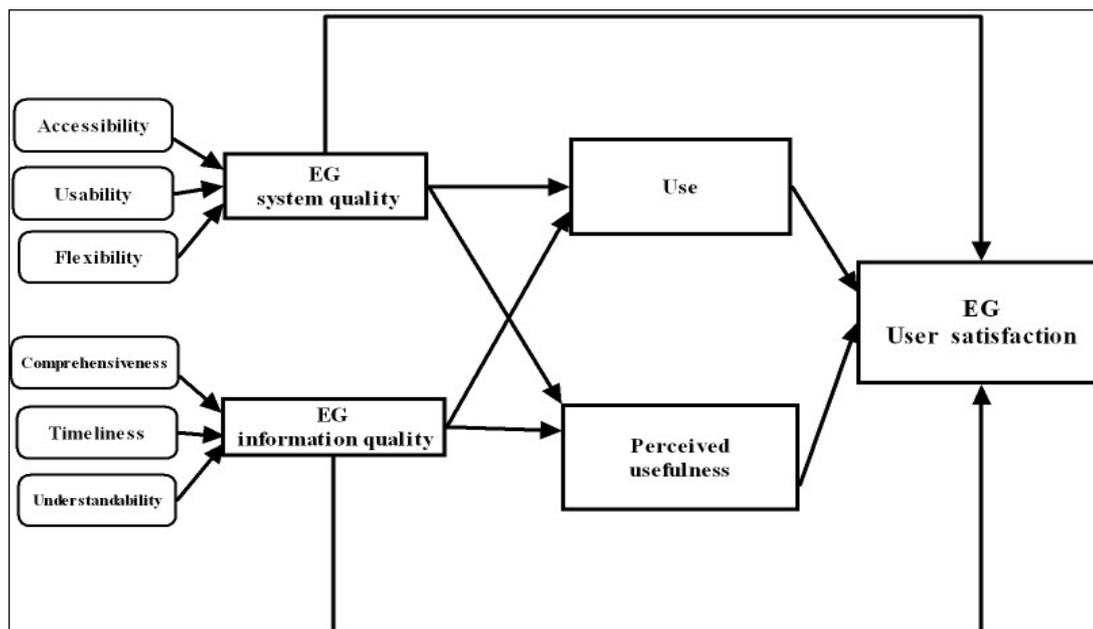


Figure 1. The study research model

The first theoretical base of this study is Davis' (1989) Technology Acceptance Model (TAM). TAM is widely applied to investigate user acceptance of technology. Davis (1989) claimed that, all else being equal, an application that the end-user perceives as being easier to use than another is more likely to be accepted. According to TAM, perceived usefulness (PU) and perceived ease of use (PEOU) influence one's attitude

toward system usage, which influences one's Behavioral intention to use a system, which, in turn, determines actual system usage. Igbaria et al (1995) examined perceived ease of use and perceived usefulness, these authors found that if the users perceive the system to be easy to use, they need less effort to use it, and will have more time for other activities, which may contribute to overall job performance.

The measures presented in Davis' (1989) study target user acceptance of computers, but TAM measures have been tested and validated for a variety of types of systems, users, etc., (Wixom and Todd, 2005). In fact, TAM has proven to be among the most effective models in the IS literature for predicting user acceptance and usage behaviour. Yet, few of TAM studies have investigated the impact of system characteristics as antecedents to ease of use or perceived usefulness (Wixom and Todd, 2005). In their integration of the technology acceptance literature, Venkatesh et al. (2003) stress the need to extend this literature by explicitly considering system and information characteristics and the way in which they might influence the core beliefs in

TAM, and might indirectly shape system usage.

In contrast to the TAM literature, system and information characteristics have been core elements in the literature on user satisfaction (Delone and McLean 1992). Within this literature, user satisfaction is typically viewed as the attitude that a user has toward an information system; Doll and Torkzadeh (1991:6) say that user satisfaction is an important theoretical construct because of its potential to determine both upstream and downstream links in this value chain. Upstream activities refer to factors that cause satisfaction, where user satisfaction is treated as a dependent variable, when the aim of the research is to determine factors affecting user satisfaction (Delone and Mclean, 1992).

<p>Casual factors → belief → attitude → performance related behaviour → social and economic impact upstream → Satisfaction → downstream</p>
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Source: Doll and Torkzadeh (1991:6).

Figure 2. Systems to value chain

Downstream activities refer to behaviours affected by satisfaction, where user satisfaction is treated as an independent or antecedent factor (Doll and Torkzadeh, 1991; Delone and Mclean, 1992).

In the IS literature, user satisfaction has been defined and described by linking attitudes - behaviour. For example, Baroudi et al. (1986:785) defined it as the "extent to which users believe the information systems available to them meets their information requirement". Baroudi et al. highlight that user satisfaction is an attitude toward the IS. Etaezadi -Amoli and Farhoomand (1991:1) described satisfaction as "the amount of affect that one feels for or against some object or behaviour", and link user attitude to success. Melone (1990) suggests that relating satisfaction (attitude) to intention to use or use of the systems (success) has some similarity to the downstream research domain in the assumed influence (attitude- behaviour).

In a recent review of user satisfaction research, Au et al. showed that user satisfaction research has focused on the upstream activities, and studies on the downstream chain have been relatively narrow (Au et al, 2002:454). In similar vein, Larsen's (2003) review of antecedents of IS success show that research concerning performance related behaviour has been light but regular since the late 1970s and contains only a few concepts (Larsen, 2003:184), with measures such as the one identified as "individual impact" by Delone and Mclean (1992).

Plethoras of models and instruments to measure user satisfaction have likewise been developed and these are as diverse as they numerous (Au et al, 2002; Zviran and Erlich, 2003). Most of the tools were developed following a review of the then-existing literature, and tested using interviews, surveys, or a combination of the two (Zviran and Erlich, 2003:84; Au et al, 2002; and Mahmood et al, 2002). Yet there is no single measure or group of measures generally agreed on and inconsistency of measurement and mixed items in the existing measuring scales characterized user satisfaction measurements and scales, according to Zviran and Erlich (2003:84). For example, Etezadi-Amoli and Farhoomand (1991) found the instrument developed by Doll and Torkzadeh (1988) to be unreliable as a predictor of the degree of user satisfaction and it did not provide a means to assess the relative importance of each item to respondents. More evidences of the lack of consistency of user satisfaction instruments and measurement was found by Galleta and Lederer (1989), and Au et al. (2002).

Another key problem with user satisfaction research is the range of factors influencing user satisfaction. Such factors are often difficult to isolate due to their complex interrelationships (Zviran and Erlich, 2003), and the fundamental similarity of user satisfaction and user attitude noted by Melone (1990).

Given the lack of agreement on the theoretical

construct of user satisfaction, there is, not surprisingly, little agreement on how to measure user satisfaction. Initially, the measurement scope was mainly limited to system characteristics for end-users (e.g., Doll and Torkzadeh, 1988) or information features received from the system (e.g., the user information satisfaction instruments). Information features and system quality were not always explicitly separated as dimensions of user satisfaction, until Delone and Mclean (1992).

In view of these observations, using user satisfaction as surrogate indicator for measuring the success of EG has some theoretical difficulties, in similar vein, using TAM alone may not be sufficient to adequately capture the full meaning of effectiveness or the success of EG; Accordingly, we drew inspiration from DeLone and McLean (1992), whose conceptually developed, but did not empirically test, a model of IS success that included six aspects: system quality, information quality, use, user satisfaction, individual impact, and organizational impact. Seddon (1997) modify Delone and Mclean's model based on theoretical considerations. Seddon integrated additional construct of perceived usefulness from TAM (Davis 1989) and developed a modified model included three types of variables: measures of information and system quality, system use as behaviour, and general measures of net benefits from system use. Rai et al. (2002) further built on Delone and Mclean and Seddon. They viewed usefulness as being related to individual impacts and noted that it was based on several of the constructs Delone and Mclean had linked to individual impacts, such as improved individual productivity. Rai et al. (2002) focused on five constructs – system quality, information quality, perceived usefulness, user satisfaction, and system use - and represented system quality in terms of ease of use and system use in terms of system dependence. They conducted a survey of 274 users of an integrated student information system, and test Delone and Mclean's and Seddon's models. Based on the empirical results, they also tested an amended Seddon model, including a correlation path between perceived usefulness and system use, and found this model to perform the best.

In this study, constructs from perceived system and information quality from Delone and Mclean and Rai et al.'s modified Seddon model are posited as two key drivers of perceived usefulness and perceived ease of use, albeit with one modification. Perceived ease of use did not separated from system quality, which is

consistent with Al Shibly et al.,(2006) who suggest the effort which users believe is involved in using an IS considered an important factor in building user satisfaction. Given this, the emphasis on ease of use as a dimension of EG is argued to be increasing (Al Shibly et al., 2006). Now ease of use part of system quality. But ease of use level contributes only part of the factors determining system quality.

Delone and Mclean (1992:69) describe individual impact as “an indication that an information system has given a user a better understanding of the decision context, has improved his or her decision-making productivity, has produced a change in user activity, or has changed the decision maker's perception of the importance or usefulness of the information system” (p. 69), Seddon (1997) belief individual impact mean benefits accruing to individuals from using the IS. We do claim that perceived usefulness covers some aspects of individual impact. Perceived usefulness essentially covers the impact on decision-making productivity. Nevertheless, in this study, Perceived usefulness refers to the actual benefits adopters receive from utilizing EG.

3. IDENTIFYING THE THEORETICAL CONSTRUCTS IN THE EG SUCCESS MODEL AND RESEARCH HYPOTHESIS

3.1 Elements of EG Systems Quality

Three elements of the EG system quality construct were identified as accessibility, flexibility, and usability. Accessibility involves user's judgment of the degree to which the technical components of the EG support a user in accessing an EG. Before making use of the information or functionality provided by the system, an individual must first gain physical access to it through some interface device, and subsequently formulate a query that retrieves the desired information from the system, As noted by Wixom and Todd (2005), the accessibility of a system affects the reputation and value of the system and the convenience benefit of using a EG. Thus, accessibility and usability are important elements of EG systems quality which capture interface aspects of EG design, and without which the convenience benefit of using a EG cannot be achieved, flexibility refers to the way the system adapts to changing demands of the user. While a system which does not meet the users' need for information is unlikely to be used, inaccessibility to the system is also a possible reason for

user rejection and dissatisfaction (Rai et al, 2002). The accessibility problems of systems affect the reputation and value of the systems and of the information provided (Strong et al, 1997) and have been seen as critical to IS success (Molla and Licker, 2001). Within the end user computing literature, the speed with which a computer system responds has been presented as an important factor influencing the satisfaction and emotional responses of users (Rai et al., 2002).

Research also suggests users evaluate IS based on how easy they are overall to use and how effective they are in helping them accomplish their tasks (Rai et al, 2002); that is, usability is a critical determinant of greater satisfaction (Rai et al, 2002). The design, layout and sequencing of EG screens should make it easy for users to find the way (Rai et al, 2002). Good EG usability will sustain a user's motivation to continue using the EG, enhance the user experience, and eventually increase user satisfaction with that EG.

Palmer (2002) believes a system with a high degree of usability should generate a desirable perception of its use and an intention to use a system. Flexibility refers to the way the system adapts to changing demands of the user. An effective EG should characterize by greater flexibility, this in turn would make the organization more responsive to its ever changing services need. This research suggests that the greater the perceived system quality of a EG, the higher is the EG effectiveness.

3.2 Elements of EG Information Quality

Information quality, the quality of the information that the system produces and delivers, is considered to be a key factor affecting IS success (Wang and Strong, 1996). In the EG context, Web site information quality suggests delivering relevant, updated, and easy-to-understand information to significantly influence citizens satisfaction (Zhang et al, 2001). In the electronic commerce context, it is proposed that the higher the quality of the Web site information, the more customers would select that Web site for shopping. EG information quality can be measured using information comprehensiveness, timeliness, and understandability. Information comprehensiveness includes relevant depth and scope, and completeness of the information. Timeliness includes updating of the information. Understandability includes ease of understanding and clearness of the information. The significant effects of information comprehensiveness, timeliness, and

understandability on increasing information quality were exhibited in previous studies (Delone and Mclean, 2003).

In the EG environment, there is no face-to-face description of service. This arguably increases the importance of the way a service is presented, introduced and demonstrated. Providing information is a fundamental purpose of a EG Web site, and the target audience that a organization wants to attract drives the Web site content (Day, 1997; Iyer, 2001).

The generic literature reviewed about the association between information quality and satisfaction is fairly consistent, and suggests that high levels of information quality lead to high levels of satisfaction. Thus, Palmer (2002) found that higher quality of information is positively related to website success. Delone and Mclean (2003) put forward information quality and user satisfaction as two major dimensions for evaluating the success of EG. In considering satisfaction in the Web usage environment, Pitt et al. (1995) suggest that information quality is the dominant concern of the user, and the systems quality in delivering this information is secondary. Katerattanakul and Siau (1999) and Zhang et al (2000) note that an important role of Web sites is information delivery and that the quality of information is considered critical in e-commerce success.

McKinney et al (2002) suggest that, at the same time, the Web site's performance in delivering information can be independent of the quality or nature of the information, thus making it possible to have a clearer distinction between Web site information and the underlying system. Further, they argue that while distinguishing between information quality and systems quality may not be widespread in traditional IS user satisfaction studies, such a distinction is clearly possible on the Web due to the feasibility of separating content from the content-delivery system. Recognizing and modelling information and system aspects separately may elucidate the process by which consumer satisfaction is formed. Within the Web sites context, McKinney et al (2002: 297) noted that the lack of physical contact inherent in the online shopping experience causes customers to "*rely heavily on technology and system quality*" (p.297). McKinney et al thought that Web consumer satisfaction is directly and positively impacted by system quality, defined as the consumer's judgment about WBEC system performance in delivering information and carrying transactions. At

the same time, the Web site’s performance in delivering services is also important and may be independent of the information quality:

EG information quality can be measured using information comprehensiveness, timeliness, and understandability. Information comprehensiveness includes relevant depth and scope, and completeness of the information. Timeliness includes updating of the information. Understandability includes ease of understanding and clearness of the information. The significant effects of information comprehensiveness, timeliness, and understandability on increasing information quality were exhibited in previous studies (Hong et al, 2001–2002; Delone and Mclean, 2003; Wixom and Todd, 2005). In the context of a digital

library application, Hong et al. (2001–2002) examines how information relevance, clarity of terminology, and screen design influence ease of use and usefulness. Their results show mixed effects with only relevance influencing both usefulness and ease of use.

Table 1 presents the hypotheses motivated by the above discussion and that in section 2. The incorporation of quality into the EG success model must describe the dependency of user satisfaction on system quality and information quality. This supports the underlying belief in Delone and Mclean’s 2003 model that user involvement should lead to increased positive outcomes for the user. Thus, hypothesis H1 is generally well supported by the literature. Hypothesis H2, H3, H4, and H5 are more exploratory.

Table 1. The study hypotheses

Hypotheses concerning EG quality as determinant of EG user satisfaction	
H 1	EG user satisfaction is positively associated to EG system quality and EG information quality.
H 1a	EG user satisfaction is positively associated to EG system quality.
H 1b	EG user satisfaction is positively associated to EG information quality.
Hypotheses concerning EG quality as determinant of EG Perceived easy of use and EG Perceived usefulness	
H2	EG user satisfaction is positively associated to EG use
H 3	EG user satisfaction is positively associated to EG Perceived usefulness
Hypotheses concerning EG quality as determinant of EG Perceived easy of use and Perceived usefulness	
H4	Use is positively associated to EG quality
H5	Perceived usefulness is positively associated to EG quality

4. RESEARCH DESIGN AND METHOD

The research design and methods section is divided into two sub-sections. First, Measures of the factors are discussed, after which the focus is shifted on the Data collection procedure and the study sample

4.1 Measures of the Constructs

To test the model in Figure 1, we prepared a questionnaire. The development of the survey instrument was formulated after the process proposed by Churchill (1979). First, groups of questions were compiled from validated instruments to represent each construct, and wording was modified to fit the EG context to be studied. Details of all questions used in measuring variables for this study are presented in Appendix 1.

There are five groups of questions that measure six variables as follows.

First, drawing upon previous research we reviewed related to user satisfaction and EG quality, notably Wixom and Todd (2005) and Seddon, and Yip (1992),

EG system quality was measured using three factors: accessibility, usability, and flexibility. A 7–item scale was adopted and refined from instruments used by Wixom and Todd (2005) and Seddon, and Yip (1992) which were reported to have high reliability (Cronbach alpha values greater than 0.80). Second, the 6 questions on information quality are based on Bailey and Person (1983), and Seddon and Yip (1992), with modifications to fit the specific context of an EG. Bailey and Pearson’s instrument is widely accepted, has been tested for reliability and validity by several researchers, and has become a standard instrument in the IS field. Third, the 3 questions on Satisfaction are from Seddon and Yip (1992). Fourth, the 2 questions on Perceived Usefulness are from Davis (1989). Fifth, the variables Use, 3 questions to measure these variables were adapted from Seddon and Yip, (1992).

The first draft of instrument was pre tested by five researchers and experts in the fields of information systems, each one with practical and/or academic experience. Each expert was provided with a working

definition of the construct being measured, and was asked to rate: how well they felt individual statements reflected the stated definition; their opinion of whether the questions were likely to accurately measure each dimension; whether the questions were vague, ambiguous, difficult to understand, or had contradictions; whether there was incompatibility between any item and the dimension it was supposed to measure; and whether there were any set of items that did not fully capture the dimension it was supposed to measure. The aim was to detect and remedy errors in the instrument design (Cavana et al, 2001). A tabulation format for collecting this information was used because it reduced the length of the instrument and enabled the expert to write any comments or suggestions next to the instrument items. Minor changes were made based on their suggestions.

4.2 Data Collection Procedure and Sample

Data for this research were collected using the survey instrument in the context of the free simulation experiment research design. Specifically, participants were asked to use the Internet during an unsupervised session to access four nominated EG sites, review the EG site, and then answer questions about particular scenarios. This research design is appropriate for this study for three reasons. Firstly, it is appropriate because the variables of interest are difficult to manipulate. Secondly, it is suitable because participants could easily access nominated EG sites, review the EG site, and then answer questions based on a particular scenario (Straub et al, 2005). Thirdly, it is suitable because respondents could be easily assigned to a real evaluation case (Straub et al, 2005). As this study survey instrument was developed as a general tool for EG success, and not for any specific survey, we manage it in the same way as a real evaluation case. That is, we did not ask participants questions concerning EG in general, but asked them to visit specific EG Web sites obtained from a small survey of experts.

This type of quantitative study is an established approach to the study of IS success (Straub et al, 2005), and to the study of interactions of human and computers. The basic purpose of the free simulation experiment technique in this setting was to establish and define the relationship between the independent variable and the dependent or outcome variable. The main strengths of free simulation experiments lie in precision and control,

where precision is achieved through quantitative and reliable measurement and control is achieved by the design (Straub et al, 2005). Furthermore, hypotheses are tested via a deductive method and the use of quantitative data to allow statistical analysis.

As this research linked success of EG with the reaction of citizens (specifically to their sense of satisfaction with EG), knowledge of Web technology is assumed and expected in the target population. In this research, the population consisted of all EG users / citizens aged 18 and over who have experience with the Web and Internet technology and have access to a Web-enabled computer. Identifying a sample representative of the population is complicated by the lack of access to reliable lists documenting citizens. Although, several databases exist, including citizens databases at public companies, these databases are operationally inaccessible because of confidentiality laws. Ethical concerns are also applied to the use of the lists of Internet service providers. The possibility of using a Web based survey conducted over the World Wide Web was explored and abandoned after recognizing the technical and methodological difficulties. After an assessment of available resources and data collection strategies, a decision was made to draw the sample from the University student populations in the area of information technology, management information systems, and electronic government.

To maximize the response rate, and therefore reduce the possibility of no response bias, recommendations of Fink (2006) were followed. Thus, to minimize the respondent costs, the instrument was designed so that it would be easy to answer. The use of sensitive or demographic questions was kept to a minimum. To establish trust with the respondent, the introduction to the survey explained why the study was important, and promised confidentiality. In addition, the researchers' university were named as the sponsors of the study, to provide legitimacy. Finally, attention was given to minimize the difficulty of instrument, through wording of the item, using Arabic language, and pre testing, as discussed above.

Seventy five participants took part in this study; evaluated 4 Web sites. Of the 300 instruments collected, 19 were considered unusable because over 25 percent of these instruments' questions were not answered (Fink, 2006). It was assumed that those respondents had, for these Web site evaluations, been unwilling or unable to

co-operate fully. These 19 data sets represented 5 participants, 2 of whom provided no usable returns from any of the 4 Web site evaluations, one of whom returned 3 unusable questionnaires, and two of whom returned 2 unusable questionnaires. A total of 281 usable Web site evaluations were obtained, representing a 31% response rate from the forms which had been distributed to 180 potential respondents. Male participants represented a slightly higher percentage of the completed sample (approximately 58%) compared to female participants (approximately 42%). The majority of the participants were aged 23-32 years. The completed sample was composed of well educated individuals, approximately 80% of whom were postgraduate students.

The participants were mostly experienced computer

and Internet users. Approximately 87% of the participants had more than 5 years experience in using computers. The majority of the participants (90%) had used the Internet and Web (using email, WWW, etc.) for more than 3 years. 94% of the participants accessed the Internet daily. Participants were asked to navigate to the determined Web sites either on their in-lab PCs or home PC. For this reasons, they were asked to specify the Internet speed connection of the PC used while completing the survey instrument. The result shows that 58% of the participants were using TI (1.5 million bits per second) Internet speed connections. Participants' demographic statistics, computer, and Internet usage information were analysed and are summarised in Table2.

Table2. Characteristics of the Respondents

Parameter		Frequency	Percent
Age	18-22	39	13.9
	23-27	98	34.9
	28-32	77	27.4
	More than 33	67	23.8
Gender	Male	162	57.7
	Female	119	42.3
Student Status	Undergraduate	55	19.6
	Graduate	226	80.4
Computer Experience	Under 3 years	0	0
	3-5 years	37	13.2
	Over 5 years	244	86.8
Internet and Web experience (Either using email, WWW, etc.)	Less than 3 months	0	0
	3 months - 6 months	7	2.5
	7 months – 11 months	0	0
	1 - 2 years	20	7.1
	3 years or more	254	90.4
Internet Usage	Every Day	265	94
	A few times a week	15	5
	A few times a month	1	4
	Once a month	0	0
Internet Speed Connection	56 K bits per second	44	15.7
	ISDN 1B+D - 64 K	8	2.8
	ISDN 2B+D - 128 K	65	23.1
	TI (1.5 million bits per second)	164	58.4

5. RESULTS

5.1 Results of Instrument Reliability Testing

Cronbach reliability tests were performed using

SPSS. The results are presented in table 3. As shown in the table 3, the overall reliability coefficient for the 21-item instrument is extremely high, at 0.87. Each of the two quality scales had alpha values greater than 0.80.

The Perceived easy of use, Perceived usefulness, and EG satisfaction had Cronbach alphas of 0.89, 0.85, and 0.92, respectively. The analysis provides evidence that the study measures are internally consistent and thus reasonably free of measurement error.

Table 3. Reliability of the Scales

Variables	Number of Items	Code	Cronbach Alpha
EG system quality	7	SQ	0.92
EG information quality	6	IQ	0.89
Use	2	PEU	0.82
Perceived usefulness	3	PU	0.88
EG satisfaction	3	EGS	0.85
Total	21		0.87

5.2 Results of Hypothesis Testing

The correlation coefficients between EG user satisfaction and each of EG system quality, EG information quality, EG use, and EG Perceived usefulness are each statistically significant with $r = .428, .385, .546,$ and $.486$ respectively at .05 level of

significance(see table 4).

Table 4. Correlation Matrix between Independent Variables and EG user Satisfaction

	US	SQ	IQ	PEU	PU
US	1.00	.428*	.358*	.546*	.486*
SQ	.428*	1.00	.374*	.442*	.315*
IQ	.358*	.374*	1.00	.527*	.030
USE	.546*	.442*	.527*	1.00	.337*
PU	.486*	.315*	.030	.337*	1.00

*Significant ($P < .05$)

The results of the regression analysis on the relationship between the dependent variable (EG user satisfaction) and the combination of the four independent variables are presented in Table 5. It follows that predicting EG user satisfaction with the four independent variables gives a coefficient of multiple regression (R) of .657 and a multiple correlation square (R²) of .431. These values are statistically significant at .05 level of significance suggesting that only 43.1 percent of the variance of EG user satisfaction were explained by the combination of the four independent variables to predict EG user satisfaction.

Table 5. Summary of Multiple Regression Analysis of the Relationship between EG user Satisfaction and a Combination of Independent Variable

Variables	R	R-Square	Adjusted R-Square	Standard Error	Sig.
SQ IQ USE PU	.657	.431	.418	21.76	.000

Table 6. Significant Tests of Regression Weights of Independent Variables

Variables	B	Standard Error	Beta	T	Sig.
SQ	.866	.421	.127	2.057	.000
IQ	2.834	.496	.336	5.714	.021
PEU	2.443	.610	.281	4.003	.000
PU	1.673	.721	.155	2.320	.041
(Constant)	-44.627	12.127		-3.679	.993

Table 6 presents the Standard Regression weights (B), Standard Error of Estimate, Beta, T-ratio and the level of significance for each of the independent variables. This is with a view to further determining the relative power of each of the four independent variables to predict EG user satisfaction. The four independent variables have values that are significant at .05 level thus implying that the variable contribute largely to the prediction of the dependent variable (EG user

satisfaction). From the values of Beta weights and t-ratios for each independent variable, it becomes clear that information quality, followed by perceived usefulness factor had the highest contribution to the prediction of the dependent variable. However, system quality has the least (though still significant) contribution to the prediction. Overall the results indicate support for the hypothesis H1, H2, and H3.

To test whether a system quality and information

quality will significantly predict perceived ease of use, data collected were analysed employing multiple regression analysis. Table 7 reveals that the analysis of variance of the multiple regression data gives an f-ratio of 121.488 which is significant at .05 level of significance, thus implying that a combination of eg system and information characteristics is significantly related to perceived ease of use. They explain 46% of the variance in perceived ease of use (adjusted $r^2 = 0.463$). The f ratio of 121 is highly significant ($p < .001$). The t-tests are significant ($p < .05$) for both system quality ($t(278) = 2.95$) and information quality ($t(278) = 9.94$); therefore, both system quality and information quality are making significant contribution in explaining the variance in perceived ease of use. The standardized beta values for system quality is 0.17, and for information quality is 0.56, which shows that

information quality has more impact than system quality. Overall the results indicate support for the hypothesis H4.

In the next regression, the independent variables were system quality and information quality, and the dependent variable was perceived usefulness. Table 8 shows that 27 percent of the variance in perceived usefulness is explained by the two factors (adjusted $r^2 = 0.274$). The regression model is significant in explaining perceived usefulness; the f ratio of 54 is highly significant ($p < .001$). The t-tests of each factor is significant ($p < .05$), namely system quality ($t(278) = 4.00$) and information quality ($t(278) = 2.74$). The standardized beta value for system quality is 0.33, and for information quality is 0.23. From both tests we see that system quality has more impact than information quality. Overall the results indicate support for the hypothesis H5.

Table 7. Mmultiple Regression Analysis of the Relationship between System Quality and Information Quality and Perceived Ease of Use

Variables	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
SQ	.193	.065	.168	2.955	.003
IQ	.671	.067	.564	9.942	.000
Model Summary			ANOVA		
R	.683		F	121.488	
Adjusted R square	.463		Sig.	.000	

Table 8. Multiple Regression Analysis of the Relationship between System Quality and Information Quality and Perceived Ease of Use

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
SQ	.470	.118	.331	4.000	.000
IQ	.288	.105	.227	2.743	.006
Model Summary			ANOVA		
R	.528		F	53.764	
Adjusted R square	.274		Sig.	.000	

6. DISCUSSION, CONCLUSION, AND IMPLICATION FOR FURTHER RESEARCH

The results indicate that information quality, system quality, perceived usefulness, use, and user satisfaction benefit are valid measures of EG success. The hypothesized relationships between the success variables were significantly supported.

This results provides several important conclusions, the first conclusion related to the relationship between

the EG system quality and satisfaction. This finding is consistent with previous studies in the conventional IS success and the limited number of previous studies that have tested similar relationships.

The literature suggest that, in the context of electronic government, a EG website becomes a primary user interface to connect government with citizens (Straub and Watson 2001), and citizens perceptions about government services is largely built upon their interactions with the EG Web sites. As such, EG system

quality is largely characterised by the interaction between citizens and the EG Web site (e.g. information searching, the Web site speed in loading the texts and graphics, and ability to find the service the citizen is looking for). Within the electronic government context, the lack of physical contact inherent in the online experience causes citizens to depend greatly on system quality (McKinney et al, 2002).

Researchers in the area of conventional IS generally regard system quality to be a highly important characteristics of all interactive computer systems (Rai et al, 2002), independent of the specific application the system was designed to support. In the electronic commerce success context, researchers such as Weinberg (2000) and Turban and Gehrke (2000) found that down speed was a key determinant of a successful Web site. In turn, the finding of this research suggests that the greater the perceived system quality of a EG Web site, the higher is the Web site success, agreeing with the literature noted above. However, there has been little empirical research about the impact of EG system quality on citizens satisfaction. Therefore, this research contributes to some extent to the current knowledge about the impact of system quality on citizens satisfaction.

The second conclusion relates to the impact of EG information quality on user satisfaction. The generic literature about the association between information quality and satisfaction is fairly consistent and suggests that high levels of information quality lead to high levels of satisfaction (, Palmer, 2002; McKinney et al, 2002). Many studies have found that information quality is important for the success of general IS, for example, Palmer (2002) found that higher quality of information is positively related to WBEC success. Delone and Mclean (2003) put forward information quality and user satisfaction as two major dimensions for evaluating the success of web based information systems where information quality attributes included accuracy, timeliness, precision, reliability, currency, and relevancy.

Our research confirms the previous research and found that there is a high association between information quality and consumer satisfaction. It also adds to the literatures by identifying that level of Web site information quality is significantly associated with satisfaction in the electronic government context.

The third conclusion for the research relates to the

impact of use on satisfaction. While use is not a new concept in IS research, our literature review shows that the use of EG is still an under researched construct in the electronic government context (Aladwania and Palvia, 2002; Yang et al, 2005). There was little empirical investigation according to Gounaris and Dimitriadis (2003). Delone and Mclean (2003) identified use as determinant for the success of Web sites in the context of e-commerce but did not test this. This research presents empirical evidence that suggests satisfaction with EG is positively associated to use, as previously speculated.

6.1 Implications for Theory and Academic Literature

The first and central contribution of the study is the development of a simple model that illustrates the importance of EG quality as criteria for EG success. The model appears to provide useful and pioneering insights into EG success. The role of the two IS quality components (system quality and information quality) is not new. However, the developed understanding of the dimensions of each of the two components in the context of EG, and in the presence of TAM variables, through theoretical integration, provides new material.

In addition, the framework of this EG success model enabled the construction of a new instrument which measures quality of the EG and of different TAM components (Appendix1). This EG success instrument is simple, easy to administer and can be used with users of a variety of EG. This has several benefits for EG success researchers. At the level of a single study, this instrument can help a researcher select measures of EG success that will enable him/her to improve explanations of EG success in his/her theoretical model. At the level of the entire community of researchers who study EG success, the approach illustrates a disciplined way of creating EG success measures. In the field of IS research a well-defined outcome measure is essential, yet existing user satisfaction measures are being challenged by changing technology and changing applications. The instrument is an initial step toward such a measure.

The second main contribution of this study is the manner in which IS success literature has been synthesised. Although IS authors (e.g. Delone and Mclean, 1992) have undertaken extensive review of IS success literature, we know of no previous authors who have provided a comprehensive review of IS success in the context of EG. It is widely acknowledged that

research in the IS success is fragmented, and criticized for lack of theoretical grounding (Avgerou, 2000, Larsen, 2003). In this study, the literature review was grounded with theoretical integration between the user satisfaction measures and TAM. The implication for IS success theory may further encourage the existing practice of integrating models for application to the EG success. From a theoretical perspective, this study, by adding EG quality to TAM, extends the scope of TAM to account for indicators of systems characteristics.

6.2 Limitation of this Research

Related to the research methods, there are several limitations of the research methods used in this study.

Firstly, the current study adopted a free simulation experiment design, which was conducted at one point in time (cross-sectional design). While it provided a useful snapshot and helped to understand the phenomenon under study, it could not explain possible changes in citizens’ satisfaction over time. It is generally recognised that longitudinal studies (or at least a series of cross – sectional studies) can detect attitude changes over time and allow stronger inferences to be drawn about the dynamic elements of behaviour (Starub et al, 2005).

Secondly, there were limitations arising from the sample used in this study. First, the sample size was relatively small. Given the relatively small size, more versatile and powerful statistical techniques such as structural equation modelling (SEM), which is optimised for large samples of 400 responses (Starub et al, 2005), could not be run. Instead this study used conventional regression methods to analyse the data gathered from the experiment.

Moreover, the participants were not taken from a probability sample. Although there was no evidence of sample biases compared to the population from which the sample was drawn, this possibility cannot be ruled out. A related problem was that of the population of interest for the study, university students.

In brief, this study provided a structure for understanding EG success and explored the impact of both EG quality on EG satisfaction, EG usefulness and EG ease of use. The detailed framework is the first rigorous research step toward understanding the important confluence of two powerful streams of IS success models on EG. The framework we built from theory and empirical research provides a foundation for future research.

Appendix 1: EG SUCCESS QUESTIONNAIRE

EG System Quality	Code
Accessibility	
• In general, how do you rate the Web site speed?	SQ1
• How do you rate the Web site speed in loading the texts and graphics?	SQ2
• How easy is it to find this Web site?	SQ3
Usability	
• How do you rate the ease of using this Web site the first time you access?	SQ4
• How easy is it to figure out where to go on this Web site?	SQ5
Flexibility	
• EG can be adapted to meet a variety of needs.	SQ6
• EG returns answers to my requests quickly.	SQ7
Information Quality.	
Comprehensiveness	
• How much of the information needed to make a purchase is available on the Web site	IQ1
• How complete was the information displayed on this Web site	IQ2
Timeliness	
• How up to date do you believe is the information described on this Web site?	IQ3
• Do you get the information you need in time?	IQ4
Understandability	
• How clear is the meaning of information about products displayed on this Web site?	IQ5
• Does the system provide the precise information you need?	IQ6
Perceived Usefulness	

EG System Quality	Code
Using EG saves me time.	PU1
Using EG makes it easier to do my job.	PU2
Overall, I find EG useful to my job.	PU3
Usage of the system	
You are dependent on the EG system.	USE1
The frequency of use with the EG is high.	USE2
EG Satisfaction..	
How adequately do you feel EG meets yours expectations of your area of responsibility?	S1
How effective is EG?	S2
Overall, are you satisfied with this EG?	S3

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