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A Preliminary Assessment of the Impact of eGovernment Technologies in Governmental Agencies

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A PRELIMINARY ASSESSMENT OF THE IMPACT OF eGOVERNMENT TECHNOLOGIES IN GOVERNAMENTAL AGENCIES

ABSTRACT

This study involves an empirical assessment of the impact of eGovernment technologies in local and state government agencies throughout the State of Texas using the following major constructs: eGov system quality, eGov information quality, eGov system usage, and eGov user satisfaction. An IS success model for these agencies were proposed using the DeLone and McLean framework. The data for validating the model was collected from a sample of 300 government agencies in Texas. The structural equation modeling (SEM) approach using Analysis of Moment Structures (AMOS) was used to analyze the data. Overall, the model fits the data indicating its veracity. With the exception of the relationship between eGov information quality and eGov user satisfaction, all other associations among other constructs were found statistically significant. The manuscript concludes by providing recommendations for future research and practice.

INTRODUCTION

Although there are numerous studies reviewing the effectiveness of various evaluation techniques in the commercial space, the author knows of none that have been modified specifically for the small to medium sized governmental entity. It is expected that results from this research will contribute to a greater understanding of the impact sufficient evaluation has on the ultimate success of e-government implementation projects. This research will therefore focus specifically on the development of decision making techniques as they pertain to government websites. Additionally, the author will

compare the use of sophisticated analytical methods against user-oriented approaches typically utilized by e-commerce to adjust its business practices.

The development of eGovernment technologies such as the Internet/world wide web, intranets, and extranets have created many opportunities for governmental agencies to effectively deliver services to citizens. Very few studies have been conducted to date on the extent to which these technologies have been utilized in governmental agencies, and, more importantly, on whether or not eGovernment has brought about improvements in managing the service delivery.

The use of eGovernment technologies (the Internet/world wide web, intranets, and extranets) in eGovernment is a relatively recent phenomenon, however. Accordingly, very few studies have been conducted to date on the extent to which eGovernment technologies have been utilized in Governmental Agencies, and, more importantly, on whether or not e-enabled Governmental Agencies (eGov), with the use of such technologies, has brought about improvements in managing service delivery.

The objective of the present research is to investigate the impact of using eGov on organizational performance and productivity. The rest of the manuscript is structured as follows: the next section reviews relevant literature on the use of information systems and eGovernment technologies in Governmental Agencies, as well as on information systems success. This is followed by the presentation of methodology used in the current study. The results are provided next, along with a discussion of these results. Limitations of the study are cited. The manuscript concludes by providing a summary and suggestions for future research.

LITERATURE REVIEW

In reviewing the literature referred to in this work, it is clear that there is a necessity to provide further insight into the technology process known as Service Oriented Architectures, which allows for the re-use of shared services (such as security, downloads, personalization) among all those who wish or need to communicate with the citizen. The data collection will therefore include questions about the various views and understanding of this emerging technology.

This study will step beyond the dimensions found in similar research in an effort to mitigate the risk to successful implementation projects. And by applying an understanding of those factors that place an implementation project at risk, this approach offers an opportunity to search for something that is both new and useful.

Al-Kibsi et al. (2001) provides one of the earlier papers describing benefits, expectations and cautions of e-government, by analyzing 500 detail-based e-government initiatives. Examples of expectations are represented, for instance, by reduction in cost for:

Arizona vehicle registration from $6.60 to $1.60

IRS tax return from $1.60 for paper to $0.40 on-line

Singapore export license processing, which was reduced from 21 forms, 20 days, and 23 agencies down to one on-line form in15 seconds.

Within the cited examples, savings achieved are attributed to rule-based decision engines that issue permits automatically. Estimates place local government spending within the U.S. at $568 Billion (2000), and expectations suggest that just putting regular services (work permit, renewal of license, tax return) online can produce 20-25% savings.

Also the use of outsourcing is demonstrated by Hong Kong paying flat fee of $0.80 to Web vendor for every transaction, vs. $1.90 at the counter. The research included the survey questions regarding the rule-based decision engine, expected and actual savings realized.

The Civic Resource Group (CRG 2001) reports the description of e-government efforts for all cities in the U.S. with a population greater than 100,000 with over 70 variables (information delivery, technology, e-policies and standards, service delivery, essentials usability and design, community building and civic engagement, and economic development impact, etc.). In also alluding to success factors used by DeLone/McLean and SOA-type organization changes, they concluded the need still exists for better planning and phased implementation when implementing e-government at the enterprise level. It was also noted that these entities should "look inside" as well as outside for stakeholders, and more rational budgeting.

Patel (2003) introduces the need for a service strategy that allows the domain expert to require quality, in the same manner as existing e-policies allowed a vendor to ensure the 'best practices' by provider. This may be considered as a very early application of the SOA concept.

Min (2004) describes results of a survey conducted on a random sample of 200 cities with populations of 8,000 – 10,000. Of the 200 cities surveyed, only 48 replies were received. These results give an idea of what to expect in selecting targets. Min looks at issues of access by type--DSL, Cable, Wireless--and adds parameters of Cost (fixed, variable), Quality (security, reliability), and Speed (latency and bandwidth). He applies the Analytical Hierarchy Process (AHP).

Yi (2005) explores the influence that individual user differences have on use. The differences included self-sufficiency, computer self-sufficiency, personal innovativeness, age, gender, and several combinations of these factors. The paper provides a guide to over 200 studies of such differences. They formulate a triangular model with corners being Perceived Usefulness, Perceived Ease of Use, and Technology Usage Behavior. The model allows gender, age, personal innovativeness, and computer experience to moderate or influence the relationship (paths) between the corners.

Becker (2003) outlines the way to enhance accessibility for older, handicapped, or language limited users in a level that must meet NIA, Section 500 guidelines (2003), thus providing groundwork for standards that can be used in SOA.

Users and Requirements Issues

Burns (2006) offers a succinct description of rural and urban use and internet access through December 2005. He shows that up to 58 percent of rural users have some form of home access (home broadband, home dial up, and office only), compared to 65 percent of urban users. This implies that small communities may already have faced challenges with implementing e-government. Wang (2005) evaluated users' gain in capacity to find information through a web site. Users are categorized by their physical capacity and network access capabilities. We can expect senior, handicapped, and language limited citizens to add special resources and design criteria beyond this study. Her model does not deal with the issues of user needs in general, but she helps define the citizen-centric approach to design. Ruth (2007) mentions that cost sourcing is a secondary goal and describes the full potential of e-government to link citizens with user-friendly services that have the latest IT advances.

Since e-government is the use of the Internet to deliver public services on-line, replacing the delivery of services at department or agency counters, Burns (2006) recommends rural use of the Internet, stating that this will act as a "distance killer."

The evaluation of e-government is concerned with the manner that it is implemented. This research needs to adapt a model of implementation that offers measurable variables that can be sampled through surveys. Various models have been applied in the literature. Following is a description of a few of the models and the model chosen for this research.

Irani, et al. (2006) divides an e-government system into the publication, interaction, and transaction stages, but fails to include an integration stage. Halley (2005) mentions that in a sample of ten enterprises, SOA architecture evolved into a three-layer structure (producers, distributors, and consumers) in 84% of the cases. Organizations were able to overcome problems by developing a three-layer, horizontal architecture model and making sure that interfaces were described in industry accepted standards. Beer (2006) introduces RAFEG architecture which features flexibility, security, adaptability and interoperability between agencies. Gill-Garcia (2006) applies Fountain's Technology Enactment framework modified through IT and literature reviews and introduces various constructs and indicators for a PLS (Partial Least Squares) to evaluate the recursive part of his model.

Contenti, et al. (2003) refers to the four stages of development model initiated by the Australian National Audit Office in 1999. This description of activities and service levels is simple and offers a rich approach for requesting data and will be used in this research framework.

DeLone and McLean (1992) propose interrelationships among six IS dimensions in what is referred to as the 'DeLone and McLean (D&M) IS Success Model'. The six dimensions in the D&M model are (1) system quality, (2) information quality, (3) system usage, (4) user satisfaction, (5) individual impact, and (6) organizational impact.

While DeLone and McLean postulate causal relationships, the 1992 article did not test these relationships empirically. Since 1992, however, a fairly good number of empirical investigations have been undertaken of the various interrelationships proposed in the D&M model. DeLone and McLean (2003) themselves provide a ten-year update of the model, reviewing the results of 16 empirical investigations that have supported (or *not* supported) the postulated relationships. They also update their model with new or revised constructs as follows: (1) the addition of *service quality* as a new construct, to address a third major dimension of quality, and (2) the replacement of the earlier individual impact and organizational impact constructs by a *net benefits* construct (cost savings, expanded markets, incremental additional sales, reduced search costs, time savings). Moreover, they revisit the difficulties associated with the multidimensional aspects of usage (e.g., mandatory vs. voluntary, effective vs. ineffective, informed vs. uninformed) and propose that it may be worthwhile in some contexts to pay closer attention to *intention to use* (an attitude) as an alternative measure to usage (a behavior), to address concerns raised by Seddon (1997). They emphasize, however, that attitude is extremely difficult to measure, so that many researchers may choose to remain with system usage.

Molla and Licker (2001) attempt to theoretically extend and respecify the original IS success model (DeLone and McLean, 1992) into a proposed 'e-commerce success

model'. Molla and Licker replace information quality with 'content quality' and user satisfaction with 'customer e-commerce satisfaction', propose two additional dimensions (trust and service), and refer to 'e-commerce success' (in place of the earlier individual impact and organizational impact constructs).

However, DeLone and McLean (2004) propose that the same six dimensions in their updated IS success model (DeLone and McLean, 2003)—i.e., (1) system quality, (2) information quality, (3) service quality, (4) usage, (5) user satisfaction, and (6) net benefits—may be used for measuring eCommerce success. They proceed to apply these eCommerce success measures to two case examples, Barnes & Noble and 'ME Electronics' (with the name of the latter company changed for confidentiality). While they argue that the two case examples provide logically compelling support for these eCommerce success measures, they do admit a need to test these measures empirically.

The present research is an attempt to empirically investigate the impact of eGov on organizational performance and productivity. It examines the use of eGovernment technologies in Governmental Agencies in terms of five constructs: (1) eGov system quality, (2) eGov information quality, (3) eGov system usage, (4) eGov system user satisfaction, and (5) organizational impact.

METHODOLOGY

In the current study, we focus on five constructs pertaining to eGov: (1) eGov system quality [SQ], (2) eGov information quality [IQ], (3) eGov system usage [SU], (4) eGov user satisfaction [US], and (5) organizational impact [OI]. Our study did not address the dimension of individual impact [II], which refers to the effect of information

on behavior of the recipient. Each of the five constructs was measured using variables derived from the literature (see Appendix A for a listing of the measures that were used for each construct). Organizational impact is measured in terms of effectiveness, efficiency, performance, and productivity.

HYPOTHESES AND PROPOSED MODEL

System quality is defined as the extent to which an information system exhibits ease of use and user friendliness, ease of learning, useful features and functions, response times, convenience of internal and remote access, and system accuracy. Etezadi-Amoli and Farhoomand (1996) find a strong relationship between system quality and information quality. A system high in quality will result in an increase in the ability of that system to provide relevant, accurate, timely, complete, coherent, accessible and compatible information. We accordingly propose a first hypothesis.

[H1] eGov system quality will positively influence eGov user satisfaction.

Igbaria et al. (1997), using the Technology Acceptance Model (TAM), evaluate the impact of system quality on system usage. They measure system quality in terms of perceived ease of use and perceived usefulness, and system usage in terms of personal computing acceptance among users in small firms. On this basis, system quality is found to have a significant influence on system usage and thus user satisfaction.

Taylor and Todd (1995) apply TAM, the Theory of Planned Behavior (TPB), and a decomposed variation of TPB in evaluating usage of a student computer lab. System quality is measured in terms of perceived usefulness and ease of use. They find a significant impact of system quality on system usage and thus user satisfaction.

Mahmood et al. (2001) conclude that there is a strong and significant positive relation between the perception of ease of use and the perceived usefulness of an IT system to the actual amount of usage. This is consistent with TAM and TPB, which consider attitudes toward using the system as influencing system use.

The foregoing discussion leads us to our second hypothesis.

[H2] eGov system quality will positively influence eGov system usage.

For two decades, IS research has attempted to explain and predict IS use from several angles, and characterize the relationship between information quality and system usage. In examining the usage literature, DeLone and McLean conclude that "the problem to date has been a too simplistic definition of this complex variable." Thompson et al. (1991) used the work of Triandis to explain system usage through social factors and long term consequences. In the past several decades, many studies have been made to explain, predict and increase user acceptance of information systems based on different theoretical approaches, e.g., Innovation Diffusion theory (IDT), the intention-based theories of IT adoption (TAM), TPB, Social Cognitive Theory (SCT), and Triandis' model. System usage is an important dimension to measure IS success (DeLone and McLean, 1992, 2003).

Current literature shows that the higher the quality of the information the more the system is used successfully (Palmer, 2002; Seddon, 1997). Khalil and Elkordy (1999) also find a highly significant correlation between information quality and system usage. Kuan et al. (2005) find empirical support for information quality positively influencing the usage of the system.

We put forward a third hypothesis.

[H3] eGov information quality will positively influence eGov user satisfaction.

DeLone and McLean (2003) point out that, in a temporal sense, system usage must precede user satisfaction, and that, in a causal sense, favorable experience with system usage should lead to greater user satisfaction.

The literature provides primarily evidence of linear correlation between system usage and user satisfaction, although Igbaria and Tan (1997), in a study involving 625 respondents from among employees of a large organization in Singapore, establish user satisfaction to be an important factor that affects system usage.

Yoon and Guimaraes (1995), using data collected on 69 expert systems developed through IBM's Manufacturing Expert Systems Project, establish a highly significant ($p < 0.01$) relationship between system usage and user satisfaction. Likewise, Torkzadeh and Doll (1999), using a sample of 409 end-users in 18 organizations, find a highly significant correlation between system usage (expressed as "usage pattern") and user satisfaction.

Gelderman (1998), in a survey of Dutch managers, finds a significant correlation ($p < 0.05$) between frequency of direct usage, as a measure of system usage, and user satisfaction, and a moderately significant correlation ($p < 0.10$) between hours of direct usage and user satisfaction.

Khalil and Elkordy (1999) find a positive correlation between user satisfaction and system usage in a sample of Egyptian banks. They find, however, that a relatively high user satisfaction is associated with only a relatively average level of system usage.

We accordingly propose a fourth hypothesis.

[H4] eGov information quality will positively influence eGov system usage.

DeLone and McLean (1992) state that user satisfaction is impacted by user beliefs about information quality, among others. The D&M IS success model is consistent with TAM and TPB, where attitudes about using a system are impacted by beliefs about the system. The IS success literature is replete with research studies that empirically validate the relationship between information quality and user satisfaction as specified in the D&M model. Hunton and Flowers (1997) and Seddon and Kiew (1994), for example, find support for the relationship between user satisfaction and information quality. Rai et al. (2002) find support for all the relationships, including the relationship between information quality and user satisfaction. Kuan et al. (2005) find empirical support for information quality positively influencing user satisfaction with the system.

Chae et al. (2002) suggest that information quality, in the e-commerce area, is expected to impact customer loyalty through user satisfaction. Customer loyalty can make or break a company, especially in the e-commerce area. These authors empirically investigated the relationship between information quality and user satisfaction and found a positive relationship between the two variables.

On the basis of the foregoing, we present a fifth hypothesis.

[H5] eGov user satisfaction will positively influence system usage with the eGov system.

In the present literature review on the relationship between user satisfaction and organizational impact, we will also include the literature on the relationship between user satisfaction and individual impact, on the assumption that individual impact leads to organizational impact.

The literature on the relationship between user satisfaction and organizational impact, unfortunately, is not as clear. Etezadi-Amoli and Farhoomand (1996) find a strong relationship between user satisfaction and organizational performance. Gelderman (1998) also finds a positive and significant relationship between user satisfaction and organizational performance. Igbaria and Tan (1997) find a significant and positive impact of user satisfaction on individual performance. Hunton and Flowers (1997), on the other hand, find no significant relationship between user satisfaction and individual impact.

We propose a sixth hypothesis.

[H6] User satisfaction with the eGov system will lead to enhanced organizational impact.

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[H7] User satisfaction with the eGov system will lead to enhanced organizational impact.

On the basis of the sixth and seventh hypotheses stated above, we derive a proposed model for eGov system success as presented in Figure 1.

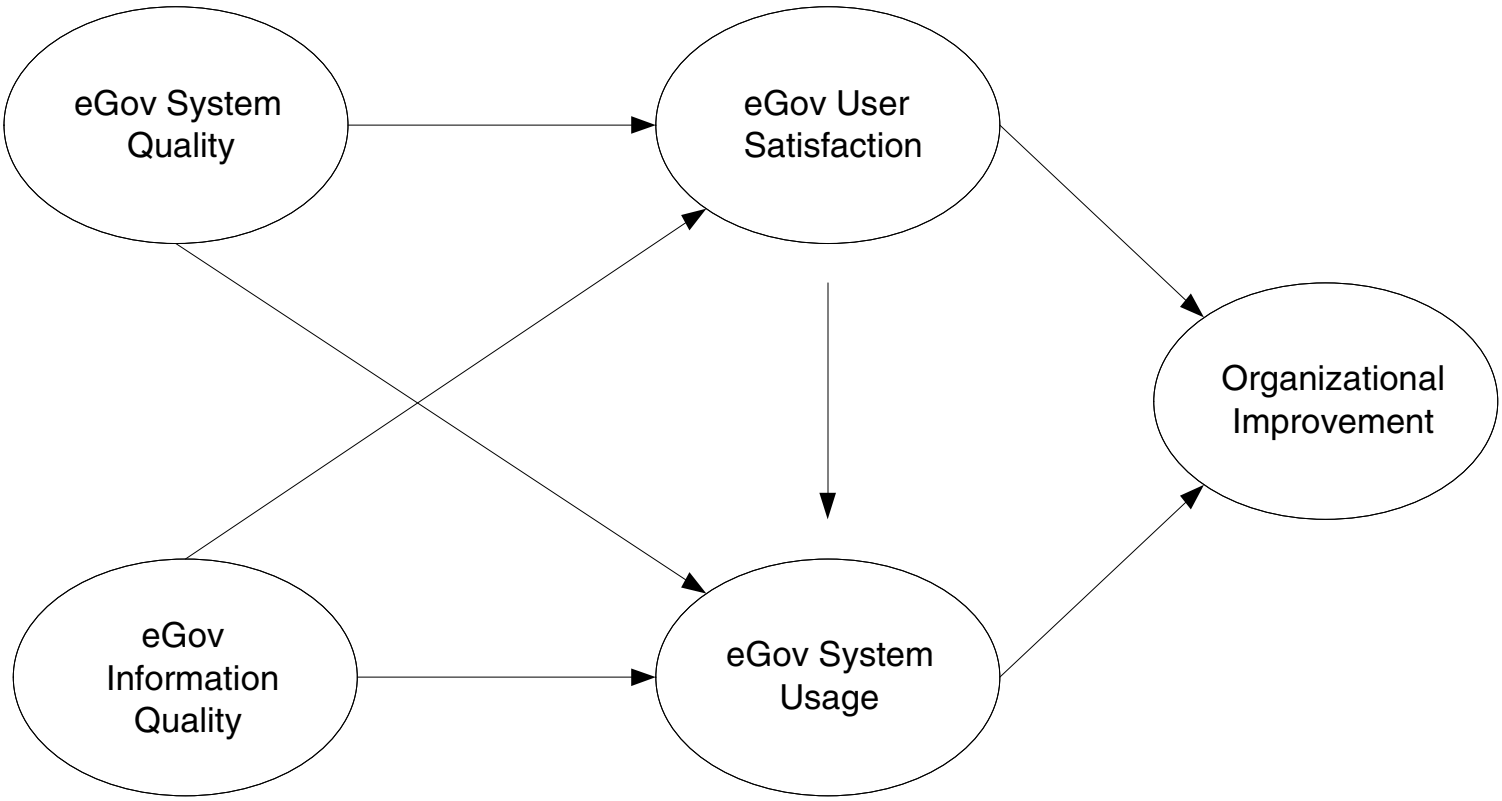

Figure 1. Proposed eGov System Success Model

RESULTS

Reliability and Validity

We use Cronbach's alpha as a measure of reliability. Cronbach's α value for the five constructs was 0.871. All are well over the 0.72 threshold specified by Nunally (1978).

Table 1. Cronbach's α Values and Correlations

Construct	SQ	IQ	SU	US	OI
SQ	1.000				
IQ	0.670	1.00			
SU	0.712	0.663	1.00		
US	0.993	0.547	0.680	1.00	
OI	0.641	0.562	0.689	0.718	1.00

Sample correlations between constructs are reported below the main diagonal.

Table 2 reports, for each construct, the mean, standard deviation, item factor loadings, and variance extracted. We apply factor analysis, which is one of two methods of construct validation suggested by Kerlinger (1973). Kerlinger points out that factor analysis is considered to be one of the most powerful methods of construct validation. As shown in Table 2, all factor loadings are between 0.704 and 0.939, except for one item in the EGov system quality (SQ) construct with a factor loading of 0.56. These factor loadings are all well above the norm of 0.40 cited by Mahmood and Sniezek (1989).

Statistical Validation of the Proposed Model

We have used the analysis of moment structures (AMOS) approach (Arbuckle, 1989), as an alternative to the LISREL software package (Jöreskog and Sörbom, 1984), to undertake structural equation modeling (SEM). The AMOS approach has been used for the analysis of small data sets. Wold (1989), for example, used this approach to analyze a model based on a data set consisting of 10 cases and 27 variables.

Table 2. Construct Validation

Construct	No. of Items	Mean	Standard Deviation	Factor Loadings	Variance Extracted
SQ	7	6.05	1.04	0.89, 0.73, 0.87 0.86, 0.56, 0.76, 0.78	0.86
IQ	6	6.29	0.99	0.89, 0.90, 0.89, 0.93, 0.93, 0.93	0.82
SU	11	5.16	1.37	0.85, 0.86, 0.79, 0.80, 0.70, 0.83, 0.90, 0.84, 0.87, 0.89, 0.82	0.77
US	7	5.76	1.24	0.72, 0.81, 0.92, 0.82, 0.92, 0.89, 0.87	0.88
OI	16	5.19	1.36	0.83, 0.88, 0.87, 0.88, 0.82, 0.83, 0.81, 0.77, 0.79, 0.70, 0.82, 0.88, 0.70, 0.86, 0.91, 0.86	0.76

The SEM methodology incorporates both measurement aspects and structural elements of the model. Since there is no consensus on a single measure, or even a set of measures, of fit, it is standard practice to report several measures (Maruyama, 1998). Our model has a chi-square of 4.763 with two degrees of freedom (df), resulting in a p-value of 0.092. The chi-square to df ratio is 2.355. Wheaton et al. (1977) suggest that a model has a good fit if the chi-square to df ratio is less than five.

Table 3 shows the resulting estimates and associated p-values corresponding to the relationships among constructs, as specified in our six hypotheses. The first two and the last four hypotheses are strongly supported. However, our third hypothesis (IQ $\rightarrow$ US) did not find any statistical support.

Table 3. Results of Hypothesis Tests

Hypothesis	Construct Association	Estimate	p-value	Significance of Hypothesis Test	Support of Hypothesis
H1	SQ → US	0.521	0.000	Highly significant	Strongly supported
H2	SQ → SU	0.600	0.000	Highly significant	Strongly supported
H3	IQ → US	0.031	0.716	-	Not supported
H4	IQ → SU	0.403	0.000	Highly significant	Strongly supported
H5	US → SU	0.376	0.000	Highly significant	Strongly supported
H6	US → OI	0.443	0.000	Highly significant	Strongly supported
H7	SU → OI	0.365	0.000	Highly significant	Strongly supported

Figure 2 provides a visual summary of the results in relation to our proposed model.

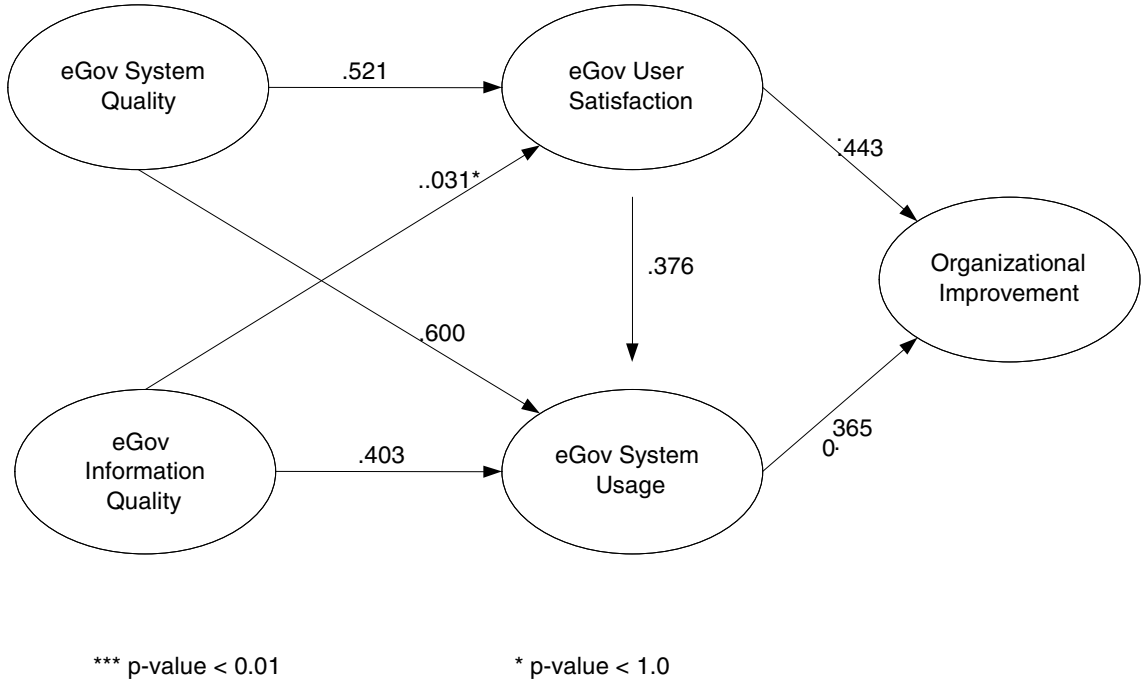

Figure 2. Statistical Validation of the Proposed Model

DISCUSSION

Our results confirm that eGov system quality plays a strong role for both eGov user satisfaction and eGov system usage (H1 and H2). These influences are highly significant and positive. Our results are consistent with findings by Igbaria et al. (1997), Taylor and Todd (1995), and Weill and Vitale (1999) of significant impact of system quality on system usage.

Our results also suggest that an eGov system's information quality will positively and significantly influence its user satisfaction (H4). This is in agreement with empirical support established by Kuan et al. (2005) for information quality positively influencing user satisfaction. It also extends beyond the positive relationships between user satisfaction and information quality found by Hunton and Flowers (1997), Seddon and Kiew (1994), and Rai et al. (2002). Likewise, Chae et al. (2002) empirically investigated, in the e-commerce area, the relationship between information quality and user satisfaction and found a positive relationship between the two constructs. We could not, however, establish that there exists a casual relationship between information quality and system usage (H3). This is where our research differ with Kuan et al. (2005), who found support for information quality positively influencing the usage of the system in a traditional information systems environment.

Our results further suggest that eGov user satisfaction positively influences system usage with the eGov system (H5). The literature provides primarily evidence of linear correlation between system usage and user satisfaction; in that sense, our results went one step beyond what is established in the literature. Yoon and Guimaraes (1995),

Torkzadeh and Doll (1999), Gelderman (1998), and Khalil and Elkordy (1999) all found a positive correlation between user satisfaction and system usage.

Our results also provide strong and positive support for the influence of eGov user satisfaction on organizational impact (H6). We are, therefore, able to totally and completely support the findings by Etezadi-Amoli and Farhoomand (1996) who found a strong relationship between user satisfaction and organizational performance and Gelderman (1998) who found a positive and significant relationship between user satisfaction and organizational performance. Our results also provide strong and positive support for the influence of eGov system usage on organizational impact (H7).

Finally, our results do show a highly significant correlation between eGov information quality and eGov system usage. This is in line with the findings by Khalil and Elkordy (1999) of a highly significant correlation between information quality and system usage.

CONCLUSIONS AND LIMITATIONS

The present research makes significant contribution to the research in the eGov area. To the best of our knowledge, it is the first *empirical* assessment of eGov system success. More specifically, the present research presents a model that integrates different eGov-related antecedents that contribute to organizational impact. It empirically validates the model using AMOS SEM approach. Results of the present study clearly indicate that eGov system quality has a positive and significant impact on both eGov user satisfaction and eGov system usage. The results of the present research also point toward a positive and significant influence of both eGov information quality on eGov user

satisfaction and eGov user satisfaction on system usage. The results also specify that there exists significant and positive influence of eGov user satisfaction and system usage on organizational impact. Interestingly, the present research results failed to show significant impact of eGov information quality of eGov system usage. This relationship must be further investigated in future research studies in the context of eGovernment.

Although the present research findings are encouraging and insightful this study, like most study, has several limitations. One of the limitations is that the study is limited to Texas. Subsequent research will be expanded to include areas outside this narrow region and to replicate the findings in different contexts and surroundings.

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APPENDIX A
Constructs and Measures Used

Construct/Measure	*Author/s*
eGov System Quality	
a. Ease of use/user friendliness	DeLone and McLean, 1992; Swanson, 1974; Belardo et al., 1982; Doll and Torkzadeh, 1988
b. Ease of learning	DeLone and McLean, 1992; Belardo et al., 1982; Jiang et al., 2001
c. Useful features and functions	DeLone and McLean, 1992; Lehman, 1986
d. Response time	DeLone and McLean, 1992; Swanson, 1974; Belardo et al., 1982; Bailey and Pearson, 1983; Conklin et al., 1982; Srinivasan, 1985
e. Convenient access	DeLone and McLean, 1992, Srinivasan, 1985; Bailey and Pearson, 1983
f. System accuracy	DeLone and McLean, 1992; Jiang et al., 2001
eGov Information Quality	
a. Relevance	DeLone and McLean, 1992; Jiang et al., 2001; Bailey and Pearson, 1983; King and Epstein, 1983; Miller and Doyle, 1987
b. Reliability	DeLone and McLean, 1992; Belardo et al., 1982; Bailey and Pearson, 1983; King and Epstein, 1983; Jiang et al., 2001; Srinivasan, 1985; Swanson, 1974
c. Timeliness	DeLone and McLean, 1992; Mahmood, 1987; Bailey and Pearson, 1983; King and Epstein, 1983; Miller and Doyle, 1987; Doll and Torkzadeh, 1988
d. Clarity	DeLone and McLean, 1992; King and Epstein, 1983; Doll and Torkzadeh, 1988
e. Conciseness	DeLone and McLean, 1992; Bailey and Pearson, 1983
f. Currency	DeLone and McLean, 1992; Jiang et al., 2001; Bailey and Pearson, 1983; King and Epstein, 1983; Doll and Torkzadeh, 1988
eGov User Satisfaction	
a. Overall satisfaction	DeLone and McLean, 1992; Mahmood, 1987; Ginzberg, 1981; Rushinek and Rushinek, 1985; Doll and Torkzadeh, 1988
b. Information needs	DeLone and McLean, 1992
c. Communication needs	DeLone and McLean, 1992; Sanders and Courtney, 1985
eGov System Usage	
a. Mandatory system use	Grover et al., 1996
b. User training	Grover et al., 1996
c. Internet enabled system for information sharing	Barua et al., 2001
d. Extranets for communication with suppliers/customers	Barua et al., 2001
e. Intranets for internal communication	Barua et al., 2001
f. Automated transmitting and processing of data	Barua et al., 2001
g. Real-time monitoring of inventory and purchase situation	Barua et al., 2001
h. Existence of online procurement/distribution system	Barua et al., 2001
i. eGov system integrated with internal organizational MIS	Teo et al., 1995

APPENDIX A
Constructs and Measures Used
(cont.)

Construct/Measure	*Author/s*
Organizational Impact	
Effectiveness	
a. Inventory carrying cost	Leonard, 1999; Teo et al., 1995
b. Stock outs	Leonard, 1999; Teo et al., 1995
c. Order cycle	Leonard, 1999; Teo et al., 1995
d. Fill rate	Leonard, 1999; Teo et al., 1995
e. Material cost	Leonard, 1999; Teo et al., 1995; Jiang et al., 2001
f. Material processing cost	Johnston and Vitale, 1988; Rivard and Huff, 1984 Emery, 1971; Chervany and Dickson, 1974
Efficiency	
a. Document preparation cost	Leonard, 1999; Teo et al., 1995; Johnston and Vitale, 1988
b. Document exchange cost	Leonard, 1999; Teo et al., 1995; Johnston and Vitale, 1988
c. Flow of documents and information	Leonard, 1999; Teo et al., 1995; Johnston and Vitale, 1988
Performance	
a. Return on sales	Mahmood and Mann, 2005
b. Growth in revenues	Mahmood and Mann, 2005; Rivard and Huff, 1984; Johnson and Vitale, 1988; Jiang et al., 2001
c. Net income to invested capital	Mahmood and Mann, 2005; Benbasat and Dexter, 1985
Productivity	
a. Sales to total assets	Mahmood and Mann, 2005; Johnson and Vitale, 1988
b. Sales per employee	Mahmood and Mann, 2005