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Resistance and support to electronic government, building a model of innovation

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Abstract

In several countries forces that resist e-government innovations apparently override those that support them. A first step is taken in order to identify organizational processes of resistance and support to e-government innovations. A multi-disciplinary and non-linear innovation model is proposed that is inspired by the Minnesota Innovation Research Program's Innovation Pathway-model. The proposed model grasps the whole process of adoption and implementation of e-government services. Observable indicators of resistance and support on the complete innovation pathway of electronic government are derived from the proposed model. Future research will have to conceptually refine and empirically test both model and indicators.

Keywords: E-government; Electronic government; Innovation model; Resistance to change

1. Introduction

E-government projects face multiple and complex challenges. Identifying and overcoming these challenges is not always easy (Gil-García & Pardo, 2005). It takes several research disciplines to identify and understand these challenges (Chengalur-Smith & Duchessi, 2000). A multi-disciplinary model of innovation that identifies different e-government innovation processes could help in these matters.

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Benchmarks such as Global e-Government (West, 2004) or those conducted by the UN (2004) and Accenture (2003) reveal that e-government innovations in particular countries advance at different speeds. The differences indicate that in several countries e-government innovations face less progress or even stagnation. In these cases, forces that hamper e-government innovations apparently override those that help. This implies that a model that identifies innovation processes alone is not adequate in identifying and understanding the challenges that e-government innovations meet. For that reason, the model must also enable identification and understanding of how these processes help or hamper e-government innovations.

In this article we propose a multi-disciplinary, non-linear model of innovation inspired by the Minnesota Innovation Research Program (MIRP) Innovation Pathway. The proposed model is composed of ten different stages of innovation. The stages are to be observed in concrete organizational processes. From every stage indicators are derived from which we expect that they may either help or hamper the innovation process. These are called indicators for support and resistance to innovation.

Models are always under construction, so it goes without saying that it will take a whole lot of conceptual refinement and empirical testing to finalize both the model and the derived indicators. We therefore emphasize that this article is a first step. The empirical work required is very extensive and will require several years. However, we do not want the academic community to wait so long for our contributions to the field. We offer a large number of indices and operational definitions. We hope this will inspire others, just like ourselves, to conduct empirical e-government innovation research that will also help to improve government organizational practices.

In this article we try to answer three research questions:

1. What stages of innovation can be observed in the adoption and implementation of e-government services?
2. What are the indicators of resistance to the adoption and deployment of e-government services in these stages?
3. What are the indicators of support to the adoption and deployment of e-government services in these stages?

The article starts with an explanation of why we chose the process of innovation as a research viewpoint. Next, definitions on stages of innovation and on resistance and support are given. Then the MIRP Innovation Pathway model is introduced and criticized. Inspired by this model and following the criticisms, a new innovation model is designed, and indicators and indices are derived and proposed. Finally, implications for future research are discussed.

2. Innovation as a research viewpoint

Our focus is on the improvement of government services by means of ICTs. Improvement means that existing services are ameliorated or new services are added that are supposed to be better than the old ones. Both kinds of services can be perceived as being new. In the literature

all ideas, practices, or objects that are perceived as new by an individual or other unit of adoption are called innovations (Rogers, 1995). So, all improvements of electronic government services that are perceived to be new by the potential adopters can be considered as innovations.

3. Definitions

Research on the processes that organizations go through in implementing innovations focuses on how and why innovations emerge, develop, grow, and (occasionally) terminate (Wolfe, 1994). In general, the stages in an innovation process reflect sequential steps of organizations in which they initiate, adopt, and implement an innovation (see for instance Pierce & Delbeque, 1997; Ettlie, 1983; Wolfe, 1994; Rogers, 1995). When a simple innovation is implemented, the stages tend to occur in a straight order. However, when innovations are complex "stages tend to be muddled and overlapping" (Wolfe, 1994, p. 411). Processes that accompany complex innovations are often iterative and contain feedbacks and feed-forward cycles (Schroeder et al., 1989). As ICT-related innovations are complex (see below), this research has to anticipate a non-linear sequence of stages within the innovation process that organizations go through. For that reason, in here "stages of innovation" are defined as:

> A non-linear set of separate periods within the total process of innovation that organizations go through, from the moment an organization grows aware of an innovation up to the organization's full deployment of the innovation.

In the most common definition resistance refers to an influence or force that hinders or stops. But such a broad definition would be too general, too abstract, and inappropriate for empirical research. To answer the research questions about resistance and support to the adoption and deployment of electronic government, services resistance is defined as:

> the extent to which new electronic government services, from the stage of official plans through the stage of implementation are obstructed, delayed, or prevented from making progress by empirically verifiable decisions and actions of actors within governments, such as project managers and project team members, heads of departments, members of the board, system designers and resource controllers.

The opposite term, support to the adoption and deployment of electronic government services, is defined as:

> the extent to which new electronic government services, from the stage of official plans through the stage of implementation are encouraged, accelerated, or advanced by empirically verifiable decisions and actions of collective actors within governments.

4. The MIRP Innovation Pathway model

Innovation is often characterized as an uncertain, dynamic, apparently random (Jelinek & Schoonhoven, 1990; Quin, 1985), or chaotic (Cheng & Van de Ven, 1996) process. Most innovation models, however, are linear (Edquist & Hommen, 1999). They reveal difficulties in grasping the complexity of organizational innovation. Particularly, the introduction and

implementation of ICTs in organizations concerns complex tasks (Landauer, 1996; Wigand, Picot, & Reichwald, 1997). Additionally, contemporary organizations such as governments can be considered complex systems themselves (Allen et al., 2002; Petrovic, 2002). Linear causality is far too simple to explain what happens in complex systems (Lichtenstein, 2000). According to Dooley (1997), linear models are not appropriate for the explanation of organizational innovation in the application of ICTs.

Van de Ven et al. (1999) discovered that of all innovations studied that "none of the innovations developed in a simple linear sequence or stages or phases of activities over time" (Van de Ven et al., 1999, p. 23). Anticipating this non-linearity Van de Ven et al. (1999) have drawn and proposed a "roadmap" for practitioners based on empirical research called the MIRP Innovation Pathway (see Fig. 1).

The roadmap lists several key elements of innovation processes, from the initial stage to the actual implementation of an innovation, that are quite similar across a highly diverse set of technological, product, process, and administrative innovations. The roadmap distinguishes between three sequential periods; an initiation period (processes 1, 2, and 3), a developmental period (processes 4 to 10), and an implementation/termination (processes 11 and 12) period in which an innovation is either realized or terminated and abandoned. Each

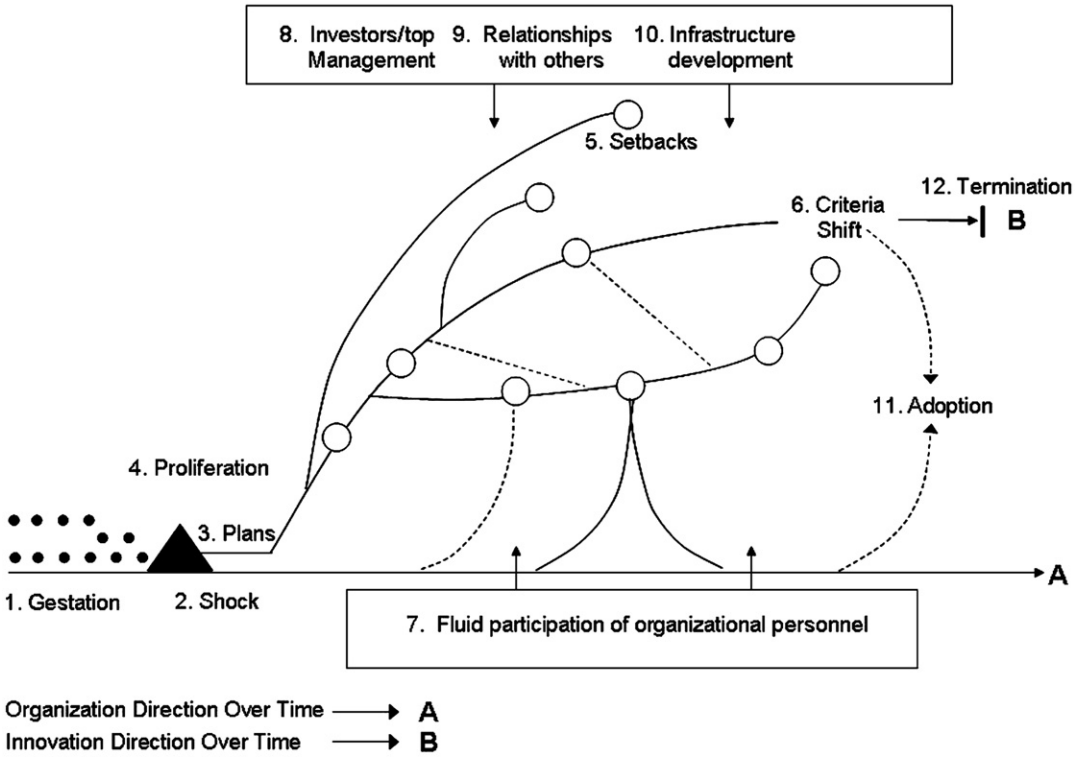

Fig. 1. The MIRP Innovation Pathway (Van de Ven et al., 1999).

period contains several processes. For instance, the initiation period ends with an approved plan, and the impletation starts when activities are deployed to apply the innovation. Unfortunately, it would take too many words to explain all the details of the processes within the MIRP Innovation Pathway. For a more detailed description we refer to Van de Ven et al. (1999, chap. 21).

As governments can be seen as complex systems and the improvements of electronic government services as complex tasks, the MIRP Innovation Pathway appeared to us as a suitable model to map the whole process of innovation in electronic government services. However, to serve this purpose several problems with the MIRP Innovation Pathway model would have to be solved.

5. Problems of the MIRP Innovation Pathway model

The first problem relates to the doubts we have about the supposed non-linear character of the model. The core of the pathway is a linear sequence of the three periods; the initiation, developmental, and implementation/termination period. Despite the fact that some processes within the periods are called non-linear by Van de Ven et al. (1999), the sequence of these three periods is defined in a fixed and linear way. Below we will argue that even this sequence of three main periods not always follows a linear path.

The second problem is that the MIRP Innovation Pathway strongly focuses on the development of an innovation. However, common knowledge about innovations in ICTs holds that especially in practice most difficulties occur in the implementation period. For instance, studies show that in the United States only about 28% of all IT projects were successfully implemented in the year 2000. Forty-nine percent exceeded the budget and/or the time limit and finished a project with fewer features and functions than originally specified. While 23% of the projects failed and never made it to the end. (Standish, 2001). Hence, we think it would be wise to focus on implementation problems when we want to inform practitioners.

The third problem relates to the distinction between the developmental and the implementation/termination period. Van de Ven et al. (1999) claim that in the developmental period the changes to an innovation are made for the sake of the innovation itself. Whereas in the implementation/termination changes are for the sake of the organization's specific needs. However, in contemporary development methods of software and other applications of ICTs such a distinction no longer holds as end users frequently are involved in the developmental process. In fact, nowadays it is common to accept user participation in information system design (see for instance Wigand, Picot, & Reichwald, 1997; Prahalad & Ramaswamy, 2000; Flak, Moe, & Sæbø, 2003).

The fourth and final point of criticism relates to the moment of adoption. It turns out to be difficult to pinpoint the moment of adoption in the pathway. According to the figure itself (Van de Ven et al., 1999, p. 25), and its immediate explanation following that figure, adoption takes place in the implementation/termination period (Van de Ven et al., 1999, p. 53). However, another explanation of the pathway mentions a different moment. That particular explanation

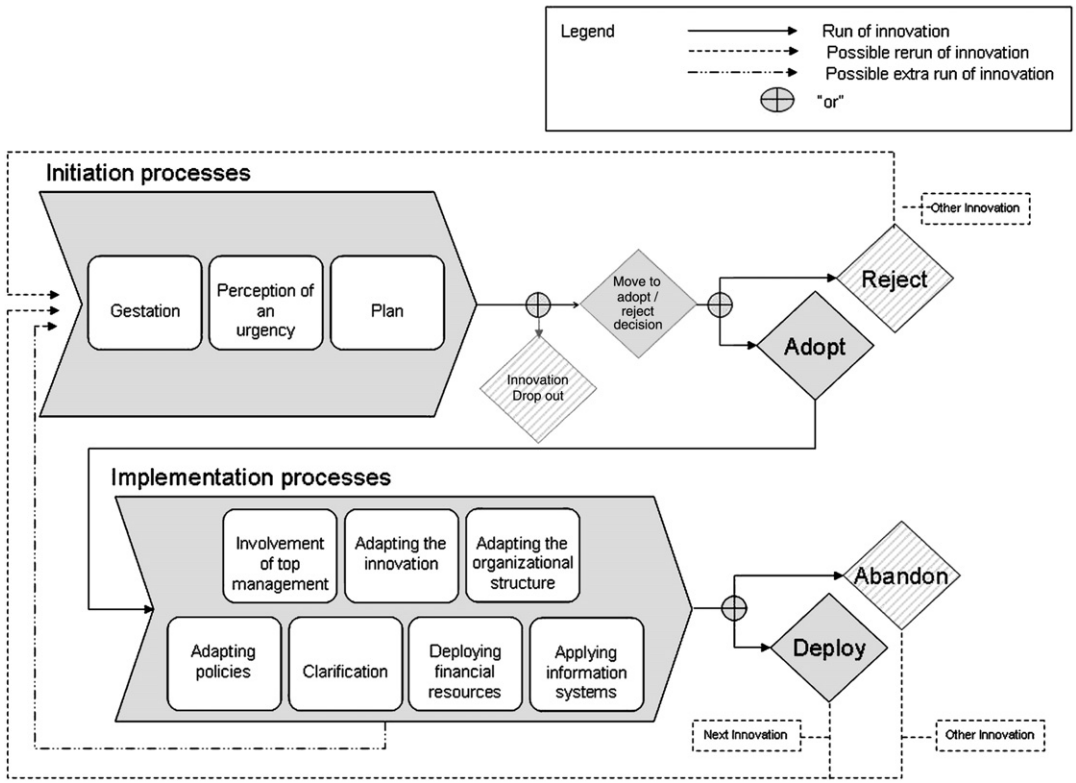

Fig. 2. A model of the initiation and implementation of innovations related to electronic government services in contemporary government organizations.

says that adoption takes place throughout the developmental period (Van de Ven et al., 1999, p. 54).

6. A new model

At first sight, the MIRP Innovation Pathway seemed to be an appropriate model to map the improvement of electronic government services. But the problems described above inhibit a straightforward use of it. Therefore, we have designed a new model that may be inspired by the MIRP Innovation Pathway – four out of ten innovation processes distinguished are similar (the first four of our model) – but actually has become a new model (see Fig. 2).

In this model, we try to solve the four basic problems discussed.

1. The moment of adoption: The first basic change in our model is the determination of the moment of adoption. In our model adoption (and its counterpart rejection) acts as a demarcation between the initiation processes and the implementation processes

2. Merging development and implementation: The second change is to erase the distinction between the developmental period and the implementation period as they are merged in contemporary application development methodology.
3. Non-linearity: The third and most fundamental change is to map events without the assumption of linearity. The nature of our model is thoroughly non-linear. It takes account of feedbacks (rerun of innovation) and feeds forward (overlap of stages; see also below) and it assumes probability in stead of determinism in the following sequence of innovation stages:

   The initiation processes set the stage for an organization to start an innovation. The initiation processes contribute to the decision to either adopt or reject an innovation. Rejection may lead to a possible rerun of innovation. Of course, some innovations never make it to an adopt/reject moment.

   The model reflects that the adopt-reject decision concludes the initiation processes and that it is followed by a number of implementation processes. However, it is stressed that the adopt-reject decision does not necessarily take a short and isolated moment in time. On the contrary, it may take a very long time, perhaps even years, and many singular events before an organization finally has "made up its mind," hence the expression that the initiation processes contribute to the decision. Moreover, there is also a very high probability that the initiation processes, the adopt-reject decision moment, and the implementation processes overlap each other, or that during the implementation process the innovation (partly) runs the initiation process again as doubts occur whether or not it was wise to adopt the innovation.

   During the implementation processes concentrated efforts are made to transform an innovative idea, object, or practice into a fixed routine. The proposed implementation processes do not reflect a specific order. It is also possible that some of the proposed implementation processes do not occur at all. Future research has to show to what extent the presence and absence of specific implementation processes support or hamper the eventual transformation of the innovation into reality.

   The model reflects that implementation terminates after the innovation is either deployed or abandoned. However, both events do not imply that the innovation processes of an organization come to a standstill. Abandoning an innovation may very well result in running another, perhaps more promising innovation. And a deployed innovation can surely be succeeded by the next innovation, as it is often the case in long-term, multi-staged innovation programs.

   Mentioning all these examples of non-linearity raises the question whether it still makes sense to make distinctions of phases and arrange them in a model with a particular order. We think it does. We hope to show that all phases described are real and observable events of innovation processes. However, we emphasize that the remaining linear logic in our model reflects a natural order of acts of innovation that is probable, not necessary.
4. Emphasizing implementation: The final change is to pay much more attention to the implementation period of innovations, as compared to the initiation period. As mentioned above, for innovations in ICTs most difficulties occur in the implementation period.

6.1. Processes of innovation

Below each process of innovation is captured in an operational definition. With every process indicators for resistance and support are proposed. Table 1 summarizes all the indicators and explains how and where the proposed indicators can be observed; they are the so-called indices. The indicators are described in a binary way for purposes of clarity. In subsequent empirical research these binary indicators should be transformed into scales that match the specifics of particular innovations of e-government applications.

6.1.1. Gestation

Van de Ven and other scholars, notably Rogers (1995), have emphasized that innovations do not start with a single incident or inspiration. Instead, all innovations they examined have begun with a so-called "gestation" period that often lasted three or more years. During this process an organization encounters both multiple, seemingly unplanned events that trigger the recognition of the need for change, and multiple, unplanned events that create awareness of the feasibility of an innovation. But the explicit coupling of the problem (or need for change) and the solution (the innovation) has yet to me made.

The operational definition of the process of gestation in our model applied to e-government is "The process in which multiple, seemingly unplanned events occur that cause a government to recognize the need for change on the one hand and that creates awareness of the feasibility of an ICT innovation or an ICT-related innovation on the other hand. However, the explicit coupling of "having to improve government services" and "using ICT as a solution" is yet to me made."

Van de Ven et al. (1999) have observed that organizations recognize or become aware of an innovation in a process of gestation. They also found that gestation ultimately initiates efforts (such as plans and actions) to launch an innovation. Following their findings two indicators can be derived. As the gestation process triggers efforts to launch an innovation, the gestation process helps an innovation to make progress. So the presence of gestation is an indicator of support. But if there is no gestation process, an innovation is not recognized. If it is not recognized, an innovation will not be launched. In conclusion, the absence of gestation is an indicator of resistance to change that would be able to solve the problems of the organization. It is not (yet) an indicator of resistance to innovations of e-government.

6.1.2. Perception of an urgency

As mentioned above, the gestation process covers the recognition of the need for change on the one hand and the awareness of the feasibility of innovations on the other hand. But many innovative ideas are not accepted until some form of "shock" occurs that clearly signals that to overcome certain problems, acting on the innovation becomes inevitable. Of course, these signals may be orchestrated and part of some sort of organizational negotiation. However, although Van de Ven et al. (1999) emphasize that shocks are not necessarily negative, in our opinion the expression "shock" carries a negative association. For that reason, we prefer to rephrase it to a much more neutral term: "perception of an urgency." We define "perception of an urgency" as, "The moment an organization perceives a gap between the expected

performance of government services and the actual performance of them and that there is a necessity or an opportunity to close this gap by means of ICTs."

Following our definition, two indicators are proposed. The first deals with the presence of the perception of an urgency. Van de Ven et al. (1999) argue that organizations only accept a specific innovation if there is some kind of a shock. It accelerates the innovation process. Therefore, the organizational perception of an urgency is handled as an organizational indicator of support to an innovation. The second indicator relates to the opposite: the absence of the organizational perception of an urgency. If the first is a stimulus for organizations to engage in specific action, then the absence of a "perception of an urgency" offers no stimulus. If there is none, then probably organizations do not intend to adopt an innovation. As such, the absence of a stimulus is provisionally handled as a (weak) indicator of organizational resistance to innovation. It is weak because it is negatively framed (absence). There might be other reasons why a shock does not occur or is not perceived by the organization.

6.1.3. Plan

Usually the end of the initiation period is signaled by the offer of plans and budgets that are submitted to top managers or investors. In our model, the operational definition of a plan applied to e-government is "The description of a set of activities with the intention to improve electronic government services. This includes a description of the financial, and/or human and other resources that are necessary to perform the intended activities and the submission of these descriptions to top management with the attention to have them approved."

If a plan is approved, the resources have to obtained that are needed to launch implementation activities. Van de Ven et al. (1999) argue that resources are needed to launch "development" activities. Here the development and implementation processes are merged, as we have explained above. Therefore, development activities are rephrased as implementation activities. From such a point of view, the approval of a plan is a precondition for the start of implementation activities. If a plan is approved it helps an innovation to make progress. Therefore, the approval of a plan is an indicator of support. But if a plan is rejected, implementation activities cannot be launched because there are no available resources. This obviously obstructs implementation activities. As such, if a plan is rejected this is a strong indicator of resistance. It is strong because it is a "positive" and explicit organizational decision to resist a proposed innovation.

This part of the initiation process more and more requires negotiation between potentially participating government departments as e-government innovations are increasingly initiated by more than one single department. Such activities are highly visible, they tend to be framed by political and policy considerations and they require negotiation across units and entities prior to planning (Kingdon, 1995). The result of these negotiations may either lead to an approval or a rejection of the original plan. However, a substantial change or adaptation of the plan is the most likely outcome. Afterwards, negotiations may reappear in the implementation phase when the actual implications of the plan for individual governments departments become visible, possibly leading to changes within several implementation processes or even an extra run of innovation (see also Fig. 2).

Below the implementation processes are explained. We suggest to distinguish seven processes in the implementation process as a whole. The first process in our model is similar to the one contained in the MIRP Innovation Pathway.

6.1.4. Top management involvement

Top managers are frequently involved throughout the implementation process. Again, Van de Ven et al. (1999) mention that top management involvement occurs during the "development" processes. For reasons explained above, "development" processes are rephrased as "implementation" processes. Top management involvement can be defined as "The participation of top management in an e-government project by actions and decisions that directly influence the project's advancement."

Van de Ven et al. (1999) found no cases of significant innovation problems that were not solved by the intervention of top management. Similar findings of Standish (2001) underline that when top management is not involved, ICT projects are unsuccessful or bound to fail. Therefore, the proposition can be put forward that if top management is not involved, implementation problems remain unsolved. Unsolved problems delay or obstruct the implementation process. For that reason, the absence of top management involvement is proposed as an indicator of organizational resistance. Conversely, the presence of top management involvement is proposed as an indicator of organizational support.

The following six processes of implementation are not articulated in the MIRP Innovation Pathway, though some of the processes below are referred to in the explanations that go with the MIRP Innovation Pathway.

6.1.5. Adaptation of the innovation

During the implementation process innovations are adapted to the needs of the local situation. (Rogers, 1995; Van de Ven et al., 1999). In relation to e-government innovations, typical needs of the local situation are those of the users in government departments, first of all. Additionally, the needs of the consumers of these services, the citizens, and businesses can be taken into account. User participation for all these groups during implementation is an important channel for those needs. By means of user participation, users can express their needs toward the developers of ICT-related systems enabling them to adapt the innovation (Bouwman et al., 2002). The operational definition of innovation adaptation in here is "The modification of electronic government services, that are about to be implemented, to the needs of future users, both government employees and citizens or businesses."

Adaptation of an innovation to the needs of the future user or groups of users is an important step in the development of information systems (Gallivan & Keil, 2003). Users and organizations who participate in the development of an information system are likely to believe that "the new system is good, important and (…) relevant" because needs are identified and anticipated while the system is designed (Barki & Hartwick, 1994, p. 75). Conversely, implementation is likely to become a problem when the needs of the users and organizations concerned are not taken account of. The implementation of the "British Government Data Network" and the "US Federal Telecommunications System for the year 2000" both failed because insufficient attention was paid to user needs (Wyatt, 2000). In contrast, the US Department of Energy organized user participation in the development of an e-Government application. This turned out to be one of the key factors to success (Whitson & Davis, 2000).

In conclusion, if there is no adaptation of an e-government innovation, that is about to be implemented, to the needs of future users chances are big that they end up with applications

that are not sufficiently used by them. Obviously, this hinders the acceptance and the deployment of the innovation. For that reason, adaptation of an innovation to user (both users within government departments and consumers of e-government services, i.e., citizens and businesses) requirements is an indicator of organizational support to an innovation and the absence of such adaptation is an indicator of organizational resistance.

6.1.6. Adaptation of the organizational structure

In many cases, the implementation of an innovation also involves an adaptation of the organizational structure (Damanpour, 1991; Rogers, 1995; Cheng & Van de Ven, 1996; Van de Ven et al., 1999; Ebbers, 2002, 2004). Based on Mintzberg's definition of organizational structure (1983) in here adaptation of the organizational structure is defined as "A number of explicit changes in the task division and task co-ordination of organizations caused by the implementation of electronic government services." Variables that constitute organization structures are centralization, standardization, division (the degree to which activities are divided up into smaller activities), delegation, participation, and unity-of-command (Hill, Fehlbaum, & Ulrich, 1994).

What goes for innovations equally applies to organization structures: the more they are adapted to the innovation, the more likely the implementation of this innovation will succeed (Damanpour, 1991; Rogers, 1995; Van de Ven et al., 1999). Therefore, adaptation of organization structures to the innovation is proposed as an indicator for organizational support and the absence of this adaptation is put forward as an indicator of organizational resistance.

6.1.7. Adapting policy

Most often innovations of e-government require the adaptation of policy, for instance regulation, procedures, or legislation. This is a special condition of IT innovation in government. Legislation for instances imposes a strict framework for all government activities and deploying electronic services has a direct impact on this framework (Sonntag & Wimmer, 2003). For example, the combination of formerly separated government access points across different branches of government into unitary access points of electronic services has many legal implications. Questions such as who is responsible for the new services, who checks the messages and who has the legal right to serve official documents that need to be answered. Several cases of adaptations of legislation before and after the implementation of electronic government services can be observed. In Austria, for instance, several new laws had to be passed in order to manage these services (Sonntag & Wimmer, 2003). In Germany, approximately 3.700 (articles of) laws have to be adapted to the Internet (Hoegler & Schuster, 2002). For this reason, the adaptation of policy is proposed as a special phase in the e-government innovation process. The operational definition of the adaptation of policy is "The modification of the policy framework to enable the improvement of electronic government services."

Empirical research indicates that when policies are not adapted to the new features of electronic services, it infringes the progress of e-government. In the Netherlands, for example, local governments were not allowed to deliver services through the Internet as there was no legal basis for digital signatures (Hoogwout, 2003). In Germany, municipalities mentioned the existing uncertainties with regard to the legal aspects of a digital signature as one of the major barriers to deploy electronic government services (PriceWaterhouseCoopers, 2000). In

conclusion, in our model we assume that that if policy is adapted to the new features of electronic government services this is an indicator of support. However, when policy is not adapted in cases requiring such adaptation, we consider this to be an indicator of resistance.

6.1.8. Clarification

Implementation includes the clarification of the innovation to the organization (Rogers, 1995). In this phase of the innovation process questions such as "How does it work?," "What does it do?," "Who in the organization will be affected by it?," and "Will it affect me?" have to be answered. Familiar ways to answer these questions are process facilitation (Van de Ven et al., 1999), user education and personnel training (Kim & Lee, 1991), or introductions and detailed guidelines (Hoegler & Schuster, 2002). We define clarification as helping government personnel to understand the usage and effects of the improved electronic government services.

According to scholars such as Van de Ven et al. (1999) and Hooff van den (1997), the implementation of an innovation in organizations is improved with clarification. Conversely, when no means of clarification are used this will hinder the implementation of an innovation. This is also true for e-government. Ke and Wei (2004) for example see promoting the understanding of e-Government among agencies in Singapore and clear guidelines for those agencies to implement e-government initiatives as an important contributor to the Singaporean e-Government success. In Western Australia, on the other hand, not all government departments gave priority to clarification in the implementation of a Legal Aid Web application. Burn and Robins (2003) found that a proper introduction would have served better. In conclusion, we suggest the presence of clarification as an indicator for support and the absence of clarification as an indicator or resistance.

6.1.9. Deploying financial resources

A very obvious and therefore perhaps easily ignored innovation phase is the allocation of the required financial resources. If innovations are to be implemented, financial resources have to be deployed and kept available (Van de Ven et al., 1999).

Deploying financial resources is defined as "The allocation and spending of the amount of money required to support activities and obtain the necessary human and other resources such as hardware and software licenses."

In the Netherlands, for example, central government subsidized three major pilot projects in order to get e-government innovations on track, (Hoogwout, 2003). In Germany, the BundOnline2005 program invested a considerable amount of money into the improvement of electronic government services that were deemed to be necessary (Klumpp, 2002).

Obviously, the implementation of an innovation runs as long as there are financial resources. When financial resources are not allocated or when they run out before the implementation is successfully deployed, this means that the implementation process is abandoned (Van de Ven et al., 1999). This certainly goes for e-government. In various parts of the world e-government progress seems to slow down because of budget limitations (West, 2004). In the United States in the 1990s, up to the Congress' decision to improve IT funding in 2000, many e-government programs ran into great difficulties because they had little or no financial resources (O'Hara et al., 2000; Relyea, 2002). In conclusion, the allocation of

Table 1
A summary of indicators of support and resistance to the improvement of government services via the use of ICTs

No.	Innovation phase	Indicator of support	Indicator of resistance	Indices (+=support, −=resistance, S=type of source, E=examples)
Initiation processes				
1	Gestation	Presence of gestation	Absence of gestation	+ On the one hand: the presence of statements pointing at problems related to governments services or already existing e-government services. On the other hand, and not related to the expressions above: the presence of statements pointing at ICTs, new types of e-government services, new technologies or standards that enable new types of e-government services, etc. − The absence of such expressions. S Official government documents, conference calls, policy papers, green papers, white papers, (written) speeches, government Web sites, interviews with top managers of government organizations, and observations of all kinds of relevant organizational social events, such as meetings and conversations amongst civil servants. E All government documents on "Good Governance" or "New Public Management" and all government research or attended conferences on "Developments in ICT" that have appeared prior to the 1990s, the decade explicitly coupling the problem of inadequate government services to the solution of applying ICT, can be treated as indicators of the presence of gestation of innovation in the field of e-government.
2	Perception of an urgency	Presence of the perception of urgency	Absence of the perception of an urgency	+ Calls for "alarm" that mention problems or opportunities and at the same time express that these problems or opportunities can or are to be taken care of by adopting e-government, or types of e-government services, new technologies, and standards that enable new types of e-government services, etc. − The absence of such calls for "alarm" in all sources. S Official government documents, conference calls, IT systems-related calls for tender, policy papers, green papers, white papers, (written) speeches, government Web sites, interviews with top managers of government organizations, and observations of all kinds of relevant organizational social events, such as meetings and conversations among civil servants.

				E	French prime minister Jospin addressing the need to modernize government services via ICT (Kampen et al., 2003) 1999 white paper called "Modernising Government" in which UK prime minister Blair and UK minister of the Cabinet Office Cunningham stressed that there is a need to improve services via what they call "modern technology" (UK Prime Minister et al., 1999).
3	Plan	Approval of e-government projects or programs	Rejection of e-government projects or programs	+	The decision makers' approval of the set of activities or the financial and/or human and other resources that are necessary to perform the intended e-government-related implementation activities.
				−	The absence of the decision makers' investment (which is treated as a weak indicator) or disapproval (which is treated as a strong indicator) of the set of activities or the financial and/or human and other resources that are necessary to perform the intended e-government-related implementation activities.
				S	(project and program) plans, interviews with project managers, resource managers, and top management, minutes of decisive meetings on projects and programs.
				E	Canadian Government On-Line initiative (available at http://www.gol-ged.gc.ca). Hong Kong's Digital 21 IT Strategy (available at http://www.info.gov.hk/digital21). Germany's Bund Online (available at http://www.staat-modern.de). Unfortunately, e-government Web sites do not list rejected plans. Rejected plans could be revealed by investigations of organizations from the inside. For instance by interviewing project managers, resource managers and top management, or by examining minutes of decisive meetings on e-government plans.
Implementation processes					
4	Top management involvement	Presence of top management involvement	Absence of top management involvement	+	Projects and programs reporting to or monitored by top management (which is treated as a weak indicator) or that are positively responded to by top management (which is treated as a strong indicator).
				−	Projects and programs not reporting to or monitored by top management (which is treated as a weak indicator) or that are negatively responded to by top management (which is treated as a strong indicator).

(continued on next page)

Table 1 (*continued*)

No.	Innovation phase	Indicator of support	Indicator of resistance	Indices (+=support, −=resistance, S=type of source, E=examples)
				S (project and program) reports, research of fellow scholars, interviews with project managers, and top management, minutes of decisive meetings on projects and programs, and observations of all kinds of relevant organizational social events, such as project or program manager meetings and conversations amongst top managers. E Responding to a so-called "chaotic mess" in e-government initiatives the Thai government intervened in 1996 by framing a national IT master plan that had to cope with the many problems caused by these initiatives that were initiated halfway the 1990s (Varavithya & Esichaikul, 2003). The implementation of online services at the Western Australian Legal Aid Office. The decision of the Legal Aid Office's top management to treat e-government as a strategic goal was generally endorsed as a key success factor in bringing its services online. (Burn & Robins, 2003).
5	Adaptation of the innovation	Presence of adaptation of the innovation	Absence of adaptation of the innovation	+ Alterations of e-government system designs based on the needs, demands and constraint of: future users; systems that the e-government service is to be integrated with; and organizational processes that the e-government service has to support. − The absence of such alterations. S Program and project plans and reports, research of fellow scholars, especially the paragraphs on the validation of systems and applications, user panels, user questionnaires, participation sessions, etc., and of course the actual reports of user interviews and sessions, interviews with project managers, and observations of all kinds of relevant organizational social events, such as project or program meetings and conversations amongst project/program team members. E The US Department of Energy has built a Web-based information system after the assessment of the needs of future users, i.e., scientists, engineers, and program and project managers (Whitson & Davis, 2000). The Australian Tax Office that also organized user participation in the development of its information systems (Segall et al., 1994).

6	Adaptation of the organizational structure	Presence of adaptation of the organizational structure	Absence of adaptation of the organizational structure	+ Changes that occur in the degree of delegation, unity-of-command, centralization, participation, standardization, and division (i.e., the degree to which activities are divided in smaller activities). − The absence of such changes. S Interviews with project managers and unit managers, research of fellow scholars, information system designs, comparisons between old and future information system designs. E The Brazilian Justice Department linked its information systems directly to the Central Bank system. This bypass reduced processing time from an average of 5 working days to a maximum of 24 hours (Joia, 2003). Due to the shift of filing requests from the Central Bank to singular financial institutions the interdependence of all parties concerned, the steps in the working process and the routines have changed. Because the judges are able to file requests electronically with singular financial institutions, they no longer depend on individual employees at the Central Bank. This implies a change in the organization structure, as both centralization (interdependence of tasks) and standardization (a change in the dependence of judges on the strict routines of previous task divisions) have changed with the implementation of the system.
7	Adaptation of policy	Presence of adaptation of policy	Absence of adaptation of policy	+ Policy (to be) adapted in relation to e-government. − No policy (to be) adapted in relation to e-government. S Passed bills or legislation in progress, often made available on government Web sites. E Examples of Web sites that register government legislation are: http://www.bundesregierung.de http://www.hmso.gov.uk
8	Clarification	Presence of clarification	Absence of clarification	+ Explanations intending to make government personnel understand usage and effects of an e-government service that is to be implemented. − The absence of such explanations. S E-government Web sites, guidelines, introductions, training courses and curricula, intranet, demonstrations. E Examples of Web sites containing explanations are: http://www.cabinetoffice.gov.uk/e-government/about/ http://www.e-government.govt.nz/about/index.asp

(continued on next page)

Table 1 (*continued*)

No.	Innovation phase	Indicator of support	Indicator of resistance	Indices (+=support, −=resistance, S=type of source, E=examples)
9	Deploying financial resources	Sufficient resources are available	Insufficient resources are available	+ E-government projects or programs announcing a balanced account (which is treated as a weak indicator) or a financial surplus (which is treated as a strong indicator). − E-government projects or programs announcing a financial deficit. S Financial paragraphs and reports, interviews with project managers and resource controllers. Examples of financial reports on e-government projects/programs are: E-Government Progress Report 2005 of the US Department of energy: http://cio.doe.gov/Documents/E-Government%20Progress%20Report%202005.pdf http://www.ssc.govt.nz/display/document.asp?docid=4528&pageno=12
10	Deploying information systems	Working on the interoperability of information systems	Not working on the interoperability of information systems	+ The announcement of activities and measures that improve the interoperability of information systems. − The absence of such announcements. S Project and program plans, IT systems related calls for tender, IT policy papers, e-government Web sites, interviews with project managers. E Examples of Web sites announcing improvement of interoperability are: http://www.egypt.gov.eg/english/documents/default.asp http://www.e-government.govt.nz/

sufficient financial resources is an indicator of support and insufficient financial resources or the absence of financial resources are an indicator of resistance.

6.1.10. Deploying information systems

Wieringa et al. (2003) divide the total sum of information systems into three different service layers; an application systems layer, an implementation platform layer, and a physical network layer. The application systems layer supports or fully performs parts of the services and business processes. The implementation platform layer supports the application systems layer. It is a set of software that assists in running the application software and ranges from operating systems, middleware, and network software to database management software. The physical network layer contains the physical resources that support the implementation platform layer and the application systems layer. As mentioned above, the application systems layer supports or performs parts of the services. Consequently, the improvement of electronic government services requires that a particular application is added to or changed within the application systems layer. From time to time, as it supports the application layer, this causes changes within the implementation platform layer too. And occasionally, changes to the physical network structure are also required.

We define deploying information systems as "Adding a new electronic government service application to the application systems layer, the implementation platform layer and/or the physical network layer or changing an existing electronic government service application within these information system layers."

Nowadays many organizations, particularly government departments, have so-called legacy information systems (Tapscott and Caston, 1993) Legacy information systems have been inherited from languages, platforms, and techniques contained in older generations of hardware and software (search390.com). Many legacy information systems are not or not sufficiently interoperable. Which means that applications in the application systems layer are not able to work with each other or with the supporting implementation and/or network layer. As a result, it becomes harder to add a new e-government service application to existing information systems. This creates great obstacles to the implementation of e-government services (Tapscott and Caston, 1993; United States General Accounting Office, 2000; Pappa & Makropoulos, 2004). Information systems can regain or establish interoperability by the adoption of open standards, for example, and by the use of a "broker" of services that is able to convert one product's interface into another (Pappa & Makropoulos, 2004). Consequently, as non-interoperable information systems are obstacles to the addition of new e-government services to existing information services, we want to propose attempts to realize interoperable information systems as indicators of organizational support whereas not working on interoperability is proposed as an indicator of organizational resistance as a necessary condition of the deployment of electronic government services is not fulfilled.

The table below (Table 1) summarizes all the indicators and explains how they can be detected in particular types of sources; i.e., the indices. Basically, we will consult three different categories of sources: (electronic) documents, interviews, and observations. The indicators are offered in binary form (resistance or support) for purposes of clarity. Once focus of empirical research moves to particular e-government applications or innovations the indicators will have to be turned into scales (more or less resistance and support).

7. Conclusions and implications for empirical research

In this article, we have tried to demonstrate that a particular innovation model grasping the whole process of adoption and implementation of electronic government services is able to identify a long list of indicators of resistance and support to e-government at the organizational level. The model we looked for should not be limited to explicit signs of resistance and support in the implementation process, but it should already start with the first phase of initiation: the gestation process. Defined in this way, the whole innovation process can last many years, in some cases even more than a decade.

The innovation model we have looked for should also be flexible enough to grasp non-linear processes of change that often occur in innovation processes in general and e-government innovation in particular. The most appropriate, all-embracing innovation model we could find, the MIRP Innovation Pathway model, appeared to be too linear and too much concentrated on the initiation and development periods, neglecting the implementation period. Moreover, development and implementation were rigorously separated while in fact they are increasingly integrated in real organizational life and actual development methods. Therefore, we had to design another model that is supposed to be thoroughly non-linear. Our model does contain a large number of subsequent ideal-typical phases but these do not suggest a determinate order as they allow for feedbacks and feed-forwards.

Subsequently, we have tried to derive a large number of indicators and indices of organizational resistance and support to electronic government services from an operational definition of each of the ten phases in the model. These indicators and indices can be validated and measured in empirical investigations of cases of complete innovations in e-government. Here they should be tested and refined. Two kinds of validation and testing are required.

In the first place, a large and diverse number of e-government projects of new electronic services in several countries with different traditions of government has to be compared with the proposed innovation model in order to find out whether the model encompasses all the relevant phases or processes; perhaps other phases or processes need to be included, or proposed ones have to be excluded. Future research will have to show whether or not the proposed model can encompass three different units of research. Namely, the e-government approach as a whole starting in the mid eighties. Second, new e-government strategies or very significant changes within the established set of e-government services such as the transformation from government oriented to citizen oriented services, often lasting 10 years. And finally, single e-government projects often lasting 1 to 3 years.

Secondly, all indicators will have to be validated. Cases of successfully and unsuccessfully implemented electronic government services need to be selected. The indices have to be translated from binary to scalable indices in order to match specific research situations, and the selected cases need to be analyzed to determine whether the indicators we have listed have played a significant role in failure or success. Moreover, the selected cases should also be analyzed for indicators that appear to be relevant for the case but that are not contained in the model we have proposed. In this way, indicators can be added until saturation sets in. And finally, as some indicators perhaps may be more significant than others, the relative significance of the indicators themselves should be estimated.

References

Accenture. (2004). *eGovernment leadership: High performance, maximum value*. Retrieved April 4, 2006, from http://www.accenture.com

Allen, P., Ramlogan, R., & Randles, S. (2002). Complex systems and the merger process. *Technology Analysis and Strategic Management*, *14*(3), 315−329.

Barki, H., & Hartwick, J. (1994). Measuring user participation, user involvement, and user attitude. *MIS Quarterly*, *18*(1), 59−83.

Bouwman, H., Dijk, J., Hooff, van den, B., Wijngaert, & van den, L. (2002). *ICT in organisaties, adoptie, implementatie, gebruik en effecten*. Amsterdam: Uitgeverij Boom.

Burn, J., & Robins, G. (2003). Moving towards e-government: A case study of organisational change processes. *Logistics Information Management*, *16*(1), 25−35.

Cheng, Y., & Van de Ven, A. H. (1996). Learning the innovation journey: Order out of chaos? *Organization Science*, *7*(6), 593−614.

Damanpour, F. (1991). Organizational innovation: A meta-analysis of effects of determinants and moderators. *The Academy of Management Journal*, *34*(3), 555−590.

Dooley, K. J. (1997). A complex adaptive systems model of organization change. *Nonlinear Dynamics, Psychology, and Life Sciences*, *1*(1), 69−97.

Chengalur-Smith, I., & Duchessi, P. (2000). Client-server implementation: Some management pointers. *IEEE Transactions On Engineering Management*, *47*(1), 127−145.

Ebbers, W.E. (2002). *Facing the Digital World, connecting a permanently changing Internet to rigid organizational structures*. Ph.D. dissertation, University of Twente.

Ebbers, W. E. (2004). Ambities en prestaties van een digitale Belastingdienst: Verwezenlijking oorspronkelijk 'elektronisch' ambitieniveau van de Belastingdienst nader bekeken. *Bestuurskunde*, *8*, 258−365.

Edquist, C., & Hommen, L. (1999). Systems of innovation: Theory and policy for the demand side. *Technology in Society*, *21*, 63−79.

Ettlie, J. E. (1983). Organisational policy and innovation among suppliers to the food processing sector. *Academy of Management Journal*, *26*, 113−129.

Flak, L. S., Moe, C. E., & Sæbø, Ø. (2003). On the evolution of E-Government: The user imperative. In R. Traunmüller (Ed.), *EGOV 2003, LNCS 2739* (pp. 139−142). Berlin: Springer.

Gallivan, M. J., & Keil, M. (2003). The user-developer communication process: A critical case study. *Information Systems Journal*, *13*, 37−68.

Gil-García, J. R., & Pardo, T. A. (2005). E-government success factors: Mapping practical tools to theoretical foundations. *Government Information Quarterly*, *22*, 187−216.

Hill, W., Fehlbaum, R., & Ulrich, P. (1994). *Organizationslehre* (Vols. 1 and 2, 5th ed.). Stuttgart: UTB.

Hoegler, T., & Schuster, T. (2002). Qua Vaids e-Government?—A trap between unsuitable technologies and deployment strategies. In R. Traunmüller & K. Lenk (Eds.), *EGOV 2002, LNCS 2456* (pp. 403−406). Berlin: Springer.

Hooff, van den, B. (1997). *Incorporating electronic mail, adoption, use and effects of electronic mail in organizations*. Ph.D. Dissertation, Amsterdam: Otto Cramwinckel Uitgever.

Hoogwout, M. (2003). Super pilots, subsidizing or self-organization: Stimulating e-government initiatives in Dutch local governments. In R. Traunmüller & K. Lenk (Eds.), *EGOV 2003, LNCS 2739* (pp. 85−90). Berlin: Springer.

Jelinek, M., & Schoonhoven, C. (1990). *The innovation marathon*. Cambridge: Basil Blackwell.

Joia, L. A. (2003). Key success factors for electronic inter-organizational co-operation between government agencies. In M. A. Wimmer (Ed.), *KMGov 2003, LNAI 2654* (pp. 76−81). Berlin: Springer.

Kampen, J. K., Janssen, D., Rotthier, S., & Snijkers, K. (2003). *De Praktijk Van EGovernment In Zeven Landen Van De OECD*. Brussels: Bestuurlijke Organisatie Vlaanderen.

Ke, W., & Wei, K. K. (2004). Successful e-government in Singapore. *Communications of the ACM*, *47*(6), 95−98.

Kim, S., & Lee, J. (1991). A Contingent analysis of the relationship between IS implementation strategies and IS success. *Information Processing and Management*, *27*(1), 111−128.

Kingdon, J. W. (1995). *Agendas, alternatives, and public policies*. New York: Harper Collins.
Klumpp, D. (2002). From Websites to e-Government in Germany. In R. Traunmüller & K. Lenk (Eds.), *EGOV 2002, LNCS 2456* (pp. 18−25). Berlin: Springer.
Landauer, T. K. (1996). *The trouble with computers: Usefulness, usability, and productivity*. Cambridge, MA: The MIT Press.
Lichtenstein, B. M. B. (2000). Emergence as a process of self-organizing: New assumptions and insights from the study of non-linear dynamic systems. *Journal of Organizational Change Management*, *13*(6), 526−544.
Mintzberg, H. (1983). *Structures in fives: Designing effective organizations*. New Yersey: Prentice-Hall.
O'Hara, C., & FCW Staff. The Big Payoff. In *Federal Computer Week*. Retrieved November 6, 2000, from http://www.fcw.com/article71988
Pappa, D., & Makropoulos, C. (2004). Designing a brokerage platform for the delivery of e-government services to the public. In M. A. Wimmer (Ed.), *KMGove 2004, LNAI 3035* (pp. 178−189). Berlin: Springer.
Petrovic, O. (2002). The immanent fields of tension associated with e-Government. In R. Traunmüller & K. Lenk (Eds.), *EGOV 2002, LNCS 2456* (pp. 187−190). Berlin: Spinger.
Pierce, J. L., & Delbecq, A. L. (1997). Organizational structures, individual attitudes and innovation. *The Academy of Management Review*, *2*(1), 22−37.
Prahalad, C. K., & Ramaswamy, V. (2000). Co-opting customer competence. *Harvard Business Review*, *78*(1), 79−87.
PriceWaterhouseCoopers. (2000). *Die Zukunft heißt E-Government: Deutschlands Städte auf dem Weg zur virtuellen Verwaltung*. PWC: Franktfurt am Main.
Quin, J. B. (1985). Managing innovation: Controlled chaos. *Harvard Business Review*, *63*(3), 73−85.
Relyea, H. C. (2002). E-Gov: Introduction and overview. *Government Information Quarterly*, *19*, 9−35.
Rogers, E. M. (1995). *Diffusion of innovations* (4th ed.). New York: The Free Press.
Schroeder, R. G., Van de Ven, A. H., Scudder, G. D., & Polley, D. (1989). The development of innovation ideas. In A. H. Van de Ven, H. L. Angle, & M. S. Pool (Eds.), *Research on the management of innovation: The Minnesota studies* (pp. 107−134). New York: Harper and Row.
Segall, P., Cebalo, M., Jolly, C., & Wilson, B. (1994). The modernisation of the Australian taxation office, issues in participatory design in large organizations. *Information Technology and People*, *7*(3), 19−36.
Sonntag, M., & Wimmer, M. (2003). Legal aspects of one-stop government: The case of applying for a building permission. In R. Traunmüller (Ed.), *EGOV 2003, LNCS 2739* (pp. 385−392). Berlin: Springer.
Standish, *Extreme Chaos*. Retrieved April 2001 from http://www.standishgroup.com/sample_research/index.php
Tapscott, D., & Caston, A. (1993). *Paradigm shift: The new promise of information technology*. New York: McGraw-Hill.
UK Prime Minister, & the UK Minister for the Cabinet Office. (1999). *Modernising government*. London: The Stationary Office.
United Nations. (2004). *UN global e-government readiness report, towards access for opportunity*. UN: New York.
United States General Accounting Office. (May 2000). *Electronic Government–Federal initiatives are evolving rapidly but they face significant challenges*. Retrievable at http://www.gao.gov: GAO/T-AIMD/GGD-00-179.
Van de Ven, A. H., Polley, D., Garud, R., & Venkataraman, S. (1999). *The innovation journey*. New York: Oxford University Press.
Varavithya, W., & Esichaikul, V. (2003). The development of electronic government: A case study. In R. Traunmüller (Ed.), *EGOV 2003, LNCS 2739* (pp. 464−467). Berlin: Springer.
West, D. M. (2004). *Global e-government 2004. Center for public policy*. Rhode Island: Brown University.
Whitson, T. L., & Davis, L. (2000). Best practice in electronic government: Comprehensive electronic information dissemination for science and technology. *Government Information Quarterly*, *18*, 79−91.
Wieringa, R. J., Blanken, H. M., Fokkinga, M. M., & Grefen, P. W. P. J. (2003). Aligning application architecture to the business context. In J. Eder & M. Missiko (Eds.), *CAiSE 2003, LNCS 2681* (pp. 209−225). Berlin: Springer.
Wigand, R., Picot, A., & Reichwald, R. (1997). *Information, organization and management, expanding markets and corporate boundaries*. Wiley: Chischester.

Wolfe, R. A. (1994). Organizational innovation: Review, critique and suggested research directions. *Journal of Management Studies*, *31*(3), 405−431.

Wyatt, S. (2000). ICT innovation in central government: Learning from the past. *International Journal of Innovation Management*, *4*(4), 391−417.

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