

Basic Approaches for the Evaluation of IT-Investments in E-Government: A Literature Review

Wolfgang Palka, Gülümser Yigitel, Marlen C. Jurisch, Petra Wolf, Helmut Krcmar

Chair for Information Systems
Technische Universität München
Boltzmannstraße 3
85748 Garching, Germany
palka@in.tum.de
yigitel@in.tum.de
jurisch@in.tum.de
wolf@in.tum.de
krcmar@in.tum.de

Abstract: Electronic government (e-government) investments are made to help governments transform service delivery in a way that they fulfill their obligations to stakeholders in the most efficient and cost effective way. During this process, governments are under constant pressure to deliver better public services with fewer resources which necessitate the use of confidential evaluation methods for IT investments in e-government in order to guide policy and decision makers and to raise public approval. Despite a various number of evaluation methods, there is still lack of an appropriate method, which takes all perspectives and dimensions into account. The aim of this paper is to investigate the existing state of art dealing with the principle approaches of evaluation of e-government investments by following a comprehensive review of the normative literature and contributing to these works by suggesting guidelines for developing an appropriate model.

Keywords: IT investment, e-government, literature review, evaluation methods.

1 Introduction

Influenced by the advent of the information society, governments all over the world are modernizing the offered public services, interactions with citizens and transforming the government activities through involvement of information and communication technologies (ICT). In this process, electronic government (e-government) investments are made and governments are constantly challenged to improve the quality and cost effectiveness of service delivery. However, the implementation and permanency of e-government projects depend on a wide range of factors from a multi-perspective point of view. One of the most important factors to mention is the public approval, which seems to be much lower than its potential according to the recent studies [Un10]. That is the

point, where the evaluation of benefits and the cost effectiveness of e-government investments come into question and need to be clarified in order to raise the public awareness and to guide decision makers.

The main benefits and the motivation of e-government investments are thought to be the reduction of administrative and operational costs as well as enhancing the services offered to business, citizens, and the general community at large also contributing to public value. Nevertheless, it is difficult to measure such benefits and outcomes of e-government in quantitative measures, although the investment costs are relatively determinable [BS07]. Moreover, the costs of e-government projects usually do not emerge at the same place as the benefits arising from them. While the administrative centers are carrying the investment and running costs, the citizens are the ones to take advantage of economic benefits [SS07]. Despite difficulties, several evaluation methods in the past 15 years have been developed, following different approaches and focus points. Most of these methods focus just on the financial outcomes and economic benefits while only some take also social, political, ideological, strategic dimensions, and trust, integrity, as well legitimacy issues into consideration. Consequently, the examination of the current approaches shows the lack of a unified and complete evaluation method that considers the technological, public and policy requirements as well as cost effectiveness equally.

The focus of this paper is to explore the various methods used to evaluate cost effectiveness of e-government investments in former literature and to build a basic conceptual framework based on the analysis and comparison of these methods by bringing out where the gaps, strengths and weaknesses arise from. Consequently, this paper aims to guide future researches in developing a comprehensive and precise evaluation method to monitor cost effectiveness by comparing related costs/risks with the obtained benefits in e-Government investments. This paper answers the following research questions: *what is the current state of the art for the evaluation of e-government investments?* Underpinning this aim, our research has three principles objectives. First, we discover what the existing approaches for the evaluation of e-government investments are. Second, we compare these approaches and investigate their advantages, disadvantages or limitations. Third and finally, we derive recommendations based on the analysis of the existing approaches.

2 Theoretical Background

According to the “Memorandum Electronic Government” [ME00], e-government is defined as the usage of ICT for the execution of processes for public decision-making and the provision of public goods and services in politics, state, and government. In addition, e-government has evolved to be a multidisciplinary research field which requires the competencies of different disciplines to bring forward innovative solutions. The disciplines taking part in this research field can be summarized as follows [Wi07]: (1) social and human sciences; (2) political, strategic, democracy and legal sciences; (3) information and knowledge research sciences; (4) organizational and economic sciences; and (5) computer sciences.

Traditional investment evaluation methods like return of investment, internal rate of return etc. are typically based on conventional accountancy frameworks and are specially designed to assess the bottom-line financial impact of investments by setting direct project costs against quantifiable benefits achievable. Since such approaches are not able to accommodate the full range of benefits, costs and risks, new methods conformable to the nature of public service and e-Government investments become necessary [Ir05]. The purpose and focus of the evaluation of cost effectiveness in delivered public services is to determine whether an e-government investment is affordable and worthwhile or if it causes extra expenses in mid-and long-term. For an integral and complete examination and holistic view of the cost effectiveness in such projects, it is essential to take perspectives of all the involved parties into consideration and follow a basic approach which has a multi- perspective, multi-dimensional, decision assistant with a formative character [WK05]. In this sense, the term “cost-effectiveness” describes the relationship between total costs and total utility, but it distinguishes between monetarily assessable uses; quantifiable, but not monetarily assessable uses; and non-quantifiable uses.

3 Methodology

In order to provide a state of the art map including the existing approaches used to evaluate e-government investments, we conducted a concept-centric literature according to [WW02]. Within the scope of this study, the initial data collection for the relevant literature has been made on a set of keywords (“*e-government evaluation method*”, “*IT public strategy*”, “*online government approaches*”, “*public IT-government improvement models*”, and “*decision making process for IT Investments in public sector*”) based search in the following databases like EBSCO-Host, Emerald Insight as well as Google Scholar. These databases do not only provide access to a large amount of electronic articles but also cover the AIS “basket of eight” journals, additionally IS journals, the most relevant business administration, e-government and other administrative science journals. In the extent of this literature review, books, conference proceedings, and other research articles have also been taken into consideration. The search was restricted with regard to the year of publication in that only the literature between 1990 and 2011 was included.

The results of the first stage screening the literature search delivered a large collection of studies with more than 4300 publications. In the second step, we determined the relevant studies through a rough examination of titles and where necessary abstracts on account of the conformity to the context. After this step, our sample had 160 publications. In the next step of the evaluation process, we selected publications that focus on the evaluation methods and according to the following criteria: Originality and innovativeness, i.e., the studies must introduce or describe new and concrete approaches, methods, procedures; economical attitude/view, i.e., the introduced approaches must have been derived from a business administrative point of view; and conformity to e-Government, i.e., the methods must be applicable for measuring the cost effectiveness of IT investments particularly in e-Government. According to these criteria, we identified 34 articles relevant at the first glance. However, after a closer examination, we eliminated 9 more articles since they did not include any new models especially built to be used in the

assessment of e-government investments. As a result of this filtering process, we have chosen 25 articles at the last phase and analyzed them regarding the evaluation methods used for e-government investments.

4 Results

Table 1 illustrates the determined evaluation approaches with respect to their source, a short description, and the main characteristics.

Method	Description	Source
EFQM (European Foundation for Quality Management)	The model describes a non-prescriptive management framework for self-assessment to improve and understand the complex cause and effect relationship in an organization. It is based on nine criteria, five as enablers that cover what an organization does and four as results reflecting what an organization achieves.	[Sc03]
3P Value	3P Value proposes a model to evaluate the value of mobile government applications and services through three perspectives, namely Prime Value, Pleasure Value, Post Value.	[Sc07]
SCM (Standard Cost Model)	SCM is a method for defining and quantifying administrative burdens for businesses imposed by regulation.	[Ne10] [Cr08]
WiBe (Wirtschaftlichkeits Betrachtung)	This framework widens the traditional project considerations and provides solid statements by combining the monetary evaluation aspect with the qualitative criteria. The criteria are mainly grouped in four modules: Cost & Benefit Parameters, Time Urgency for Replacement, Qualitative and Strategic Importance, External Impact on other institutions.	[Rö10]
eGov Signposts	This model of Danish government proposes a general guideline to follow in form of five signposts, instead of setting blunt targets. Two of these signposts involve external outcomes to the public and the rest are internal.	[La05] [Cr08]
PRM (Performance Reference Model)	This model focuses on for main measurement areas of IT Investments, which are Mission and Business Results, Customer Results, Processes and Activities, Technology. It also identifies different measurement categories and indicators for each measurement area.	[Da06]
BEGIX (Balanced Egovernment Index)	This scorecard system incorporates a well-balanced set of indicators around benefits, efficiency, participation, transparency and change management. It enables a total and detailed evaluation of cost effectiveness of concrete projects through 49 criteria.	[Be02] [Gr03]
VMM (Value Measuring Methodology)	This model proposes a scalable approach for estimating and analyzing value, risk and cost of electronic services and evaluating the relationship among them. It identifies five value factors for analyzing the value created from IT services, namely Customer Value, Public Value, Government Operational Value, Government Financial Value, Strategic Value.	[Da06] [HV10]
MAREVA (Method of Analysis and Value Enhancement)	It defines a value analysis based on 5 components, which are Profitability for State, Necessity, Risk Control, Internal Benefits of Public Domain, External Considerations for Users. Additionally, it considers different risk categories.	[Cr08] [Vo09]
eGEP (E-Gov Economics Project)	This model was developed as a general measurement framework rooted in pre-existing measurement methods already in use in different countries such as Signposts of Denmark, Mareva of France, WiBe of Germany, Monitor of Holland. It was built around three value drivers of efficiency, democracy and effectiveness.	[Cr08] [AW07] [BS10]
CAF (Common Assessment Framework)	This model has been developed in cooperation of EU ministers responsible for public administration. It provides a self-assessment framework using quality management techniques to improve performance.	[Sc03]
eGov Rechner	This model is based upon political, social and economic dimensions which are oriented to administrative and user perspectives. It contains out of four modules: Process Designer, Process Calculator, Qualitative Benefit Measurement, eGov Screener.	[Fr07] [Sc07] [Ne10]
Utilitas (Utility Assessment Model)	A Swiss model based on a catalogue of questions. According to a certain weighting given to each answer, the questions are assessed in order to identify the qualitative benefit and cost effectiveness and to map them on a matrix. The key benefits of a project are grouped under five categories: Modernization/Image, Cost Savings, Quality Improvement, Process Optimization, Fulfillment of Legal and Organizational Requirements.	[Lö10]
MONITOR	This approach examines the value of eGovernment investments through interviewing the public and private people so that making use of services is analyzed and consequently contentment level of users are documented. Since contentment of the services has a direct impact on investment decisions.	[Ne10]

Table 1: Existing Evaluation Models

In order to make a decision for an IT investment in e-government that is cost effective the following dimensions have to take into account [WK05]: multi-perspective, i.e., an integrated consideration of perspectives of all the stakeholders involved in the process like citizens, business, government etc.; decision assistant, i.e., the convenience in helping to take an investment decision, designation of concrete numbers and measures to estimate the cost effectiveness; multi-dimensional, i.e., taking all dimensions like costs, benefits, quality, and strategy, urgency, flexibility into account and consequently equally consideration of quality dimensions with the monetary measures; and formative Character, i.e., determining if derivation of constructive hints for improving the evaluated project is feasible. Based on these criteria, we evaluated and compared the different approaches. Table 2 illustrates our results.

	Multi-perspective	Decision assistant	Multi-dimensional	Formative
EFQM	✓	✓		
3P Value		✓		✓
SCM	✓			✓
WiBe		✓	✓	
eGov Signposts	✓			
PRM		✓	✓	✓
BEGIX			✓	✓
VMM		✓	✓	
MAREVA	✓	✓	✓	✓
eGEP	✓	✓	✓	✓
CAF	✓		✓	✓
eGov Rechner	✓	✓	✓	
Utilitas		✓	✓	✓
MONITOR	✓		✓	

Table 2: Further Analysis and Comparison of Methods

The 3P Value Method is particularly developed for mobile government applications and focuses only on user/citizen perspective. Therefore, it is not convenient as a general comprehensive approach. Likewise, SCM is also not a sufficient method to be in use for a complete evaluation since it involves only quantitative aspects focusing on measuring the financial and administrative costs. The main strength of PRM is its measurement indicators which help to reduce uncertainty for project managers and key decision makers. On the other hand, VMM provides a clear framework for making tradeoffs among different alternatives and striving to optimize value, minimize cost, and diminish risk by addressing people, technology and processes. As being suggested as a reference model in Germany, WiBe defines acceptance rules of the proposed projects based on certain focus areas. However, the prioritization mechanism does not seem to be effective since it is based on a threshold system. If at least one value dimension reaches a given threshold, the investment can be considered for funding, without analyzing the other factors. Moreover, the French model MAREVA does not provide a clear management for portfolio management although it fulfills all the requirements and necessary criteria of an evaluation method. But it is especially a powerful and innovative approach for defining the value of a project by integrating return on investment, public sector issues around productivity, impacts on citizens and public servants an organization's complexity, and the necessity of the project. It is also easy to use even without training and enables better project management through early identification of risks [Cr08].

The model CAF proposes a total quality management tool and looks at the organization from different angles at the same time, bringing a holistic approach to organization performance analysis. What is highly appreciated in the CAF implementation is the involvement of staff, enabling them to discuss the state of affairs of the organization and the options for the future. On the other hand, Utilitas is a relatively new method from 2009 that has been applied to evaluate 45 e-government solutions in 2010 and has received positive feedback [Lö10]. A close inspection of Table 2 shows that only two models seem to satisfy all the criteria for an ideal and complete evaluating model: eGEP and MAREVA. The economical aspect of e-government, enforcing a high focus on monetary measures can turn out to be a trap, causing a concentration on quantitative measures. However, the ideal model should provide a combination of qualitative and quantitative indicators. At this point, eGEP seems to be the appropriate answer, which tries to balance quantitative and qualitative metrics, with relative importance in percentage terms and with possible sources of collection, such as administrative records for personnel costs, input and output volumes.

After a close investigation of the introduced models, it is noticeable that country specific priorities, strategies and specialties play an important role in the determination of development and implementation criteria of e-government investments. They sometimes widely differentiate among countries so that different evaluation models have been developed and adapted specifically in order to meet these criteria which make it difficult to agree upon an overall acceptable and efficient evaluation methodology. The efforts and studies of European Commission in this field have resulted in the formation of the eGEP method that aims to combine the best practices of particular methods used in Europe. However, the adoption of the eGEP framework in EU member states has been somewhat disappointing. Countries have raised concerns of comparability and feasibility. It is believed that few indicators are comparable across countries and that it is not always feasible to collect data [Cr08]. As a result, it is important to identify precisely the purpose and direction of the investment at the beginning and the country/region specific characteristics while determining the appropriate evaluation model.

5 Implications for Future Research and Practice

According to [Ir05], many e-government decisions are political and the evaluation is always subjective because of the political culture, irrational decision making processes, and irrelevance of economic metrics in the public sector domain. However, a recent study about e-government [PS10] illustrates a new trend of change towards service oriented interaction between government and society and program management, also meaning improving the user experience and changing the paradigm of service provision from an administration centric perspective to a customer centric perspective. Although the word “customer” is not always deemed to be a suitable connotation in a public service context, it does embody elements that are worth considering by governments. User experience takes into consideration the channel preferences of users, the specific needs of users, simple procedures and short service delivery timeframes [Lö10]. As a result, the evaluation methods that give a higher priority and importance to user needs and satisfaction are more likely to be preferred in the near future.

Originating from the analysis of the existing approaches we derived the following implications for future research: (1) the evaluation model should integrate related risks with the handling alternatives in the evaluation method; (2) the evaluation model should be flexible, customizable and adaptable to the specific conditions according to the hierarchical (from local to global) and maturity level of the governmental organization unit that executes the investment and to the requirements, characteristics, and context of the target region; (3) the precision of the evaluation model depends on the degree of its multidimensionality – the model should integrate and evaluate as many dimensions as possible; (4) the evaluation model should give a higher weight and priority to citizen perspective, needs, satisfaction, and trust in the evaluation process while embracing all perspectives.

6 Conclusion

Within the scope of this paper, the various methods used to evaluate cost effectiveness of e-government investments have been briefly described, examined, and compared in order to identify limitations, strengths and weaknesses. Afterwards, the main concepts and important criteria derived from the analysis and comparison process have been given in order to guide future researches and close the breach in this area. This paper has revealed the accumulated knowledge of a collection of literature regarding the methods used in the evaluation of IT investments in e-government over the past two decades. However, there are still many aspects that are not included within the frame of this study and further investigations are required. The body of work in this field is developing rapidly with the continual accumulation of knowledge, empirical methods, and insights. In addition, due to their nature and function, information systems and technologies are continuously driven by the need to adapt and evolve, causing them not to be rigid over time, so the evaluation methods used shall not stay rigid and also be improved.

References

- [AW07] Aibar, E., Waksberg-Guerrini, A., (O.A.): Towards a Network Government? A Critical Analysis of Current Assessment Methods for E-Government. In: Wimmer, M., Scholl, H. J., Grönlund A. (eds.), *Electronic Government*, 6th International Conference, EGOV 2007, Springer, Heidelberg, S. 330--341.
- [Be02] Bertelsmann Stiftung: *Balanced E-Government: Elektronisches Reagieren zwischen administrativer Effizienz und bürgernaher Demokratie*, 2002.
- [BS10] Bhatnagar, S. C., Singh, N.: *Assessing the Impact of E-Government : A study of E-Government Projects in India*. *Information Technologies and International Development*, Vol. 6, No. 2, 2010, S. 109-127.
- [BS09] Brecht, L. Schallmo, D.: *Ein Referenzmodell zu Prozessmanagement: ERP Management*. GITO Verlag, Ulm, 2009.
- [BS07] Busch, R., Schönholzer, M.: *Richtige Prioritäten für e-Government Vorhaben setzen*. *eGov Praesenz Fachzeitschrift*, Ausgabe 2/07, S. 47—48, 2007.
- [Cr08] Cronin, M.: *eGovernment International Best Practices*. Technical Report, Forfas, 2008.
- [Da06] Dadayan, L.: *Measuring Return on Government IT Investments*. In: *Proceedings of the 13th European Conference on IT Evaluation*, 2006, S. 1-12.

- [Fr07] Fröschle, N.: Anwendung des Egov-Rechners für eGovernment Geschäftsprozesse: Vom Messen zum Engineering. In: Neue Verwaltung 8th Kongress mit Fachmesse eGovernment, Fraunhofer Institut Arbeitswirtschaft und Organisation, Leipzig, 2007.
- [Gr03] Graafland, I. et.al.: SIBIS New eEurope Indicator Handbook, Statistical Indicators Benchmarking the Information Society, 2003.
- [HV10] Hajdin, G., Vrcek, N.: Methodologies for Measuring E-Government Development: The Croatian Case. In: Proceedings of 21st Central European Conference on Information and Intelligent Systems, Zagreb, Croatia, 2010, S. 319-325.
- [In13] Investopedia Financial Dictionary, <http://www.investopedia.com/terms/p/profit> accessed on March 15th, 2013.
- [Ir05] Irani, Z. et.al.: Evaluating e-Government: learning from the experiences of two local authorities. Information Systems Journal Vol. 15, S. 61–82, 2005.
- [La05] Lau, E. et.al.: OECD Peer Review of eGovernment in Danmark. Technical Report, OECD, 2005.
- [Lö10] Lörnitz, B. et.al.: Digitizing Public Services in Europe: Putting ambition into action. Technical Report, 9th Benchmark Measurement, Capgemini, IDC, Rand Europe, Sogeti and DTi, European Commission, Information Society and Media, European Commission, 2010.
- [Me00] Memorandum Electronic Government, http://www.gi-ev.de/fileadmin/redaktion/Download/presse_memorandum.pdf, accessed on March 10th, 2013.
- [Me13] Merriam Webster's Online Dictionary, <http://www.merriam-webster.com/dictionary/cost-effective> accessed on March 10th, 2013.
- [Ne10] Neuron, A. et.al.: Assessing and Evaluating Value and Cost Effectiveness of eGovernment Initiatives Focusing the Qualitative Evaluation. In: Proceedings of the 14th IRSPM Conference, Bern, 2010.
- [PS10] Pardo, T., Styrim, E.: Digital Government Implementation, A comparative Study in USA and Russia. In: Proceedings of 16th Americas Conference on Information Systems, Lima, Peru, 2010.
- [Rö10] Röthing, P.: The WiBe Framework (Germany) Overview of an European Measurement Approach to E-Government Efficiency Assessment and User Satisfaction. Working paper, WiBE Team PR, 2010.
- [Sc03] Scheske, M.: Benchmarking öffentlicher Verwaltungen im Bereich Electronic Government: Ein Selbstbewertungsmodell für kommunale Electronic Government-Aktivitäten. Technical report, Institute for eGovernance Competence Center, 2003.
- [Sc08] Scheuring, H.: Der www-Schlüssel vom Projektmanagement. Verlag Industrielle Organisation, 2008.
- [SS07] Schönholzer, M., Schaible, B.: Brauchen wir M-Government in der Schweiz. eGov Präsenz 1/07, 2007, S. 18-19.
- [Su07] Summermatter, L., Sommer, P.: Die Wirtschaftlichkeit von e-Government Projekten analysieren – eine neue Methode. eGov Praesenz 2, 2007, S. 42-44.
- [Un10] United Nations E-Government Survey 2010: Leveraging E-Government at a Time of Financial and Economic Crisis, UN Publishing Section, New York, 2010.
- [Vo09] Vossey, B.: Measuring Returns from e-Government: The Case of French Local Government. Thesis for MSIT, HEC, 2009.
- [WW02] Webster, J., Watson, R.T.: Analyzing the Past to prepare for the Future: Writing a literature review. MIS Quarterly, Vol. 26 Nr. 2, 2002, S. 13–23.
- [Wi07] Wimmer, M. A.: The Role of Research in Succesfull E-Government Implementation. In: E-Government Guide Germany: Strategies, Solutions and Efficiency, S. 79-87, Fraunhofer IRB Verlag, Stuttgart, 2007.
- [WK05] Wolf, P., Krcmar, H.: Prozessorientierte Wirtschaftlichkeitsuntersuchung für E-Government. Wirtschaftsinformatik, Vol. 47 No. 5, S. 337-346, 2005.