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Abstract

Information technology (IT) has become one of the core elements in the improvement of organizational performance. A significant number of government organizations are embracing electronic government (e-government) as a mean to improve public service. However, numerous factors have been recognized as potential barriers to e-government initiatives. The use of IT to enhance internal communication and external communication has been regarded as a significant factor in the achievement of e-government success. The main purpose of this research is to assess whether the use of IT for communication affects how e-government barriers are perceived. We devised an instrument and conducted an empirical study with a municipal government. We used Structural Equation Modeling (SEM) to evaluate our model. The results of the study empirically validate the instruments, and provide support for the relationship between e-government barriers and the use of IT for communication.

Keywords: E-government, information technology, public sector, communication

Introduction

The value of Information Technology (IT) for improving organizational performance has been recognized and extensively discussed by numerous researchers as well as practitioners (Bruce 1998; Henderson and Venkatraman 1993; Kearns and Lederer 2000; McFarlan 1983; Reich and Benbasat 1996; Rockart et al. 1996; Sircar et al. 2000; Weill and Broadbent 1998). While the primary attention has been paid to IT in the private sector, citizens and public leaders are increasingly aware of the potential of IT to improve government organizations. In recent years, electronic government (e-government) has emerged as an instrument that can bring benefits to government organizations such as cost savings, improved communications and coordination, expanded citizen participation and increased government accountability.

Citizens and policy makers all agree that governments can improve their services and operations by more effectively utilizing IT at all levels. During the past decade, the U.S. Congress has taken several legislative initiatives to encourage government agencies to improve their IT and proactively adopt e-government. Several specific legislations have established a roadmap to a more efficient and effective use of IT and the adoption of e-government. The Clinger-Cohen Act of 1996 requires the heads of federal agencies to link IT investment to agency objectives and establishes an agency Chief Information Officer to select, manage and control IT investment (P.L. 104-208, 1996). The Government Paperwork Elimination Act of 1998 (GPEA) establishes that federal agencies can accept the submission of electronic information and make electronic transactions between government agencies and business possible (P.L. 105-277, 1998). The E-Government Act of 2002 furthers the improved management and promotion of electronic government services and processes. This Act also institutes a Federal Chief Information Officer at the Office of Management and Budget, and establishes a broad framework of Internet-based measures to enhance citizens' access to government information and services (P.L. 107-347, 2002).

There are numerous barriers that e-government initiatives must overcome before they can bear fruit. These barriers may be technical, organizational, social, cultural and psychological in nature (Heeks 1999; Mechling and Applegate 2001; Moulder, 2001; Moon 2002). Effective communication among all stakeholders is essential to overcoming these barriers to a successful e-government or IT initiative. Successful e-government requires establishing proper communication channels to share and collaborate the vision, values, and expectation of the community among all stakeholders (Garnett, 1992). Questions abound: Who will be affected by e-government and how? What are critical success factors of e-government? How to measure the success of e-government? What is the effect of internal as well as external communication in e-government success?

To address some of these questions, we conducted a study of an e-government initiative at a municipal government. We investigated how the city government communicates with its stakeholders and whether that has any impact on the e-government initiative. We proposed a model that postulates a relationship between how an organization communicates with its stakeholders and the level of barriers to e-government. We devised two instruments to measure e-government barriers and organizational communication and conducted a web-based survey with city employees.

Background

E-government -- the use of all information and communication technologies to facilitate the daily administration of government -- is touted as a viable solution to many problems that government organizations have been experiencing such as inefficient operations, slow service, and lack of accountability. Properly planned and implemented, e-government has the potential to dramatically change the nature of government organizations. Despite the immense potential, there is little understanding as to how to improve the success of e-government initiatives. E-government is more than setting up a server and posting Web pages on it. It is a complex issue because it affects many aspects of the government and many individuals and organizations. According to a study that analyzed more than 1,500 Web sites in 70 metropolitan areas in the United States, the majority of local governments used their Web sites merely to provide phone numbers and address information, while only 11 percent of the Web sites in the study provided more sophisticated automated online services (West 2001).

However, the pressure to advance e-government is mounting. Government organizations at all levels are experiencing pressures in various forms such as budget cuts and legislative mandates. The Clinger Cohen Act of 1996, also known as the Information Technology Management Reform Act (ITMRA), is a good example. It requires agencies to be more accountable for their investment on information technology (IT). The Government Paperwork Elimination Act (GPEA) of 1998 requires the Federal Government to accept information from the public in electronic format. Federal agencies must be able to accept electronic filings with electronic signatures, if necessary, or justify to the Office of Management and Budget (OMB) why the information cannot be filed electronically. The E-government Act of 2002 promotes the improvement of the management and promotion of electronic government services and processes. This Act also institutes a Federal Chief Information Officer at the Office of Management and Budget, and establishes a broad framework of Internet-based measures to enhance citizens' access to government information and services. The guiding principle included in those laws is to make easier for citizens to interact with government. The Act also calls for improving the federal government's portal (FirstGov.gov) so that citizens will have access to better-organized information in fewer clicks, regardless of agency. It mandates uniform access to the government's functional services such as paying taxes, applying for loans, and getting disaster assistance.

E-Government Barriers

While e-government promises many benefits to governments and citizens, it also poses many problems and concerns. Besides technical problems, e-government initiatives may have to maneuver through a highly complex and contentious political and organizational environment. Some government agencies or officials may perceive e-government as a potential threat to their power and viability and become reluctant to the idea of the "government at your fingertips." Consequently, many e-government initiatives may remain under-developed and under-utilized with little integration among agencies, or even among functions within an agency. The typical government's stovepiped structure and information technologies are not conducive to deploying e-government to improve its performance. E-government also brings out governance issues to the front because e-government has the potential to fundamentally alter organizational structure, management processes and administrative authority (West 2001).

Security and privacy issues are another significant challenge for successful e-government. Government organizations at all levels collect, process, and disseminate a wide range of sensitive information on personal, financial, and medical aspects of their citizens. Rightfully citizens may feel vulnerable to the possibility of their sensitive information being exposed or stolen as e-government

makes access to such information easier. Despite government measures to keep information secure and ensure citizens' trust in e-government, the issues of privacy and security remain critical. For example, although the Privacy Act of 1974 still provides some protection, there is a concern that it does not fully address various loopholes. A government agency could abuse the "routine use" rule in the Act, which allows agencies to share information on individuals for the routine business of government, and access sensitive personal information without the knowledge of individuals whose privacy is being infringed upon (Datz 2003).

The E-Government Act of 2002 specifically recognizes three areas of challenges for e-government: (1) Governments are not doing enough to maximize use of its online services; (2) Governments are not receptive to private and public service providers who may contribute to innovative electronic service delivery; and (3) Necessary incentives and institutional structures to realize the full potential of electronic service delivery are lacking. Many e-government initiatives remain in early stages with the capabilities limited to posting simple information on their Web sites. Nevertheless, some progressive governments have started providing more sophisticate e-government functions such as conducting government transactions online. A report in the UK shows that 152 of the 457 services detailed in central government departments were available electronically (Performance and Innovation Unit 2000). Some local governments have developed attractive and useful sites, but there are few transactional services provided.

Technology itself would not guarantee success with e-government but it is necessary that any e-government initiative must ensure that it has sufficient resources, adequate infrastructure, capable IT staff, and effective IT training and support (Koh and Balthazard 1997; Mechling and Applegate 2001; Moulder 2001; Moon 2002).

Government organizations must carefully assess all these technical, organizational, and political issues and formulate strategic plans for necessary organizational and management changes to eliminate potential barriers to successful e-government.

Role of Communication in E-Government Initiatives

Effective communication among the relevant parts of the government enterprise is essential in overcoming barriers to successful e-government. The allusive goal of IT alignment might be more often realized if the communication between IT and other personnel were realized first (Luftman et al. 1999). The public sector should utilize digital technologies to improve services and make them more efficient. Reports, payments, applications, and other types of communication with public administration should be handled electronically. The full digitalization of the public sector should make sure that work processes oriented towards paper handling and manual control is reduced, and that double work and unnecessary work processes are removed. The goal is to reduce the costs in the public sector while improving citizen and company access to public service.

The development of the Internet and their potential to improve the communication between different segment of the community, to provide information and to pay your taxes makes this a critical resource to achieve any e-government initiative. E-government initiatives can be classified in three main domains; (1) Improving government processes (eAdministration), (2) Connecting citizens (eCitizens) and services, and (3) Building external interactions (eSociety) (Heeks 2001). EAdministration deals particularly with improving the internal workings of the public sector. Some of specific goals of this initiative include: cutting process costs, managing process performance, making strategic connections in government, and creating empowerment- transferring power, authority, and resources for processes from their existing locus to new locations. Connecting Citizens and government is an initiative that deals particularly with the relationship between government and citizens, and they may well incorporate: Talking to citizens, listening to citizens, and improving public services. E-society initiatives are intended to improve communication between government and other institutions of the society like private sector companies, non-profit and community organizations" (Heeks 2001).

Research Model

A review of prior research did not provide an acceptable model for a study of relationship between the use of IT for communication and e-government barriers. However, we identified several elements that we later incorporated into our study. The importance of effective communication in public administration has been recognized as early as in the 1950's (Simmons et al. 1950). Garnett (1992) identified eight barriers to communication at government level: (1) differences in frame of reference, (2) Physical distance, (3) Hierarchy, (4) Information overload, (5) Distractions, (6) Language, (7) Prejudice, and (8) Faulty communication skills. The use of IT to support internal as well as external communication can overcome these barriers since IT allows instantaneous and personalized communication with multiple audiences.

Based on these issues recognized from the literature we constructed a research model. The primary contention of the model is that the effective us of IT to communicate with various stakeholders should eliminate or lower the barriers to successful e-government initiatives (See Figure 1). On the communication side of the model, we recognize three different communication needs that made up the communication construct; (1) Communication of vision and strategy, (2) Communication for internal collaboration, and (3) Communication with the key segments of the community (Luftman 2000; Henderson and Venkatraman 1993). On the other hand, the barriers construct consists of two categories; (1) Organizational (and technological) issues and (2) Security and privacy issues.

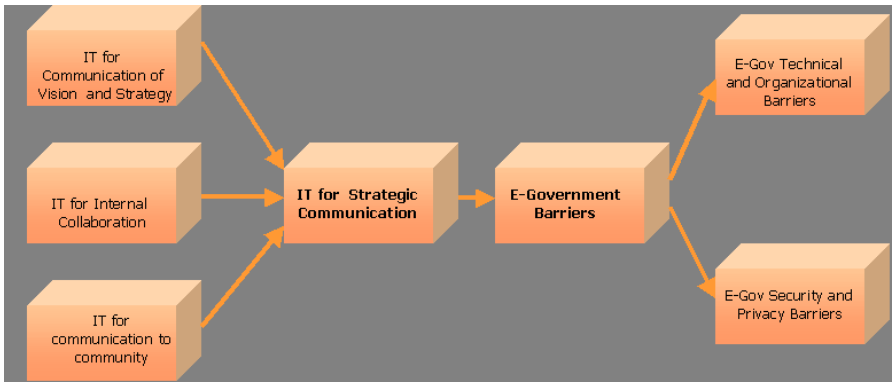


Figure 1. IT Communication and E-Government Barriers

Hypotheses

Although several studies have looked at e-government barriers and IT communication separately, none has considered the two together. This study attempts to assess the relationship between the two constructs. From the model, we postulate three hypotheses as follows:

H1: A high level of IT for strategic communication is associated with a lower level of e-government barriers
H2: A low level of e-governance technical and organizational barriers is associated with higher levels of IT for strategic communications.
H3: A low level of e-governance security and privacy barriers is associated with a high level of IT for strategic communication

Instrument Development

Since there was no instrument readily available to assess our model, we developed one following Churchill's (1979) eight-step process to develop reliable measures. These eight steps are: (1) Specify domain and construct, (2) Generate sample of items, (3) Collect data, (4) Purify measures, (5) Collect data, (6) Assess reliability, (7) Assess validity, and (8) Develop norms. The items to measure the IT communication came from studies on the benefit of IT for Government organizations (Prins, 2001; Heeks, 2001) and IT business alignment (Chan et al. 1997; Chan, 2001; Croteau and Bergeron 2001; Henderson and Venkatraman 1993; Luftman et al. 1993; Luftman et al. 1999; Luftman 2000; Sabherwal and Chan 2001). We recognized three major categories of IT communications from the literature and generated a sample of items; (1) IT for communication of values and strategy, (2) IT for internal communication and collaboration, and (3) IT for communication with the key segments of the community (citizens, business, religious organizations, etc). The part of the instrument to measure e-government barriers consisted of two sections: One that measured the organizational barriers and another that measured barriers associated with privacy and security concerns. Two previous studies and their instruments served as the basis for the new instrument. Koh and Balthazard (1997) developed an instrument to measure Internet practices in business. Deshazo et al. (2001) measured the levels of e-government activities of 131 municipal governments using 52 e-government service items organized in 12 categories. Items from these instruments were carefully examined for inclusion in the new instrument.

A pilot test was conducted with panels of experts, including IS researchers, doctoral students, and select city employees in order to purify the measures. Feedback from the pilot studies was incorporated into the final version of the instrument. After this revision, a three-item questionnaire was used to measure the IT communication construct using a scale from 1 (strongly disagree) to 7 (strongly agree). An option of Not Applicable (N/A) was also included. Eight items were developed and used to measure e-government barriers. A seven point Likert–type scale from 1 (Absolutely not critical) to 7 (Absolutely critical) was used with an option of Not Applicable (N/A).

Sample and Data Collection

The final version of the instrument was posted on the Web. An invitation letter and a password to access the survey was sent by e-mail to 1,100 city employees in all the different areas of the city government.

A total of 339 responses were received over a period of five weeks for a response rate of 30.7 percent. However, only about 800 employees have easy access to computers and given this our response rate is more appropriately about 42 percent. Those employees without access to computers were provided an option of using a hardcopy version of the survey but none of hardcopy surveys were received. These employees without computer access are a subset of field service personnel such as trash service employees. While this group might have provided valuable information from their own perspective, we do not deem their absence as critical because they would not be directly involved in the design and delivery of e-government services. Males comprised 48% of the respondents and the average age of the respondents was 40.

Data Analysis

Churchill (1979) stated that a correct specification of the construct, a good sample of items to measure the construct, and the purification of the scale would produce a measure that is content or face valid and reliable. Content validity -- i.e., how representative and comprehensive the individual items are in a scale -- was assessed through an examination of the process by which scale items were generated (Nunnally 1978; Straub 1989). A panel of experts was utilized in this process.

The Cronbach alpha internal consistency reliability coefficient was used to assess the reliability of the instruments. This coefficient indicates the consistency of responses to the items by the subjects. As shown in Table 1 all alpha coefficients exceeded 0.80, ranging from 0.86 to 0.92. These results indicate a high level of internal consistency among items that measure each construct.

Table 1. Cronbach's Alpha as Reliability Measures

Construct	Cronbach's alpha
E-government organizational barriers	0.92
E-government security and privacy barriers	0.86
IT use for communication	0.91

Construct validity was assessed using factor analysis, which is the preferred statistical method to assess construct validity (Allen and Yen 1979; Scarpello and Campbell 1983; Galletta and Lederer 1989). Factorial validity is an indicator of the inference one makes from the score (Blau 1985; Straub 1989; Crano and Brewer 1973; Bynner 1988). Straub (1989) supports the use of factorial validity because it helps to determine whether the measures chosen are true constructs or merely artifacts of the methodology itself. If constructs are valid, high correlations between measures of the same construct can be expected and low correlations between measures of different constructs are expected (Cambell and Fiske 1959).

Specifically, the factor structure of the IT communication was assessed using Principal Axis Factoring (PAF) with Promax rotation. PAF was chosen instead of Principal Component Factoring because PAF is considered a more effective factor analysis technique. This technique has an implicit assumption of an underlying factor model. Promax rotation, an oblique rotation, was used instead of Varimax rotation due to the high likelihood that the factors would be correlated (Harrison et al. 1997). The PAF with Promax rotation extracted three factors with eigen-values greater than one. Factor loadings ranged from 0.63 to 0.92 for the organizational e-government barrier items. The loadings for security and privacy-related barriers ranged from 0.74 to 0.93. The items for the IT for strategic communication construct have loadings ranging from 0.84 to 0.91 (see Table 2). The results of the factorial validity show three factors perfectly separated as the proposed model postulated.

Analyzing the two scales separately, the factorial variance accounted for by the seven items measuring the e-governance barriers construct was 76.3%. The factorial variance accounted for by the three items measuring the IT for strategic communication was 85.2%.

Table 2. Factor Analysis

	Factor		
	1	2	3
BARR1	.877		
BARR2	.923		
BARR3	.755		
BARR4	.859		
BARR5	.790		
BARR6			.744
BARR7			.932
BARR8	.632		
COMM1		.919	
COMM2		.882	
COMM3		.838	

Extraction Method: Principal Axis Factoring
Rotation converged in 5 iterations.
Loadings < .30 not shown

Model Assessment

The proposed model was assessed using Structural Equation Modeling (SEM). This statistical technique, sometimes called covariance structure analysis, uses the covariance matrix for the input variables of the model (in this case the questions on the instrument) to perform a maximum likelihood linear structural relation analysis incorporating both latent and manifest variables (Hartwick and Barki 1994). This technique was used to check the overall goodness of fit of the model through the validation of the measurement model, and the fit of the structural model.

SEM estimates the parameters of the hypothesized model with a sample covariance matrix and determines the fit of hypothesized model. This process uses to determine how close the estimated covariance matrix is to the sample covariance matrix. A good fit indicates that the sample data support the proposed model. We used LISREL 8.52 to assess the validity of the hypothesized model, following the five stages of SEM suggested by Bollen and Long (1993): (1) Model specification, (2) Identification, (3) Estimation, (4) Testing fit, and (5) Respecification.

Maximum likelihood (ML) estimation is the method used in LISREL. The output of the LISREL analysis is divided into four sections: (1) The covariance matrix, (2) The maximum likelihood estimates, (3) The fit indices for the model, and (4) The R^2 values for each variable. A model with a low chi-square or high p-value indicates a better fit.

Researchers use a number of criteria for an acceptable fit of a model: (1) Non-significant chi-square (at least $p > 0.05$), (2) Incremental fit indices such as Normed fit index (NFI) or Tucker-Lewis Index (TLI) greater than 0.90; (3) Low Root Mean Square Error of Approximation (RMSEA) with acceptable values between 0.05 and 0.08, and (4) Parsimony indices that portray the proposed model as more parsimonious than alternative model. A good indicator of absolute fit is the Goodness of fit index (GFI), which is based on the ratio of the sum of the squared discrepancies to the observed variance. The GFI ranges from 0 to 1, with values exceeding 0.9 indicating a good fit to the data. Figure 2 shows the results obtained for this model. This model consists of three latent variables (IT for strategic communication, e-government organizational barriers, and e-government security and privacy barriers). IT strategic communication has three indicating variables. E-government organizational barriers have six

indicating variables, and e-government security and privacy barriers have two indicating variables. In this model, IT strategic communication is linked to the organization as well as the security and privacy barriers for e-government. The covariance matrix for the 11 input variables was calculated and used as input to perform this analysis.

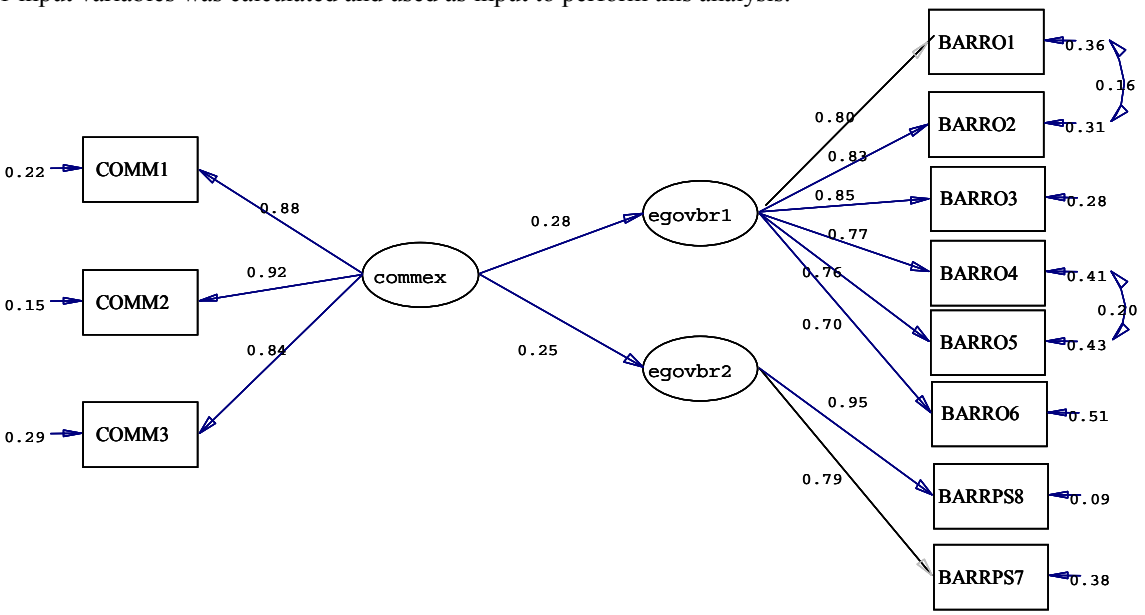
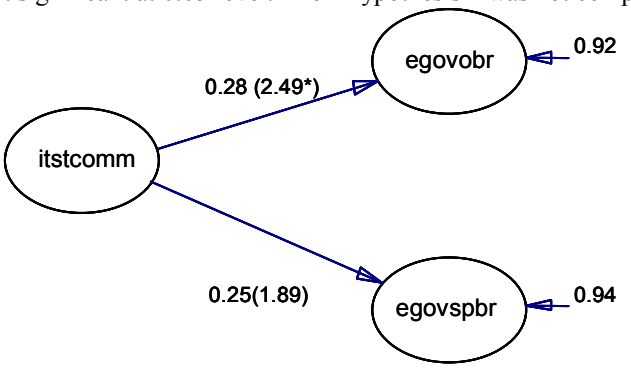


Figure 2. Model Results

Analysis of the model resulted in chi-square value 53.17 (p = 0.08), which suggests that the data fits the model. Goodness of fit index (GFI) of 0.91 indicates that the model fits very well. The RMSEA value of 0.058 is under the acceptable limit of 0.008 and implies a good model fit. The adjusted goodness of fit value is 0.85 and is close to the recommended value of 0.9. Overall the fit indices indicate that the model reproduces the covariance matrix well. Also all the loadings between indicators and latent variables are above 0.6.

Finally, the study results support the majority of hypotheses initially established. The proposed model in Figure 1 was significant, and the indicators of good fit are a GFI of 0.91, NFI of 0.92, and a ratio of chi-square/degree of freedom of 1.3 (53.17/40), which is good compared with the critical value of smaller than 2.0. The results of the structural model in figure 3 show that the perception of e-government organizational barriers is reduced as a result of the use of IT for strategic communication. This relationship is statistically significant at 0.05 level, but the relationship between IT strategic communication and e-government security and privacy barriers is not significant at 0.05 level. Then Hypothesis 1 was not completely supported.



*t-value significant at the .01 level

Figure 3. Structural Model

Hypothesis 2 that established that the perception of e-government technical and organizational barriers decrease as a result of the higher levels of IT for strategic communications was supported since the structural model shows a good fit of the data to the model, and the path between theses constructs is significant at 0.01 level. Hypothesis 3 was not supported since the path between IT for strategic communication and e-government security and privacy barriers is not significant at 0.01 level.

Limitations and Future Research

This study has some limitations. Some of these limitations stem from the lack of existing theories on the topic and others from the research design and data collection process. The study was based on a single organization and self-reported opinions of its employees. I excluded other stakeholders such as citizens, businesses partners and other government organizations. There are some limitations associated with the use of web-based survey. Zhang (1999) identified some potential threats to the validity of a web-based survey study. A web-based survey may pose some problems to some potential respondents because of the technical difficulty to access the Internet and the inconvenience and discomfort in dealing with new form of survey.

Despite the limitations the research team believes that this study makes an important contribution to the current body of knowledge about e-government because it helps explain and measure e-government barriers as well as IT for strategic communication. While future studies should expand our understanding of strategic communication and e-government barriers beyond the scope of the present research, this work can provide a foundation for such future works. Some of the suggested directions for future studies include:

- Expand the analysis of e-government barriers by including other stakeholders such as citizens, business partners, and other government organizations.
- Benchmark against comparable municipalities to recognize different characteristics of strategic communication as well as e-government barriers.
- Include government organizations at different levels (e.g., municipal, state and federal) and with different missions (e.g., civilian vs. military, customer-oriented vs. business-oriented)
- Adapt the instruments to be used in non-government enterprises.

Conclusions

This study examined the connection between the barriers that affect the success of e-government initiatives and the use of IT for strategic communication at a municipal government. The assessment of the proposed model of the relationship was based on the e-government literature as well as the models available in IT management in general and e-business in particular (Prins 2001; Milner 2002; Moulder 2001; Watson and Mundy 2000). The findings of this research provide potentially transferable knowledge for enhancing e-government practices. Government planners and IT managers can improve e-government initiatives from these findings of the research.

This work provides support for the proposed model of e-government barriers and IT use for strategic communication, and makes several contributions to the theory and research in e-government. First, it recognizes the barriers that e-government initiatives. It provides a viable instrument that can help government organizations to assess the barriers to the successful implementation of e-government initiatives. Second, it recognizes the role of IT for strategic communications and provides a concise instrument that can help public organizations to assess the use of IT for strategic communication purposes. Third, it tests existing assumptions about the relationship between strategic communications at government level with e-government barriers.

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