

December 2003

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Recommended Citation

Chircu, Alina and Lee, Daniel, "Understanding IT Investments in the Public Sector: The Case of E-Government" (2003). *AMCIS 2003 Proceedings*. 99.
<http://aisel.aisnet.org/amcis2003/99>

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UNDERSTANDING IT INVESTMENTS IN THE PUBLIC SECTOR: THE CASE OF E-GOVERNMENT

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Abstract

Prompted partly by the legislation of the Clinger-Cohen Act of 1996, public sector agencies are gradually adopting a more value-oriented approach for making IT investments. In order to comprehend this relatively new phenomenon in the public sector, we propose a conceptual framework that points out the types of value that matter in government IT investment decisions and explains what factors generate value in this context. Our framework suggests that three factors affect public sector IT investment decisions: the value of the IT solution at the initiator level (i.e. government agency), the value at the adopter level (i.e. taxpayers, lawmakers or other government agencies), and the IT risk. The IT value at each level, defined in both economic and political terms, is influenced by the political mission of the government agency. Our framework advocates that power-shifting process changes that accompany the IT investment increase both the IT initiator value (by streamlining its processes) and the IT adopter value (by enhancing their efficiency and control on the process), and decrease the associated IT risks. We test the framework with three case studies of investments in e-government solutions for grant application and processing. Our analysis shows that power-shifting process changes positively affect perceptions of value, reduce the associated IT risks and subsequently translate into IT investment decisions.

Keywords: Business value, economic value, e-government, IT investment, political value, process change, public sector, risk

Introduction

During the past several years, the advent of Internet technologies has started to significantly impact the way organizations think about and design their relationships with customers and partners. While organizations in the private sector have been at the forefront of the Internet revolution, public sector organizations are only now starting to understand the enormous benefits of leveraging Internet technologies to improve internal processes as well as interactions with external constituencies through electronic government applications. Electronic government, or *e-government* for short, can significantly enhance the ability of government agencies to exchange information and services with citizens, legislators, other agencies or businesses, and overcome some of the traditional obstacles of access to public service - distance, limited customer service hours, long lines, and language barriers.

Worldwide, there are now more than 500 Internet-related initiatives for the government sector (Al-Kibsi et al. 2001). In the U.S., public sector spending on e-government solutions is predicted to go from \$1.5 billion in 2000 to \$6.5 billion in 2005, being rivaled only by Internet spending for the financial sector (Momentum Research Group, 2000). While many federal, state and local government agencies are now moving towards providing online access to services and information, e-government initiatives are still in their infancy, with only 1% of all government interactions being conducted online (Ronen 2001; Gant and Gant 2002).

While in recent years there has been a stronger emphasis on the need to modernize public administrations and make government more business-like (Gant and Gant 2002), the biggest problem that the public sector faces currently is determining the real costs and benefits of e-government initiatives (Johnson 2002). Measuring the value of information technology (IT) investments, in

general, and e-government investments, in particular, is a relatively new concept in the public sector. Although a business case has long been an integral part of the IT investment process in private sector organizations, public sector entities are still in their infancy in the business value-oriented approach regarding their IT adoption decisions. The major proponent of documenting IT value in the public sector is the Clinger-Cohen Act, also known as Information Technology Reform Act and Federal Acquisition Reform Act (Raines 1997). This new legislation requires federal agencies to present all significant (i.e. above the certain monetary threshold) IT initiatives in a business case format in order to be approved for upcoming year's budget allocation.

We believe the relatively new approach to justifying government IT investments required by the Clinger-Cohen legislation is calling for a more value-oriented framework for the public sector. Because of their novelty and popularity, e-government initiatives provide a fruitful setting for analyzing how value is conceptualized and used to justify IT investments in this setting. In this paper, we propose a conceptual framework that points out the types of value that matter in government IT investment decisions, and explains what factors generate value in this context. While our framework builds on insights obtained from studies of IT investments in the private sector, it emphasizes the specific characteristics of IT investments in the public sector – such as justifying IT investments in both economic and political terms, from the perspective of multiple IT stakeholders that include not only the investing governmental agency but also taxpayers, legislators and other organizations that interact with it. We test this framework with three case studies of a statewide e-government initiative for grant applications, which provide support for our framework.

Theoretical Foundations and Conceptual Model

Justifying IT Investments in the Public Sector

The impetus for any IT investment is its potential to create value for the investing organization (Lucas 1999). Depending on the particular organization and sector where the IT is implemented, the IT potential value consists of a blend of tangible benefits (such as increased productivity or decreased costs) and intangible benefits (such as increased customer satisfaction or competitive advantage). Different types of IT investments are justified using different criteria, including competitive analysis, business cases, or executive instincts (Ross and Beath 2002). Researchers have also suggested that the IT investment decision can come from different levels within organizations, emphasizing the edge political justifications often have over technical and economic justifications for IT investments (Weill and Olson 1989).

While IT investment justification has been extensively studied for private sector organizations, the decision to invest in IT in public sector organizations is not yet very well understood. Public organizations are usually subject to more competing goals and have more legal and staffing restrictions than private firms (Guy 2000). For example, private organizations can achieve operational efficiencies by investing in IT that automates tasks and reduces headcount. However, public agencies have limited discretion on firing or reassigning employees to attain similar efficiencies from IT. Also, public organizations have more incentives to share information and develop systems that will benefit external entities and ensure public accountability and fair, equal access to government services, thus fulfilling their politically mandated mission. In contrast, private organizations are usually more concerned with investing in IT systems that will create competitive advantage (Rocheleau and Wu 2002). In the private sector, the organizations making the IT investment are also the ones expected to appropriate the most economic benefits of the investment. For example, in Electronic Data Interchange (EDI) implementations, the EDI initiator organization - usually a powerful buyer - benefits more than the IT adopters – the supplier organizations (Sriram et al. 2001). In public sector organizations there has been less emphasis on the economic value that IT delivers internally, and more emphasis on fulfilling political goals such as better collaboration between loosely coupled government entities and improved citizen access to public services (Dufner et al. 2002).

This suggests that public sector organizations are likely to view the potential value of the IT investment differently than private sector ones. *First*, public sector organizations will consider both the *economic value* and *political value* of making the IT investment. Economic investment justification centers on cost reductions and increased efficiency, while political justification involves increased public accountability, fairness, and equal access. The Clinger-Cohen Act (Raines 1997) underscores the duality of IT value in the public sector. Recognizing the importance of information technology for effective government, this relatively new legislation requires federal agencies to link IT investments to agency accomplishments. IT initiatives need to be justified in both financial terms (that show the IT economic cost-benefit analysis) and political terms (that show how IT can increase information accuracy, processing and dissemination, resulting in societal benefits – such as “an IT solution that allows for epidemic warnings to be processed faster and save human lives”).

Second, public sector organizations will take into account both the *IT initiator value* (i.e. the value IT creates internally for the IT investment initiator organization itself) and the *IT adopter value* (i.e. the value IT creates externally for the IT adopters, such as partner organizations or customers). In the public sector, the IT initiator is the government agency that makes the IT investment, and the IT adopters can be any of the agency's stakeholders, which include taxpayers, legislators, and other governmental entities that collaborate with the IT initiator. While in the private sector the IT investment value is usually shaped by strategic goals, in the public sector the IT investment value will be influenced by the *political mission* of the government agency, which defines how to allocate the budget to better respond to the needs of the government agency and its stakeholders. (See Figure 1.)

For example, according to our definitions above, a study of a Geographic Information System (**GIS**) implementation at the Illinois Department of Transportation indicates that the IT initiator level economic value includes cost savings due to less personnel and replacement of existing map preparation, and time savings due to ability to quickly visualize interrelationships of data and projects and respond to management queries. The IT adopter political value includes quicker and accurate communications with the legislature, regulatory agencies and the general public (Hall et al. 2001). In the case of Hong Kong's Electronic Service Delivery e-government initiative, the emphasis was put on delivering value to the ultimate IT adopters - i.e. to Hong Kong citizens (Poon 2001). This emphasis on external IT value is also evident in the efforts to implement state government web portals, which deliver value to IT adopters (i.e. taxpayers) through openness (one-stop shop for state government e-service), customization, usability, and transparency (enhanced levels of public trust and legitimacy) (Gant and Gant 2002). Understanding the value the IT system delivers to various internal and external stakeholders is extremely important, since an incomplete or non-existent value assessment can lead to IT implementation failure (Pardo and Scholl 2002). We note that while some of these value dimensions can be translated into economic terms (such as one-stop shopping and usability, which translate into shorter processing times and increased efficiency of government transactions from the citizen's viewpoint), others are clearly political dimensions (such as transparency).

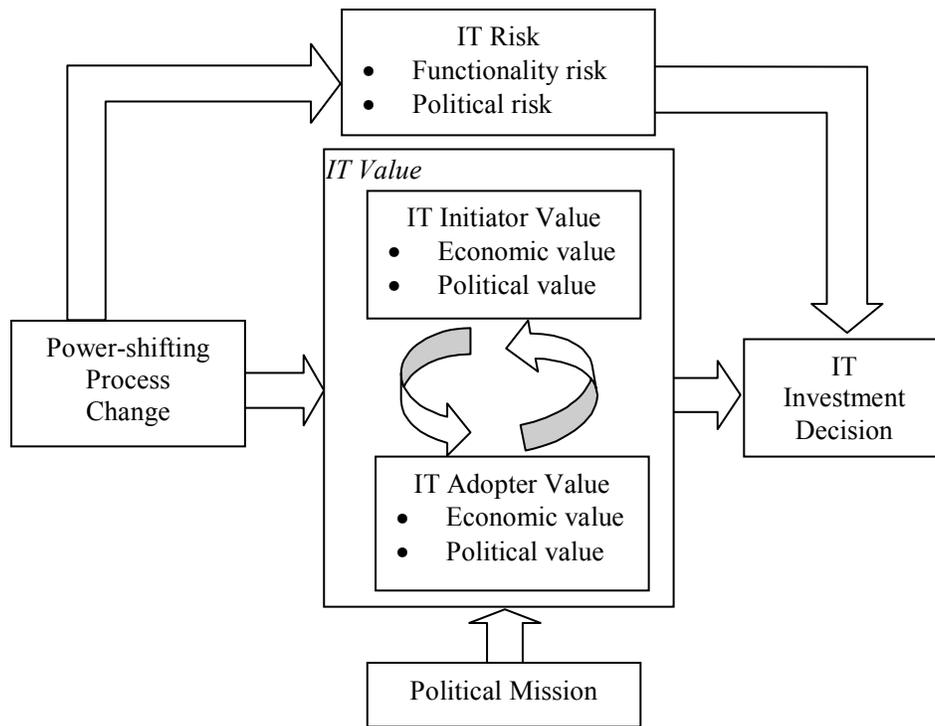


Figure 1. A Conceptual Model for IT Investment Decisions in the Public Sector

IT Investments, Process Change and Risk

A growing body of academic research and practitioner observations suggests that investments in IT alone are rarely successful. Instead, organizations need to make additional investments in process changes, human capital and training that will support the successful implementation and use of the IT solution (Chircu and Kauffman 2001). Many studies highlight the business transformation implications of a specific IT implementation. For example, Grover and Kettinger (2000) note that most successful business process change efforts would be difficult to achieve without IT enablers. Also, Soh and Markus (1995) suggest that the IT assets need to be accompanied by appropriate IT use, which usually implies process change, in order to ultimately enhance organizational performance.

IT-related process changes can reallocate the balance of power within and outside an organization. This *power-shifting process change* can have significant benefits, as in the case of empowering employees and relaxing the organizational control structures to take advantage of the cost savings of IT (Sia and Neo 1997). However, such changes can also reduce the potential value of the IT investment if disturbing the existing balance of power within the organization leads to user resistance (Markus 1983; Khan et al. 2001). This view echoes the process-oriented IT value approach where the emphasis is placed on the “middle” layer: how IT is “morphed” into the adopting organization actually dictates how much value will be realized. Overall, these previous studies seem to suggest that potential IT value is impacted, either positively or negatively, by power-shifting process change. In the public sector context, such IT-generated power-shifting process changes are more likely to have positive impacts, since public sector organizations are more focused on delivering value for all entities impacted by the IT system and may use the redistribution of power between IT initiator and IT adopters to achieve their political mission of collaboration, openness and fairness. (See Figure 1.)

IT-related process changes have the potential of generating significant IT risks. IT risks play an especially important role in the public sector, since government organizations tend to take less risks and be more watchful of their actions than private sector ones (Rocheleau and Wu 2002). In order to aid the IT value maximization, risk factors need to be categorized (Lyytinen et al. 1998), addressed at different stages of the IT investment process (Chircu and Kaufman 2001) and mitigated properly by matching the IT project risk profile with a proper risk management approach (Barki et al. 2001). Two types of risks, functionality risk and political risk, are prominent in today’s IT environment (Clemons et al. 1995). *Functionality risk* refers to the risk that the IT system will not meet user needs, while *political risk* refers to the risk of the system will not be completed or used because of user resistance or loss of commitment. The process change that goes along with the IT investment has two conflicting effects on risk. If the change is competence destroying, it is likely to be resisted, thus increasing political risk. However, such change will also ensure the IT system supports the organization’s optimal new mission, thus reducing functionality risk (Clemons et al. 1995). Other studies argue that political considerations significantly impact IT investment decisions (Weill and Olson 1989; Markus 1983). The power shift implied in the IT system design can both encourage and discourage user resistance (Markus 1983). Streamlined processes decrease unnecessary complexity and functionality risk. Political risk can also be reduced when users are involved in the IT implementation, including in the process change decisions, so that they are more likely to take ownership of the IT initiative. These previous studies suggest that process change impacts the level of IT risk, which in turn affects the IT investment decision. (See Figure 1.)

Our analysis of the existing research on IT investments in the private and public sectors provides support for the new conceptual model for IT investment in the public sector outlined in Figure 1. We propose that three main factors affect the IT investment decision for government organizations: the value of the IT solution at the initiator level (government agency), the value of the IT solution at the adopter level (taxpayers, lawmakers or other government agencies), and the IT risk. The political mission of the government agency impacts how value is defined from both an economic and political standpoint. We propose that government agencies will be more inclined to invest in IT when the risks are low and the value – either at the initiator or adopter level - is significant. Our framework posits that the impact of these factors is further enhanced when power-shifting process changes take place in the government organization. Unlike in private organizations, power-shifting process changes (e.g. shifting some process responsibilities from the IT initiator to the IT adopter) in public organizations is a way of fulfilling the organization’s political mission, and is thus more likely to have more support and generate positive results. Accordingly, our framework advocates that power-shifting changes increase both the IT initiator value (by streamlining its processes) and the IT adopters’ value (by enhancing their efficiency and control on the process), and decrease the associated IT risks.

Methodology and Data

We test our new conceptual framework in the context of e-government IT investments for electronic grants, or *e-grants*, application and processing, in a large southern U.S. state that processes more than \$18 billion in federal and other grants annually.

The state allocates the funds to more than 40 state agencies as grants, cooperative agreements, loans, loan guarantees, scholarships, and other forms of assistance in areas such as health, social services, law enforcement, agriculture, environment and natural resources, housing, community and rural and regional development, economic development, education, and training. The grant applicants comprise other state agencies, local governments and regional planning commissions, housing authorities, and private, non-profit organizations including school districts and community organizations.

The agencies' grant application processes are similar. First, the state agency issues a request for proposals for each of the grant programs it administers. Grant applicants must then fill out and submit the application to the state agency, and the application must be accepted for review by the corresponding state agency. The grant review process varies significantly among different agencies. For example, some agencies refuse to consider incomplete applications while others allow an applicant to revise an incomplete application and re-submit it. After the applications are accepted, they are reviewed by agency staff and/or external reviewers appointed by the agency. The successful applicants are then notified and the funds are disbursed. This paper-based grant application process is time-consuming and inefficient, full of data errors and inconsistencies. An e-grant system can significantly reduce the application and processing time and errors by allowing agencies to automatically receive online applications, verify their correctness and completeness, provide application status information, and transfer funds once the application is approved.

Each individual agency in the state is able to make its own decision regarding the implementation of an e-grant system. At the time this study was conducted, only some agencies made decisions to invest in e-grants solutions. Our intention is to explain why the decision to invest or not was made. Our analysis emphasizes a previously under-explored aspect of the IT investment decision – the way power-shifting process change affects perceptions of value and risk, and subsequently IT investment decisions. This analysis is exploratory in nature, and therefore a case study analysis is appropriate (Yin 1984). For our analysis, we selected three state agencies that showcase polar types of the IT investment decisions (Eisenhardt 1989) (i.e. invest/do not invest in an e-grants solution) and represent a diversity of funding areas (education, arts and health) and agency sizes (small and large, per state's classification). According to the state's Office of the Governor, these agencies are also a fair representation of the more than 40 state agencies that provide grant funding. (See Table 1.)

Table 1. Description of Case Study Sample

Agency (IT Initiator)	Size	Number of Grant Programs	Domain	Applicants (IT Adopters)	e-Grants IT Investment Decision
Education Agency (EA)	Large	1 (non-competitive funds) 120 (competitive funds)	Education	Local school districts	Yes
Arts Agency (AA)	Small	24	Arts	City and local governments, art groups	Yes
Health Agency (HA)	Large	200	Health	Health research institutions, health agencies	No

Our data collection and interpretation methods minimize perspective bias by employing multiple researchers and separating data collection and data analysis, and provide an opportunity for triangulation by integrating both primary and secondary data sources (Yin 1984; Eisenhardt 1989). The case study data was collected by two independent teams of five MBA students each, under the supervision of the paper's first author. The data collection effort included face-to-face and phone interviews with multiple decision makers from each of the studied agencies and from the statewide overseeing e-grants task force, and analysis of agency documents such as grant application forms and application process flows. A report outlining the paper-based and (if present) electronic grant application process was prepared and discussed with the participating agencies and the state's Office of the Governor. The first author of the paper was primarily involved in data collection and model building, while the second author was primarily responsible for data analysis.

Analysis

The e-grant investment decision we described in the previous section provides a perfect setting for a test of our framework. Because for the state we study and its agencies there are no political mandates or special funding provisions for implementing e-grant systems, the e-grant investment decision is up to individual agencies, which act as IT initiators. The IT adopters are the grant applicants, i.e. other state agencies, city and local governments, school districts, research institutions and community organizations.

The state legislature and the governor have established a common political mission for all state agencies: providing better service to their stakeholders. In 1992, a dedicated grants team was established to help state agencies acquire and efficiently distribute grants from federal, state, and private funding sources. To better achieve this goal, in 2000 the state legislature has called for the implementation of electronic grant application and processing systems in state agencies, as part of the state's overall e-government strategy intended to make the state government "smaller, smarter, faster." This political mission defines the political value dimension for all agencies and grant applicants in our study. At the IT initiator level, the political value comes from sharing and collaboration for better and faster grant processing, while at the IT adopter level the political value is generated by having improved, streamlined and open access to grant information and funds. The political mission also defines the most salient aspects of creating economic value: efficient processing of grant applications, with as little money as possible wasted on fixing errors and inconsistencies. At the IT initiator level, the economic value is generated primarily from direct cost savings (paper and mailing costs) and indirect savings (staff time to check the grant application data and re-enter it in the internal agency systems).

With respect to IT risks, our analysis points out that all agencies shared similar risks prior to the e-grants implementation. Most agencies agree that ownership and "buy-in" is an area that merits significant consideration. For some agencies, on-line application is a significant "cultural" shift away from the paper-based processes. Political risk is therefore a major concern in all agencies. Functionality risk is also important, since most agencies do not have a well-defined standardized process to be implemented online. As a result, the agencies recognize that process redesign should precede (or at least parallel) their e-grant implementation efforts. As the reader will shortly see, this process redesign can help reduce the IT risks.

We next describe the impacts of process change at the three agencies in our study – the Education Agency (EA), Arts Agency (AA), and Health Agency (HA).

At EA, before the IT investment decision was made, power-shifting process changes were considered and implemented. Most notably, the process for applying and approving non-competitive formula grants went through significant changes to become more decentralized. The changes were aimed at giving more power to grant applicants – the local school districts - and shifted fund distribution processes to the recipients. These implemented-changes provided a platform to make potential e-grant benefits more visible at IT initiator level, since automating the shifted process is much more efficient for the agency. EA seems to know well an IT adage, "an automated inefficient process is much more inefficient." With the e-grant system, the IT adopters – the grant applicants - are now able to fill out paperwork online. The grant winners receive award notifications and draw money periodically through the web system that is linked to a mainframe system. This mainframe links to the State Comptroller, which deposits funds into the bank account of the winners. With automation of the formula grant process, EA employees can now be free of many mundane duties such as transferring money to IT adopters and focus on more sophisticated tasks including the review process for discretionary, competitive grants. We notice that power-shifting process changes make the value at the IT adopter level (i.e. faster and more convenient fund distribution) more visible to IT initiators, which in turn increases the perceived value of IT at the initiator level (i.e. more efficient workflow).

These process changes associated with the e-grant implementation also generated less obvious benefits, such as reducing the IT risks. Since both the agency and the applicants have been involved with these process changes, their buy-in to the proposed system is more likely. In addition, the power-shifting change generates benefits for both the IT adopter and the IT initiator, by transferring a low-value and time-consuming activity – the management of non-competitive funds – from the IT initiator, who gains no benefits from controlling this process, to the IT adopter, who is the most interested in controlling the process. As a result, political risk is reduced. Also, by streamlining processes beforehand, functionality risk decreased significantly.

AA, the other e-grants adopting agency we studied, followed a similar pattern for its IT investment decision. The agency estimated its IT initiator economic value as direct savings from reduced grant application printing and mailing costs, and indirect savings from less staff time spent for manual application checks and data entry. Like in the EA case, the power-shifting process changes preceded the favorable IT investment decision at AA. The grant applicants in the AA case are city and local governments and art groups. The agency reengineered its business processes and now allows the successful applicants to manage the distribution of the funds, while AA just monitors them. While this decentralization began in 1996, the benefits of this process change were only maximized with the implementation of an e-grants system. Applications are now received electronically with audits and previous programs history. The web-based system communicates with back-end legacy systems, which allows early detection of application errors. As one agency employee commented, "There is much less back and forth with the application since so many problems are stopped on the front end." After the grant applications are reviewed by a panel of judges, the panel's comments are posted back in the e-grants system and can be viewed online. With this decentralization, both the IT initiator (AA) and the IT adopters (the grant applicants) benefit from having more control and faster fund distribution, and more efficient processes, respectively. Also, all the benefits of the e-grant solution are again more easily visible to AA, the IT initiator.

The same power-shifting process change helps lower the IT risks of AA's e-grants investment. The political risk is reduced because the AA employees are freed from the time and resource-intensive task of verifying application completeness and managing funds without having their job security threatened, and thus they are more likely to support the new e-grants system. Also, the e-grants system also increases the control of the IT adopters on their grant money, thus making them more likely to accept the system. The functionality risk is decreased since the e-grants implementation follows a streamlined process that fits the objectives of both the IT initiator and the IT adopters.

In contrast, at HA, virtually no power-shifting process changes have occurred. The agency is currently investigating its grant application and evaluation processes, and has identified over 200 areas where a work-around, modification to the process or elimination of the process is needed. However, the actual implementation of process changes did not occur. Partly due to this lack of the power-shifting process change, HA still has paper-based grant processes. HA has 200 different grant programs, each of which does its own evaluation and tracking of applications. An e-grants system would provide a better way to keep track of all the funding sources from which grant funds are withdrawn. The tracking is a big headache at the agency at this time – for example, as an HA employee pointed out, “grant amount is a very difficult number to find.” As a result, the IT initiator value proposition of e-grants couldn't have been more appealing. However, the IT adopter value is not as visible, although almost all grant applicants surveyed seem to express their desires to be able to track their application progress on-line. In addition, because of the multitude of programs and evaluation processes involved, IT risks are high, because employees involved with different grant programs may have conflicting goals that increase political risk and different evaluation processes may pose a significant functionality risk. It seems that in the absence of power-shifting process changes that would streamline and standardize the grant evaluation processes within HA, and offer more control to the grant applicants, the levels of IT value remain moderate at best and the level of IT risk is high. As a result, HA did not make the decision to invest in an e-grants system.

As the EA and AA cases suggest, increased value and lower risk generated by power-shifting process change seem to provide incentives for investing in an e-grants system. In contrast, the HA case implies that in the absence of significant process changes, the potential for value is not as significant and the risk is most likely to increase, thus leading to the decision not to invest in an e-grants system. The value-creating, power-shifting process changes seem to center around the concept of decentralization, where all or some part of the IT initiator's processes are now shared with the IT adopters. Taken together, these three case analyses provide support for our conceptual model. We also recognize the need to consider alternative explanations that could account for the results (Yin 1984). For example, it could be possible that larger agencies are more likely to invest in IT solutions for e-government. However, our case data does not seem to support this claim, since HA, one of the biggest agencies, did not invest in e-grants applications, while AA, one of the small agencies, is a strong proponent for e-grants efforts. Also, if risk levels vary significantly across agencies; agencies with lower risk could be more likely to invest in e-grant solutions. However, while our risk analysis indicates AA (smaller and more standardized workflow) has a low risk level while EA (i.e. large and complex processes) has a significant risk level, they both invested in e-grants. Finally, it is possible that the state legislature or the governor offered political favors to the investing agencies. However, we find no evidence that political incentives for investing in the e-grants system were offered to any of the over 40 state agencies, including the three in our study.

Conclusions

Our study advances theory in three ways. First, we present a new model for understanding IT investments in the public sector. Our model adds critical nuances to the business value of IT in the public sector since oftentimes government agencies operate under different rules and assumptions (i.e. economic and political considerations). Second, our paper provides preliminary insights into an under-explored research domain: how process changes, and the associated power changes implied by them, impact IT value and IT decisions. Third, our framework adopts a novel approach of combining risks and benefits in justifying IT decisions, while the majority of previous studies consider them separately.

Our research provides valuable insights to IT practitioners as well. The results of our case study provide guidance for other agencies interested in implementing a value-focused approach mandated by the Clinger-Cohen legislation. Our framework can also help guide e-government investment decisions. Public sector IT managers may use our framework to help answer questions related to the variety of IT value impacts they need to consider and the implications of different aspects of value (i.e. political and economic value). Further, by incorporating the IT initiator and IT adopter value framework into the IT investment process, public sector decision makers would be better able to allocate resources to maximize the value each stakeholder receives from the IT investment.

As it is the case with all case study research, we need to be careful in generalizing the results of this study. Although the case method is appropriate for exploratory studies, it presents inherent shortcomings in generalizability. This issue can be addressed by further empirical investigation involving a larger sample of agencies and e-government investments. Also, future research can extend our model by incorporating the decision-making process that IT managers and elected officials go through to arrive at the IT investment decision. Needless to say, individual participants bring in different value propositions for specific IT opportunities, and this “negotiated” value process presents a rich opportunity to augment our model.

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