Evaluating eGovernment Evaluation: Trend and Issues

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Abstract. Evaluating e-government has proven difficult. Reasons include the complex nature of e-government, difficulties in measuring outcomes and impact, and the evolving nature of the phenomenon itself. Practical and effective evaluation methods would be useful to guide the development. To gauge the state of the art in the field, a review of contemporary literature investigated the status of research on e-government evaluation. We found the issues involved to be described by five critical factors: maturity levels, evaluation object, type of indicators, evaluation timing, and stakeholder involvement. The review suggests that there is no best model but rather that e-government evaluation must be situated and take a formative approach to guide the next step. However in doing so there is a need for a clear perspective on where e-government development is going. On this point research is more in agreement, and we provide a model to conceptualize this development.

Keywords. E-government, evaluation, e-government models, evaluation models, literature review

1.   Introduction

Adoption of e-government has often been based on the hope of achieving benefits like less corruption, increased transparency, greater convenience, revenue growth, and/or cost reductions [1]. In order to know the realized benefits, there is a need to conduct evaluations of efforts on e-government.

Evaluation can be defined as 'a series of activities incorporating understanding, measurement and assessment' [2]. There are many e-government evaluations conducted by different organizations, like the UN or the EU, by think tanks like the Economist, and by individual researchers or research groups [3], [4]. These evaluate a variety of aspects like websites [5], e-readiness [6], or achievement [7].

Conducting e-government evaluation has been closely linked with a variety of models defining the phenomenon of e-government. One of the most cited early models is a growth model for e-government by Layne and Lee [8] comprised of the four stages: cataloguing, transaction, vertical integration, and horizontal integration. Many more models continued to be developed [3], [9], [10].

Evaluation of results of investments in ICT, in general, has proven challenging Hanna, Zhen-Wei-Qiang, Kimura, and Chew-Kuek [11, pp.89] find that "even most

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developed countries have done only limited assessments of how well ICT investments have been used". This same challenge has been observed for e-government [12] expressing the need for improved methods for evaluation due to lack of metrics and indicators. Evaluation frameworks at the organizational level were found to be one of the challenges to the success of e-government in Sub-Saharan Africa [13].

One complication is that some of the expected positive impacts cannot easily be expressed quantitatively. Therefore, qualitative aspects should complement the quantitative ones [9]. Challenges can also be linked to the complexity of e-government itself; it has political, social, technological, and organizational aspects [10], each of which requires a different set of indicators and measures.

In order to contribute to understanding issues related to e-government evaluation, there is a need to have a clear understanding of all the evaluation patterns, how it is conducted, what it focuses on, and related implications. The main research question of this paper is hence, what is the status of research on e-government evaluation? For this, we investigate the main foci of the contemporary literature on e-government evaluation and discuss the implications for future research.

2.   Method

The review was conducted following the guidelines by Webster and Watson [14]. The first article search was conducted in Scopus. Journals first considered were those recommended by Scholl [15] as the core for e-government publications: Electronic Journal of e-government, Government Information Quarterly, Information Polity, International Journal of Electronic Government Research, Transforming Government: People, Process and Policy. Further three journals recommended by IFIP EGOV and ePart Conference (http://www.egov-conference.org/journals-1) were included: International Journal of Electronic Governance, Electronic Government, an International Journal, and Journal of Information Technology and Politics. A second search was conducted in the EGOV Reference Library [16]. Well-reputed conference proceedings are also recommended [14], so the ICEGOV and conferences were included. Keywords used for searching the above-given sources were "evaluate", "assess", "monitor", "measure", "value" and "e-government". Peer-reviewed articles in English, published 2010 – 2015 were chosen. The models of e-government were also reviewed, their review extends from 2001.

The searches in the EGOV Reference Library [16] and Scopus yielded 175 and 659 articles respectively. From titles and abstracts 14 and 28 articles respectively were retained. The low retention is due to the fact that the search found many articles related to the keyword but not to e-government evaluation. In addition ICEGOV and EGOV provided nine articles. After removing duplicates, thirteen articles remained. Considering the references to the retained articles and the e-government models an additional twenty articles were added. In total, twenty-six articles and seven reports were used. The articles were analyzed focusing on concepts [14, pp. xv]. Similar elements from papers were grouped into concepts which were defined and discussed.

3. Results

Five concepts were found representative; maturity (level), evaluation object, indicators, evaluation timing, and stakeholder involvement (see Table 1).

Table 1. Identified concepts and related literature

Concept	Authors of literature
Maturity levels	Accenture (2014); Layne & Lee (2001); Andersen & Henriksen (2006); Lee (2010); Abdallah & Fan (2012); Al-Nuaim (2011); Government Accountability Office (2010); United Nations (2008)
Evaluation objects	Janssen (2010); West (2007); ActiveStandards & WelchamPierpoint (2012); Accenture (2014); United Nations (2014); Government Accountability Office (2010); Kaisara & Pather (2011); Lörincz et al. (2012); Mates et al. (2013); Papadomichelaki & Mentzas (2012); Rama Rao et al. (2004); The Economist Intelligence Unit (2009)
Types of indicators	Janssen (2010); West (2007); ActiveStandards & WelchamPierpoint (2012); Accenture (2014); United Nations (2014); Abdallah & Fan (2012); Al-Nuaim (2011); Government Accountability Office (2010); Kaisara & Pather (2011); Lörincz et al. (2012); Mates et al. (2013); Rama Rao et al. (2004); The Economist Intelligence Unit (2009); Castelnovo (2013); Chutimaskul & Funilkul (2012); Gupta & Jana (2003); Hellang & Flak (2012); Hsieh et al. (2013); Irani (2010); Jukić et al. (2013); Karunasena & Deng (2012); Lin & Fong (2013); Luna-Reyes et al. (2012); Shan et al. (2011); Siskos et al. (2014); Stragier et al. (2010)
Evaluation timing	Janssen (2010); Castelnovo (2013); Chutimaskul & Funilkul (2012); Irani (2010); Jukić et al.(2013); Berger (2015); Sorrentino & Passerini (2012); Irani & Love (2008)
Stakeholders' involvement	Janssen (2010); Gupta & Jana (2003); Lin & Fong (2013); Berger (2015); Irani & Love (2008)

Maturity

E-government has increased its scope over the past decades. The number of people using services has increased, technology has matured and diversified, the number of services has increased and the quality improved. In the mid-1990s the focus was on websites, today it is about integration, infrastructure, and open data.

Many maturity models try to capture this development in terms of distinct "levels". Early examples include the Layne and Lee [8] four-level model: catalogue, transaction, vertical integration, horizontal integration; and the Andersen and Henriksen [9] model with cultivation, extension, maturity, and revolution. The UN maturity model with five levels (emerging, enhanced, interactive, transactional, and connected) may be one of the most widely used ones. Lee [17] presents a common frame of reference using five metaphors: presenting, assimilating, reforming, morphing and e-governance. Stanimirovic, Jukic, Nograsek and Vintar [18], departing from evaluation methodologies, developed a framework for comparative analysis which focuses on evaluation levels (national, political-sociological, organizational, project, infrastructure) and development levels (conceptual framework, pilot application, practical application). Misra and Dingra suggest six maturity levels (closed, initial, planned, realized, institutional-

ized, optimizing) [19]; and a website evaluation model has five development stages (web presence, one-way interaction, two-way interaction, transaction, and integration) [20]. Accenture [6] defines three service maturity levels: publish service, interact services and transact services while the Enterprise Architecture (EA) Maturity Management Framework (EAMMF) includes seven maturity stages [21].

These models have been conceived at different times, each striving to improve on the previous ones by better describing "steps" in the general development towards greater scope (from websites towards integrated service production) and tighter integration (e.g. more automation, more user involvement, closer monitoring) on which they generally agree.

Because a general, if not straight-forward, development path can be discerned, Figure 1 uses "maturity" as the e-government dimension which all the others relate to.

Evaluation object

E-government evaluations tend to focus mostly to the front-end of services. Examples include Kaisara and Pather [23], the US E-Government Website Quality Report [5], West [4] who focus on websites. Some front-end focused evaluations include users'/citizens' perceptions of sites [26]. The UN [7] use stakeholders groups to categorize government interactions based on the different groups of users, G2G, G2C, and G2B. Mkude and Wimmer [45] add G2E, Government to Employees. Rama Rao et al. [27] subdivided G2C into government to citizens-rural (G2C-R) and -urban (G2C-U). Further elaborated categorization was suggested by Mates et al. [25] who grouped European e-government projects in ten categories and suggested corresponding assessment indicators. Accenture [6] updated the view of e-services in comparing digital government performance across countries by the category of "proactive"; the extent to which services predict what citizens would ask for and provide it upfront. Moving from the front-end, Janssen [3] focuses on organizational and technology infrastructure aspects of the back-end. The Enterprise Architecture Maturity Management Framework takes a step further by presenting a comprehensive view of the entire infrastructure in government [21].

Moving beyond individual organizations and even inter-organizational integration, Hanna, Zhen-Wei-Qiang, Kimura and Chew-Kuek [11] consider the national level in a management perspective. They chart the ways in which nations have institutionalized their e-government efforts. In different countries, control and responsibility for the e-government development are placed in different arms of government. Their model [11, pp.91] finds four different locations which suggest four different types of management and control: policy and investment coordination, administrative coordination, technical coordination, and shared or no coordination.

The UN [7] survey evaluates e-government development status at a global level, for its 193 member states. This model also concerns the national level and measures both aspects of e-government services and preconditions for their use, including telecom infrastructure and user capacity to use them. Elaborating on the preconditions, the Economist Intelligence Unit [28] ranks e-readiness by a quite comprehensive model including factors like business climate and national policies. The European Commission also developed a framework for evaluating the e-government action plan [24].

Type of Indicators

Clearly different evaluation objects require different indicators. E-government maturity leads to increasingly complex evaluation objects and simultaneously increasing integration of these object with various service processes (Figure 1 pp.130), all of which affect what is interesting to measure. Twenty-six of the thirty-three papers discuss different indicators. Indicators used depend mostly on the evaluation object and on evaluation timing.

Early phase indicators focus on input, during implementation the focus is on performance, and in later phases output, outcome and impact are in focus. Stragier et al. [41] found outcome and impact to be the more interesting indicators for both experts and researchers than input and output. However, inputs and outputs are more easily measured, and hence not surprisingly the most common evaluation models, such as the United Nations' [7] focus on these.

One challenge in comparing evaluations is that many indicators are locally or not clearly defined [32]. Indicators can also be grouped from political, technological, organizational and social perspectives [10]. However, many evaluation models mix indicators of e-government efforts with measures of preconditions. For example, the United Nations biannual survey, based on the e-government development index (EGDI), surveys the state of the art in online services so as to produce the online service index (OSI) and adds data from national statistics measuring prerequisites, including the telecommunication infrastructure index (TII) and the human capital index (HCI) [7]. The two latter are not part of e-government efforts but of general technical and human development. This way the EGDI mixes e-government development with general development in a way that on the one hand is reasonable as both technical infrastructure and literacy are prerequisites for use of e-government services, on the other hand, makes it difficult to discern the e-government component in development.

More clear-cut in this respect is the Economist Intelligence Unit model for measuring e-readiness which includes 38 indicators, 81 sub-indicators with together over 100 quantitative and qualitative criteria in six categories [28].

Many evaluations focus on more easily discernible evaluation objects, often websites. The US E-Government Website Quality Report [5] has 26 compliance checkpoints in relation to key areas of online quality: accessibility, search engine optimization, and usability. The Brown University website evaluation assesses features related to information availability, service delivery, and public access [4]. Accenture [6] adds to this by including citizen satisfaction and citizen service delivery experience in addition to measures of "service maturity".

Beyond web site evaluation, i.e., measuring output, Capgemini focuses on outcomes in terms of political priorities of the European Union e-government action plan: user empowerment, digital single market, efficiency and effectiveness and pre-conditions [24]. Focusing on the back-end of services and interoperability issues the US Government Accountability Office [21] assesses Enterprise Architecture (EA) using 59 core elements related to critical success attribute representations: EA Management Action Representation, EA Functional Area Representation, Office of Management and Budget Capability Area Representation, and EA Enabler Representation.

Evaluation Timing

Different evaluation objects become interesting at different times in the development (Figure 1 pp.130). While a website can be measured in terms of output, outcomes and impact of e-government depend on many other factors such as infrastructure and public sector business models. So when different objects should be assessed? And what are the purposes of evaluation at different times?

Focusing on investment evaluation, Irani [34] developed a four-step phased life cycle approach: ex-ante evaluation, metrics, command and control, and ex-post evaluation. The author takes evaluation as a process in the life cycle of a project. Lin and Fong [37] in developing an evaluation management model considered the phases performance planning, performance executing and applying performance result. Jukić et al. [35] suggest that ex-ante evaluation has an impact on the success of e-government. Sorrentino and Passerini [43] suggest moving from summative to formative evaluation as the latter allows to reduce uncertainty and to correct or re-orient initiatives. Formative evaluation is considered to allow elimination of barriers to adoption [42] and lead to seeking improvement [3]. There are also efforts to evaluate the impact of an initiative or a phase thereof. Castelnovo [29] showed that the goals of the national action plan for the diffusion of e-government at the local level in Italy were still far from being realized after 50 months from the conclusion of the first phase of the plan and 30 months from the beginning of the second phase.

One reason for being careful with timing is that while outputs of a project can be measured at the time it is completed, for example when a service is in operation, it is difficult to decide the right time to measure outcomes of it in terms of use, citizen satisfaction, or cost/benefit analysis.

Evaluations are not only done for the purpose of measuring the objects of evaluations, it is also for the purpose of keeping initiatives running. Many e-government projects are long-term in the sense that quantitative effects are not expected until much later. E-government aims at grand effects such as reorganizing the public sector, making government more open, more effective and more efficient. There is a need to keep initiatives going even though many effects can only be measured partially, at best, during the process. In order to achieve this, the many parties who have a stake in e-government development must be involved somehow, which brings us to the next point discussed.

Stakeholder Involvement

At any e-government maturity stage, there are stakeholders. However, the amount increases the more to the right we look in Figure 1 (pp.130) as the evaluation object is more complex and less under the direct control of the government. As e-government becomes more integrated, stakeholders become more directly involved in terms of technology as well as operations, business models, and legal and contractual regulation. Stakeholders include service users but also investors and providers. Some services are outsourced to the private sector, in others private companies act as intermediaries in service processing. In many cases, private companies co-invest because they see other benefits for themselves, for example in infrastructure development or in cloud services where the government can be an additional user among others.

Therefore, stakeholders need to be involved in different ways at different stages of e-government development. Involvement in planning and implementation contributes to creating ownership of initiatives. Involvement in evaluation adds different perspectives to the process and the results.

In their performance evaluation management model aiming at accelerating the development of e-government in China, Lin and Fong [37] highlight the importance of key performance indexes (KPIs) together with five participant roles (leader, public, performance office, appraisal object, and responsible unit) and three phases. They suggest that considering those roles improves the interaction between different roles.

Gupta and Jana [31] note the possible existence of the diversity of views of different decision makers and stakeholders. In line with that, Rowley [44] discusses different stakeholders of e-government, their roles, and interests, taking her study as a step towards an understanding of benefits of different stakeholders. Janssen [3] and Berger [42] have taken a step further, from the conceptual suggestions to practical use. In [3] a participative self-assessment tool was developed and used in evaluating organizational and technology aspects of the back-ends of fifteen organizations. This led to understanding the status of their respective organizations and seeking improvement.

4.   Discussion

This literature review aimed at providing an overview of the main foci of e-government evaluation in the current literature discussing their implications and presenting the research gaps. We found five main concepts: *maturity* (levels), *evaluation object, type of indicators, evaluation timing*, and *stakeholder involvement*. Figure 1 puts the factors discussed in context. E-government maturity generally extends over time in terms of scope (horizontal axis) and depth of integration (vertical axis). Over time, different evaluation object becomes more or less interesting. The complexity of these objects increases over time. Development is not straightforward, it comes in bits and pieces and does not happen the same way in every country, hence the curved and dotted development arrow.

Indicators used for evaluation partially emanate from these evaluation objects themselves, and partly from stakeholders. The number of stakeholders also increases as e-government matures and the objects involved become larger and more complex.

Hence also stakeholder requirements, ambitions, and expectations increase, as do the number and complexity of indicators. "Scope" is discussed by many e-government models and typically starts with websites, moves over vertical and horizontal integration to government-wide issues like information infrastructure, governance and open government. The "degree of integration" includes several factors which to some extent follow from the increased scope but also from general technical development and new government business models.

Early e-government factors include user self-service and outsourcing. More recent ones include open data and automation, both of which call for considerable integration of data sources in service production, administration, and reporting; and suggest important changes in user roles. The factors on the vertical axis are not ordered (hence the brackets); they all contribute to increased integration but in different and often complex ways.
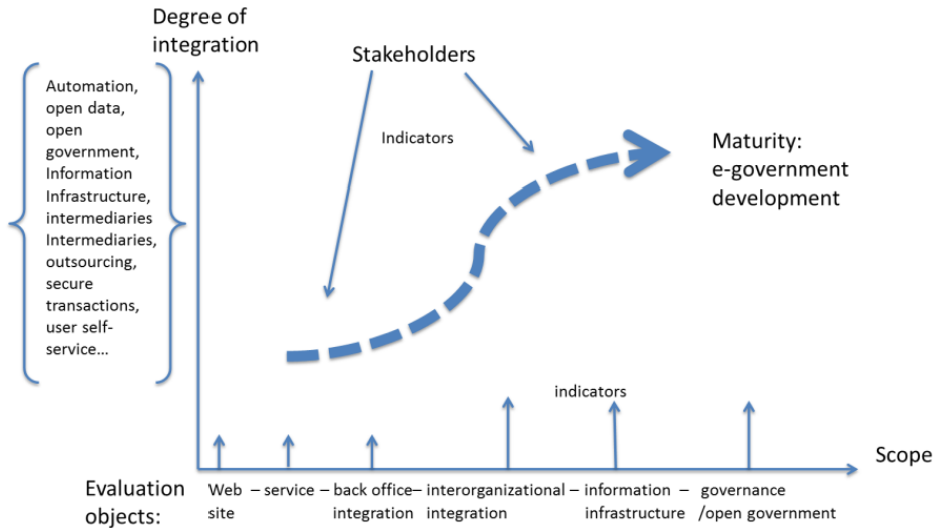
Figure 1. A general e-government maturity model based on the factors from the literature; moving towards wider scope and deeper integration

In view of Figure 1, and in terms of the five concepts by which we have categorized the literature, we can distinguish different types of evaluation models.

Many, if not most, of the papers surveyed in this study, take a development perspective. Many try to define certain stages in that development; they are "ladder models" [8] is one example. These have developed over time, adding new "steps" and new criteria. These models define criteria of "good" e-government.

"Level models" measure e-government maturity based on general models of e-government but without specifying steps. These include the UN [7], the Economist [28], the Accenture models [6], and more, which are rather to be seen as formative benchmarks of what is considered a positive development, usually without a close definition of what is good. Sometimes these models borrow criteria from stage models (e.g. vertical integration) sometimes from political agendas (e.g. user empowerment).

While both these types focus on e-government development in general, another type focuses on individual projects. Unlike the general e-government agenda, projects have a deadline and can be assessed posthoc. Such evaluations often indicate failure [46] but often with narrow criteria such as project budget or timeline. They typically measure output rather than outcome or impact. Still they can be useful and are obviously often necessary from a contract point of view, but the relation between project evaluations and the overall e-government development is not clear. Clearly it might look better if all projects succeeded, but in terms of a longer development it may in fact be good that ill-conceived projects actually fail as this helps avoid getting stuck in dysfunctional systems. There is a problem of aligning short-term evaluation of projects with long-term evaluation of e-government development.

One of the problems with all types of models is that they are mostly used to measure the state of art at a certain time, not so much with understanding the reasons; "there is a need for a better understanding of not just how, but why e-government evolves in the way(s) that it does" [47].

There are some models that indeed do try to look into reasons. The Economist model is one such, comprised of a large number of measurements of factors assumed to influence e-government positively. While there is no study comparing the performance of the various e-government evaluation models, the Economist model scored best in predicting the effect of e-government on the reduction of corruption [48].

This brings us to another set of evaluations which is not covered by this literature review, namely that on effects of e-government. Research on corruption is one such example. This literature is not included as it does not model e-government per se, only takes measures of it as one factor in measuring something else. Yet this kind of literature may be interesting for those who want to assess e-government in a more general development perspective.

Another set of literature largely not included is that trying to measure economic effects of e-government. This literature is not included because economic evaluation is typically not done using e-government models but economic ones. There are examples of e-government economic models, such as the eGEP [49], but there is not much literature on use.

5. Conclusion

This paper has presented a number of different models of e-government evaluation. We presented a simple conceptual model to be able to organize the criteria for evaluation discussed in the literature; maturity, evaluation object, indicators, evaluation timing, and stakeholder involvement. We also found different types of models; ladder models and level models try to measure output while preconditions models, or "reason" models, try to explain what makes e-government happen.

Each model represents – often implicitly – a theory of what e-government is. Our review shows that there is great variance, and one strand of future research could be to identify those theories. Arguably more interesting from a practical point of view would be to compare the effectiveness and the efficiency of the different models. How good are they at predicting to what extent our course of actions will lead us to the desired goals? After all, most e-government evaluation is not conclusive but serves to inform the next step in the development. Such research of formative models for e-government development would be useful as it would advise practitioners and help compare evaluations.

In practice, people tend to take most notice of the evaluations that are most widely used. In this case, this would include the UN model, the EU model, and the US' EAMMF. Such models tend to serve as benchmarks due to their wide use, and they also serve as formative evaluation; governments look for ways to improve their index on them. Because of that, they also contain risks as their definition of e-government is based on what can be fairly easily quantified, often technical factors, rather than more

complex organizational or social factors which many other models find equally or even more important. Research on formative e-government development should hence avoid falling into such traps but instead look for reasons behind developments.

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