

8-6-2011

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A Holistic Framework to Evaluate E-government Systems

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ABSTRACT

Evaluation of e-government systems is difficult duty since it involves many perspectives that complicate enumerating its benefits. Although the literature has reported several e-government evaluation frameworks, several shortcomings still exist in the previous work. The objective of this paper is to propose a formative and holistic framework to remedy the current research gaps. The formative position of the evaluation framework ensures the objectives achievement and the holistic side ensures completeness and continuity of the evaluation process. The framework can be used as a template for researchers and practitioners to assess e-government projects. We demonstrate the applicability and practicability of the framework by applying it to the Korean Government-for-Citizen (G4C) project.

Keywords

E-government evaluation, holistic evaluation framework, IS evaluation

INTRODUCTION

Many countries adopt e-government systems in order to establish government reforms and raise efficiency of government transactions. In developing and developed countries, investment in e-government systems is estimated to be greater than 1% of the gross domestic products (Petricek et al., 2006). However, current empirical validation is not enough to determine the effects of e-government systems on governmental performance (Lim and Tang, 2008). Research shows that evaluation of information systems (IS) in general is a difficult undertaking (Jones and Hughes, 2001; Serafeimidis and Smithson, 2000). In addition, evaluation process involves many perspectives that complicate enumerating the benefits of IS (Symons and Walsham, 1988). Evaluation of an e-government system is no exception since determining the benefits of e-government system is complicated and multi-faceted involving multiple perspectives (i.e. social, technical, political) (Beynon-Davies, 2005; Liu et al., 2004; Khalifa et al., 2004). They also entail the exploration of the diverse needs of the different citizen groups (i.e. students, lawyers, architects) (Jansen, 2005).

Farbey et al. (1993) claim that IS evaluation is a critical factor to the IS success and the choice of the IS evaluation approach should be suitable to the right organizational context. Funilkul et al. (2006) defined evaluation framework for e-Government services as “the comprehensive guidance for a government organization which can be used to develop the quality and efficiency of the objectives and strategies of its services and for conforming to citizens’ requirements”. Furthermore, there are many approaches that are designed to evaluate e-government. While some approaches are called “hard” approaches (e.g., return on investment, payback period, etc.) others may be postulated as “soft” (e.g., satisfaction of employees and citizen, degree of customization). Hard approaches address tangible benefits and risks while soft approaches are proposed to assess intangible benefits and risks. Evaluating e-government systems (and IS, in general) based on hard approaches that depend on tangible measures is the more commonly adopted evaluation basis in many countries. Hard approaches are not without several drawbacks. Some of these drawbacks are - the limited view of stakeholders, the complete dependence on accounting and financial instruments (Farbey et al., 1995), the ignorance of human and organizational aspects of the users (Serafeimidis and Smithson, 2000), and the ignorance of intangible benefits and costs that are caused by the users (Hochstrasser, 1992).

There is no IS evaluation approach that is suitable for every firm (Khalifa et al., 2004). Furthermore, evaluation approaches that combine both hard and soft facets are limited (Orange et al., 2006). Borrowing from the body of IS literature may be pragmatic, but challenging, as IS researchers still debate actively about the approach most suitable for IS domain (Alshawy and Alalwany, 2009). Many studies acknowledge that evaluation of e-government is an important research area that needs more investigation (Fountain, 2003; Jones et al., 2006; Remenyi et al., 2000). A holistic evaluation approach is necessary to determine the needs of citizens and businesses, and to help government and private firms in measuring the return on investment of e-government (Sakowicz, 2006).

Funilkul et al. (2006) summarize the purposes of the evaluation of e-government services, the first and foremost being to ensure that e-government services meet the institutional goals and objectives. This type of a formative evaluation (i.e. evaluation by achieving systems objectives), although widely accepted, is rarely deployed in e-government studies (Hamilton and Chervany, 1981; Thompson et al., 2003; Bertot et al., 2008). Formative evaluation is continuous monitoring for the systems activities and the objectives. Bertot et al., 2008 define formative evaluation as “ongoing evaluation that monitors program activities with the goal of modifying and improving the program on a regular basis”. An incessant evaluation process is crucial for enhancing current e-government services. We propose formative evaluation as one necessary pillar in the suggested framework.

Although the literature has reported several e-government evaluation frameworks, several shortcomings still exist in the previous work. First, some frameworks focus on some dimensions of e-government (e.g., citizen services, awareness initiatives, IT collaboration) and pay less attention to other dimensions (e.g., mobilization, standard setting). These studies design the evaluation framework based on the technical perspective and focus less on the social perspective. Second, many frameworks are designed to evaluate specific e-government systems in specific countries. These frameworks are usually unique to the county context and may not be applicable in a different setting. Third, the continuous achievement of e-government objectives, or formative evaluation, is not considered in most of the current frameworks. Thus, the objective of this paper is to propose a formative and holistic framework to remedy the aforementioned drawbacks. To include the social and technical aspects of the e-government evaluation framework, we lean heavily on Bostrom and Heinen’s (1977) Social-Technical-System (STS) model. We adopt Sakowicz’s (2006) four dimensions of e-government for a holistic view that includes all e-government dimensions.

The goal of proposed framework is not only to increase the knowledge in the field of e-government evaluation but also to provide a template for researchers and practitioners to assess e-government project. The conceptual framework contributes to research by integrating the formative evaluation approach, STS model, and other relevant theories from the e-government evaluation field. The formative side of the evaluation framework ensures the objectives achievement and the continuity of the evaluation process. Furthermore, by classifying the e-government systems into four interactive quadrants, the framework facilitates determining the objectives achievement gaps.

The rest of this manuscript is arranged as follows. First, we review the related e-government evaluation literature. The conceptual framework and the theoretical background will be discussed in the following section. We demonstrate the applicability of the framework by using it to assess the Korean Citizen-for-Government (C4G) project. Finally, we conclude the paper by highlighting future research directions.

RELATED LITERATURE REVIEW

Literature reports many studies that attempt to design framework for e-government evaluation. Some of these studies focus on the citizen as the center of the evaluation model. Wang et al. (2005) propose a citizen-centric approach that consists of three parts: information users, information problem, and information pool. In addition to the evaluation of e-government services, the framework has the ability to answer why citizens fail to find the needed information. Eschenfelder and Miller (2005) propose socio-technical toolkit that focuses on the value of social and political context for citizens. Carter and Belanger (2004) discuss the citizen adoption of e-government and identify seven factors that influence the citizen’s perspective of e-government services including: usefulness, relative advantage, compatibility, perceived ease of use, image, and trust in the Internet and in governments. Zhang et al. (2007) propose a user-centric evaluation model for e-government in China based on IS diffusion. Alshawy and Alalwany (2009) propose a citizen evaluation model for developing countries; the proposed model is based on social, technical, and economic factors.

Other studies propose general evaluation frameworks. Funilkul et al. (2006) propose a generic evaluation framework based on Control Objectives for Information and related Technology (COBIT), ISO 9000, and Technology Acceptance Model (TAM). Griffin and Haplin (2005) present an evaluation model for UK government based on local accountability. It consists of scrutiny processes, principal stakeholders, joined-up accountability, sanctions and the political dimension. The study showed that scrutiny committee has more influence than executives, but the executive participation affects that influence. Esteves and Joseph (2008) present a comprehensive assessment framework that examines three dimensions: e-government maturity level, stakeholders, and assessment levels. Gupta and Jana (2003) suggest a flexible evaluation framework based on hard measures, soft measures, and hierarchy of measures to assess the tangible and intangible benefits of e-government. They implement the framework in an Indian case study and find that e-government project should be in mature stage in order to have proper evaluation. Sorrentino et al. (2009) address e-government evaluation from cognitive level based on organization theory and policy studies. The research suggests the cognitive resource role to e-government evaluation. Based on analytic hierarchy process, Ji (2009) proposes a quantitative evaluation method that determines the weight of evaluation index and the gray correlation analysis. The Canadian report of Evaluation Framework for Government On-line Initiative (PWGSC 2005)

includes a measurement instrument that is used to evaluate the performance of technical, cultural, and learning initiatives of Canadian e-government. Irani et al. (2005) propose a framework to evaluate public sectors information systems. The study emphasizes the importance of the interpretive evaluation approach, the social context, and the stakeholders' involvement in the evaluation process.

The literature review shows that evaluation of e-government is a relevant topic area, but lacks cohesiveness. It also highlights drawbacks in the current studies. The purpose of this research is to address these limitations.

THE THEORETICAL BACKGROUND AND THE PROPOSED FRAMEWORK

Bostrom and Heinen's (1977) present a Social-Technical-System (STS) model where organizations are divided into two complementary systems: social systems and technical systems. Social systems consist of structure and people, while technical systems consist of technology, and tasks. All four components are interrelated as depicted in figure 1. STS examines the appropriateness of the design elements of the information systems (Bostrom and Heinen, 1977; Lyytinen et al., 1998). Bostrom and Heinen, (1977) concludes two important points: first, social and technical systems are supporting each other. Second, systems failure can be reduced by focusing on the social components (i.e. user skills) and technical components (i.e. technology and tasks). Because of the interaction between citizens and e-government systems, STS model is applicable in e-government evaluation.

The framework that we propose is depicted in figure 2. To have a holistic and formative evaluation framework, the holistic components, the objectives, and the objectives measures need to be identified. Similar to the STS model, our framework consists of four quadrants: management of e-government, e-government technology, e-government stakeholders, and e-government processes. The evaluation process that is proposed in this paper consists of two phases. The first phase is determining the four dimensions (management, technical, process, and stakeholders), objectives in each of the four dimensions, and their measures. The objectives and their measures are dynamic factors that vary from country to country. Thus, the lists of objectives and the objectives measures are by no means comprehensive but we have included the most common one identified from literature. The second phase is to evaluate the interaction among the objectives by following the suggested flowchart in figure 3.

Before discussing the quadrants of the framework, we argue that several conditions are necessary to ensure a successful evaluation process. First, e-government strategies should be linked to the wider institutional strategies in order to avoid strategy misalignment (Porter, 2001; Alalwan, 2010). Second, top executive commitment is crucial to the evaluation success. To develop an effective evaluation practice, the continuing support of senior executive officers is just as important as having formal evaluation tools (Jones et al., 2006). Last but not least, stakeholders' engagement and commitment to the use of e-government services are also essential condition to develop, implement, and evaluate e-government projects (Bertot et al., 2008). In addition to encouraging users' participations, openness allows stakeholders to understand what government firms are performing, and why certain things are done in a particular way (Eschenfelder and Miller, 2005). The following subsections discuss the details of the two phases of the evaluation process.

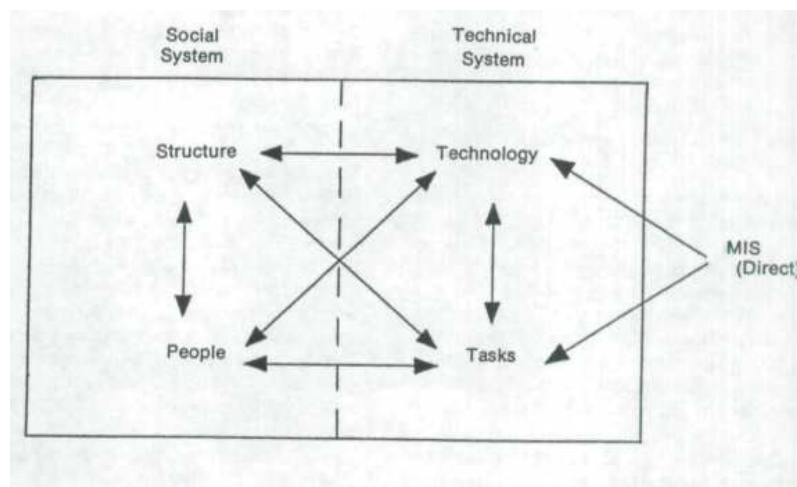


Figure 1: Social-Technical-System (STS) model, Source: Bostrom and Heinen's (1977)

Phase I: determining the objectives and their measures for each quadrant

In this phase, we determine the objectives of each quadrant and how results for each objective can be measured. Establishing measures provide a means to assess the corresponding objective. Observations and results offer valuable feedback that can be used to implement corrective actions if needed.

Management of E-government:

This part of the framework refers to the managerial aspects of e-government. It answers what government managers want to achieve from e-government system. Many studies show that providing one-stop portal, or one-stop government, is necessary for many e-government projects to eliminate the multi-level bureaucratic processes and raise the efficiency of the organization (Kamal et al, 2009). One-stop government is defined as providing integrated e-government services to the stakeholders perspective through e-government portal (Hangen and Kubicek, 2000; Dias and Rafael, 2007). Affisco and Soliman (2006) discuss the strategic importance of the one-stop portal to differentiate modern e-government services from traditional ones. Lee et al. (2005) indicate that “e-government initiatives aim at enabling government agencies to more efficiently work together and provide one-stop service to citizens and businesses”. The achievement of one-stop government can be measured by the degree of completeness of e-government.

The economic growth is also an important objective behind designing e-government systems. Gant et al. (2002) find that adopting web portals to provide e-services at state government has the potential to yield economic growth. The return on investment metric is widely used to measure the efficiency of e-government system (Gils, 2002). In addition, the lack of society information readiness is an initiator for many e-government projects not only in developed countries but also developing nations (Goldstein, 2008). Information society index is used in many studies to measure the readiness of the information society (Asgarkhani, 2005; Mutula and Brakel, 2006; Bui et al., 2003).

E-government Technology

Hardware, software, and IT infrastructure are the main drivers of e-government technology. Literature review identifies many objectives that are attributable to IT infrastructure and the interacting constituents. One objective is to have accessible and user-friendly applications. Wimmer and Holler (2003) suggest that accessible and user-friendly portal interfaces is a crucial e-government requirement since users are heterogeneous and have different experience. This objective can be measured by accessibility rate, interface effectiveness that satisfies the users’ needs (TerryMa and Zaphiris, 2003), and/or by the availability of disability access. West (2007) notes that there is progress in disability access, with 54% of federal websites offering disability access in 2007 compared to 47% in 2003. Another important objective in this quadrant is to have secured applications. West (2007) study concludes that security usage in e-government websites have also increased dramatically. The study shows that 73% of U.S government websites have some form of security policy in 2007 while the percentage was only 7% in 2000. These statistics reveal the established need and compulsion to punctuate the importance of security of e-government applications. This objective can be measure by the degree of implemented and planned e-government security initiatives and privacy policies. A third objective is to promote integration of inter-organizational services. Lam (2005) concludes that developing integration of inter-organizational services is one of the critical success factors of e-government. This objective can be measured by the degree of service integration between different organizations.

E-government Processes

We adopt Sakowicz’s (2006) dimensions to define this quadrant. According to Sakowicz (2006), e-government processes have four dimensions. The first is ‘e-services’ that describe the delivery of government information, programs, and services to the external stakeholders. The second is the ‘e-management’ process which refers to the functions that support the public institution internally such as electronic records management and information flow management. The third is ‘e-democracy’ which refers to the public activities that raise the citizen involvement with e-government system such as e-voting, cyber campaign, and virtual town meetings. The fourth one is the ‘e-commerce’ processes which involve the monetary exchange over the internet. It relates to the transaction management in the e-government ecosystem such as, paying taxes, utility bills, and vehicle registration. We synthesize three objectives for the aforementioned e-government processes - to develop organizational and operational processes, to reduce operational and organizational costs, and to develop organizational image. Kral and Zemlicka (2008) use e-government as an example of service-oriented systems that can develop business processes. In addition, many studies (Gant et al., 2002; Edmiston, 2003; Kim et al., 2007) conclude that e-government technology has the potential to reduce organizational costs and raise the efficiency. Grabow (2003: cited in Amberg et al., 2005) finds that organizational image, as perceived by employees, citizens, and other companies, is improved in response to improved electronic techniques. Many measures can be used in this regard, and we suggest the following - the degree of organizational efficiency, the degree of improved organizational reputation, and the degree of cost reduction.

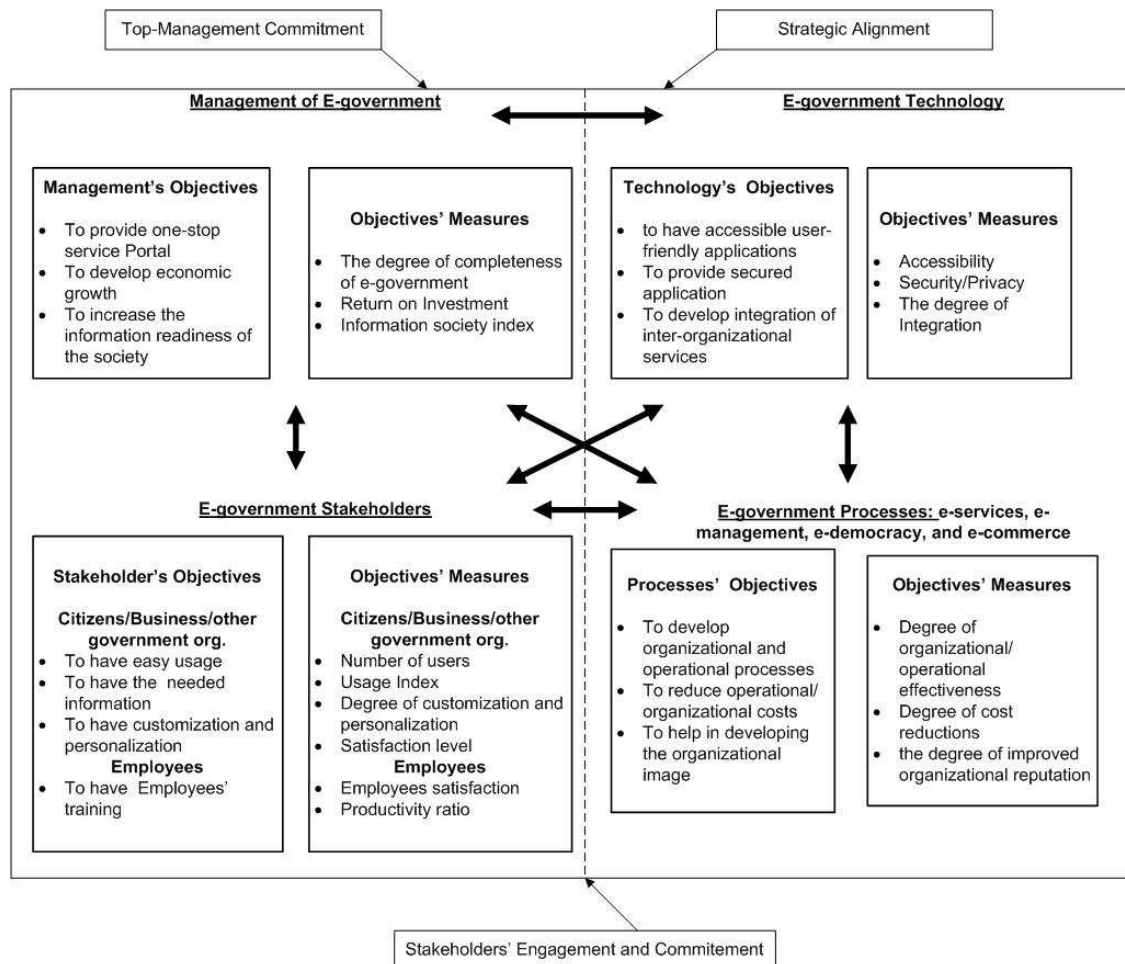


Figure 2: The objectives and their measures for each quadrant

E-government Stakeholders

E-government systems are designed to deal with different stakeholders such as employees, citizens, business, and other government organizations. We classify these stakeholders into two groups according to their shared service delivery objectives. Citizens, businesses, and other government organizations form the first group and e-government employees fall in the second group. The service delivery for the first stakeholder group (citizens, business, and other government organization) target objectives such as, providing easy usage, ensuring accuracy of information, and enabling customization and personalization features. Bélanger and Carter (2008) suggest that the accuracy of stakeholders' information is critical for e-government adoption. Chiang (2009) notes that ease of use is an essential construct of e-voting system. Tat-Kei Ho (2002) argues that e-government paradigm has shifted the service delivery principle from standardization and equity to customization and personalization. The use of e-government portals is positively associated with user satisfaction (Welch, 2005). These objectives can be measured by many means such as satisfaction level, number of users, degree of customization and personalization, and perceived ease of use. For the second stakeholder group (institutional employees) the main objective is to establish training on the new e-government systems. Chen et al. (2006) suggest that in order for the employees to accept the system, training and technical staffing should be considered during e-government planning. This objective can be measured by employees' satisfaction level and productivity ratio.

Phase II: The Formative Evaluation Flowchart

The flowchart in figure 3 depicts the formative evaluation method. As indicated earlier in the introduction, objectives achievement is the main driver that guides the formative evaluation process.

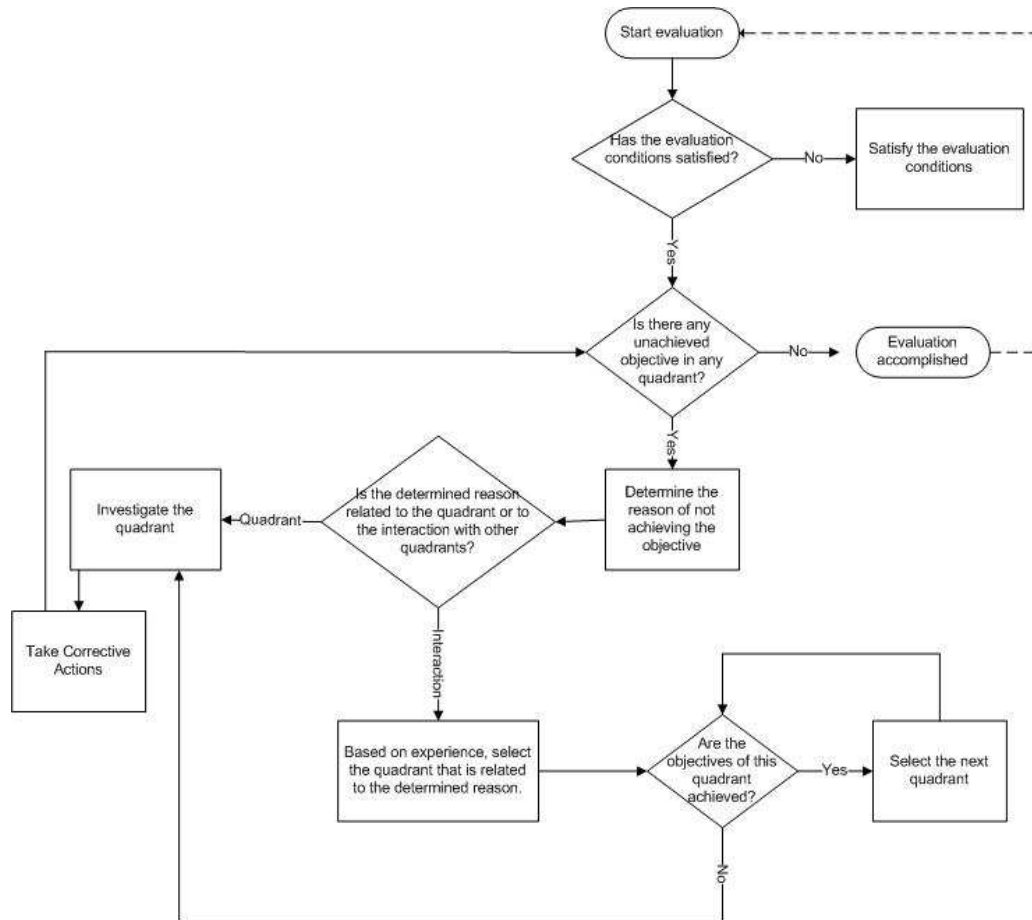


Figure 3: The formative evaluation

We should keep in mind that, as depicted in figure 2, each quadrant interacts, affects, and is affected by every other quadrant. First, the evaluator needs to make sure that the required evaluation conditions have been satisfied. After that, the evaluator needs to detect any objective deviation by using the objectives measures. If there is any objective deviation, the evaluator needs to determine the source of this deviation. Questions that can assist the evaluator in this assessment include – “is the source of deviation limited to one or more objectives in the quadrant?”, “is it contained to the quadrant itself?”, or “is it related to an interaction with other quadrants?.” If the source of the deviation is the quadrant itself, the evaluator needs to check and investigate the related factors that cause the deviation. After determining the deviation source, the evaluator can suggest corrective actions and starts the evaluation process again. If the source of the deviation is linked to another quadrant, the evaluator needs to determine the closest quadrant that may interact with the previous quadrant and identify the cause of the deviation. After the quadrant selection, the evaluator checks whether the objectives of this quadrant is achieved or not. If they are achieved, the evaluator selects another quadrant that has a deviation in his objectives. After selecting the component that has the deviation, the evaluator investigates and checks the related factor that may cause the deviation and take corrective action to solve the problem. The evaluation process is formative in that it can cycle iteratively to identify deviations from the drawn objectives. The dotted line (in figure 3) captures the ongoing evaluation cycle and the continuous feedback that provisions the formative evaluation process.

THE KOREAN GOVERNMENT-FOR-CITIZEN (G4C) PROJECT CASE STUDY

Figure 4 prepares the ground for demonstrating the applicability of the framework in evaluating e-government system. We use the suggested framework to assess the Government-For-Citizen (G4C) project implemented in South Korea. The G4C project, which began in 2002, is a “one-stop” e-government system that is designed to improve the public services provided to the citizens. From its inception, the project was driven by the vision of integrating the latest information technology to actualize government services so that the number of physical visits to the public offices could be minimized and the required paper work could be reduced.

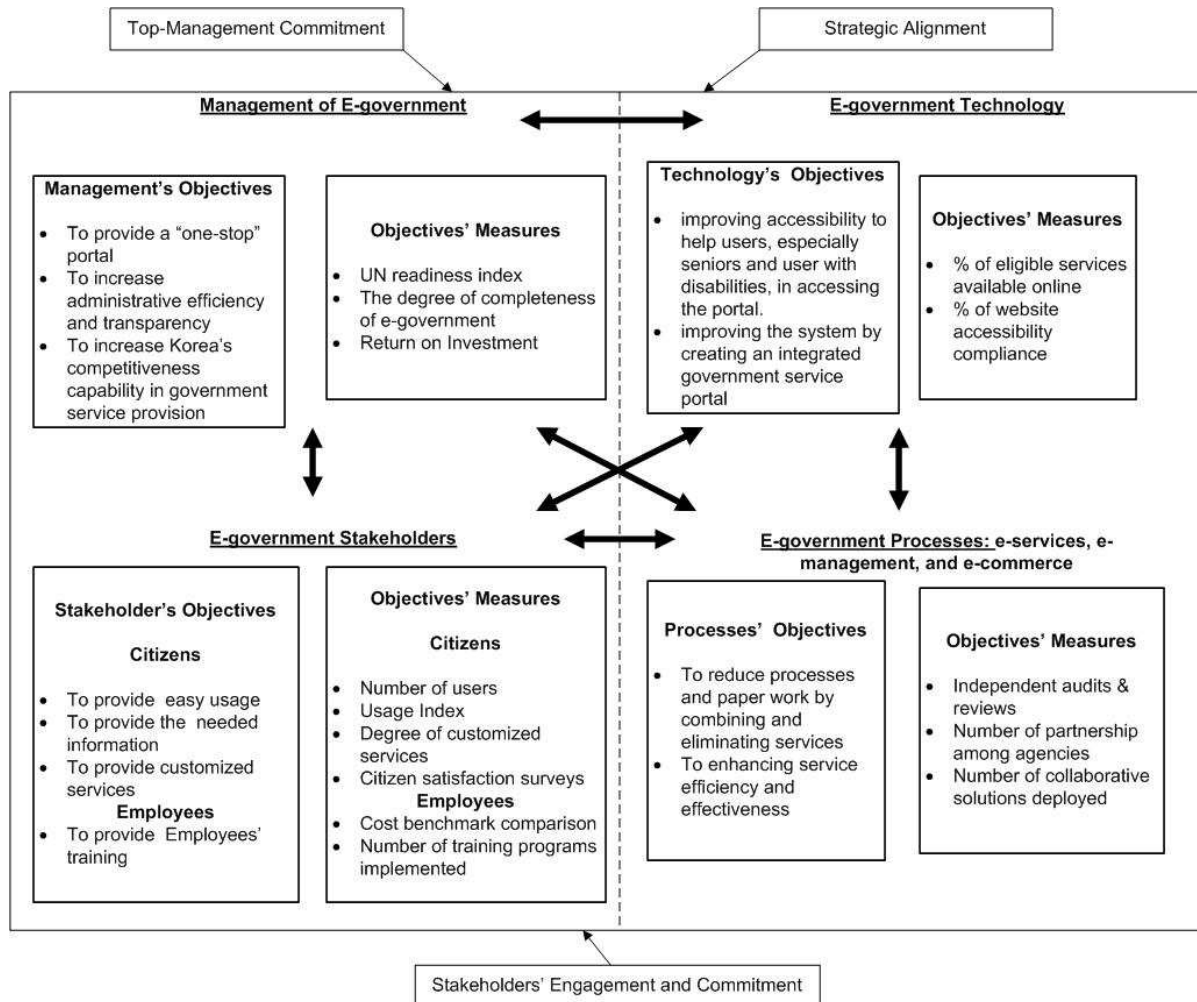


Figure 4: The objectives and their measures for the Korean Government-For-Citizen (G4C) Project

G4C ranked number one in United Nations E-Government Survey 2010 (UN, 2010), and it is considered one of the most successful and advanced e-government service systems. Our assessment method is based on the analysis of the project description and evaluation document that is published by the Ministry of Public Administration and Security (2009). We analyze the objectives and their measures in that document, and classify them using our framework. The document (Ministry of Public Administration and Security, 2009) focus is not to only to evaluate the G4C but also to describe the system before and after implementation from 2000 to 2009. Figure 4 summarizes the analysis by mapping the objectives and measure .

Although the e-government evaluation conditions need to be satisfied, the information that we have does not provide enough insight to appraise the extent to which they are satisfied. Available documentation does provide ample evidence to indicate that there is a strong top-management commitment to develop, implement, and maintain the project since the early phases of G4C system. There is affirmation gathered from testimonials and system description that demonstrate citizens' engagement and commitment, as well as government sponsored initiatives to promote online services (via advertisement and media commercials). Incentives introduced since 2007 include a system for waiving fees for all online services and transactions. There is no information regarding the extent of employees' engagement or about the necessity of linking the IT strategy to the corporate strategy. It is quite likely that these intentions are actualized, but have not been documented publicly.

In the 'Management of E-government' quadrant, the objectives include providing a "one-stop" portal, increasing administrative efficiency and transparency, increasing Korea's competitiveness capability in government service provision. In addition to UN readiness index, cost saving is measured quantitatively. The economic benefit is estimated to be 47.2 billion between 2003 and 2008. In the 'E-government Technology' quadrant, the objectives include improving the system by creating an integrated government service portal, electronic document verification system, and electronic official document

management system for civil petition. They also include functions to help seniors and those with disabilities to access and use the portal. Another objective aims to improve general accessibility by receiving information anytime and anywhere to a wide variety of government services via the Internet.

In the 'E-government Processes' quadrant, G4C processes include e-services (e.g., receiving national identification registry certificates), e-management (e.g., creating electronic official document management system for civil petition), and e-commerce (e.g., fees payment). Since the government system is not democratic, there is no intention to e-democracy. The objectives include reducing processes and paper work by combining and eliminating services, and enhancing service efficiency and effectiveness. In the 'E-government Stakeholders' quadrant, G4C categorizes two types of stakeholders - citizens and employees. G4C promotes the following citizens' objectives - to encourage using the portal by having simple verification process, creating online customized service package, and promoting usage and online education. Employees' objectives include developing and designing training programs that improve the systems and processing methods.

After determining the interaction dimensions, their objectives, and the measures of the objectives, the G4C system is ready for evaluation. This is phase II of the evaluation process and the evaluator can follow the flowchart as depicted in figure 3. The case study shows that the proposed framework can assess e-government systems effectively. The G4C case study also shows the adaptability of the framework to different e-government contexts. By dividing the evaluation process into two phases, the framework has the generality feature in evaluating e-government system.. In addition, the formative feature of the framework ensures applicability in measuring the objectives achievement and the continuity of evaluation process.

CONCLUSION

In this paper, we present a framework to evaluate the efficiency of e-government system. In addition to increasing the knowledge in the field of e-government evaluation, the goal of framework is to remedy the current gaps in e-government evaluation literature. The formative part of the evaluation framework ensures the objectives achievement and the continuity of the evaluation process. The framework facilitates filling gaps in the existing e-government evaluation systems by classifying the e-government systems into four interactive quadrants.

The framework contribution is twofold. First, it contributes to research by integrating the formative evaluation approach, STS model, and other theories from the e-government evaluation field. Second, the framework can be used as a template for researchers and practitioners to assess e-government projects. We demonstrated the use of the framework as a template by assessing the G4C project. The case study corroborates the applicability and practicability of the framework.

It must be mentioned that the proposed approach is not without limitations. Since the framework is based mainly on literature, one limitation is that the framework requires more validation by testing each quadrant in a real-world setting. Furthermore, the G4C case study is based solely on publicly available documents, reports and testimonials regarding the e-government project. In our future research agenda, we plan to improve the validation of the suggested model by designing a survey and conducting interpretive studies in a real-world public organization.

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