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Understanding E-Government Development: A Case Study of Singapore E-Government

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ABSTRACT
Rapid advances in technology and the advent of the Internet have redefined the way citizens expect of governments and their services. Pulled by citizens’ demands for a responsive government, public sector leaders have been endeavoring to develop e-government. But their efforts have been obstructed by various challenges. The extant literature offers limited guidance since most of it is conceptual. To shed new light on e-government development, we present the process of a ministry’s e-government development in Singapore. Going beyond naming the stages and outcomes of e-government, we identify the critical success factors that drive the Ministry’s e-government development. The findings of our study provide a preponderance of evidence that some critical success factors are causally related to the Ministry’s e-government success, though at different stages, the importance of certain factors may be different. Moreover, our case result underscores the need for governments to be aware of the challenges and radical organization changes required by mature e-government.

Keywords
E-government development, critical success factors, process model

INTRODUCTION
With the advances in information and communication technology, public sector leaders have been grappling with how to best use the emerging technologies to improve the effectiveness and efficiency of democracy (Watson and Mundy, 2001). As one element of e-democracy, e-government is governments’ use of technology, particularly web-based Internet applications, to inform citizens about the way to contact them and to enable citizens to pay transactions online. By migrating traditionally paper-based and face-to-face services to the Internet, e-government has the potential to cut operation costs and provide citizens the fastest and most convenient public services. But governments’ efforts in reaping benefits of e-government have been obstructed and empirical research on how to implement e-government is imperative.

In this paper, we present the process of a ministry’s e-government development in Singapore. Going beyond naming the stages and outcomes of e-government, we identify triggering factors that drive e-government development. This study is significant in that it is the first in-depth case study of full-scale e-government implementation as far as we are aware. The e-government development model formulated in this study has great contribution to the information system development literature. By showing how critical success factors (CSFs) drive e-government development from one phase to another, our research adds a process perspective to the e-government development model. The lessons learnt of our study are derived from the experience of public sector so they enrich the extant information systems implementation literature whose focus has been in private sector. Furthermore, this study provides practitioners with useful insights into implementing successful e-governments projects.

A PRELIMINARY MODEL
In current e-government development literature, there are two significant stage-based e-government development models, one developed by Layne and Lee (2001) and the other one by Watson and Mundy (2001). While Layne and Lee’s model neglects the importance of including customer-oriented views, Watson and Mundy’s model lacks in presenting the development of backend processes. To look at each stage of e-government development from the perspectives of both organizations and the citizen, we unify strengths of these two models by adding the organizational changes required into the second model. Moreover, in both of the existing models, there is a lack of a demonstration of what should be done to traverse across each strategic phase successfully. Due to the weakness of both models, there is a need to develop a relevant development process model. Hence, by tapping the huge repository of public administration and information system development theories, we further revise the model by including CSFs so that we can unveil how e-government moves from one stage to another.
CSFs in Information System Development Literature

There are three streams of research in CSFs in information system implementation, with one focusing on technical factors, another on development process management and the third one concentrating on organizational factors. Among the three groups of factors, organizational factors differentiate the most between private and public sectors, due to the great difference in their structures and administration. Hence, we choose to focus on organizational factors.

A major organizational factor that is consistently found important is the level of top management support (Jarvenpaa and Ives, 1991; Lawrence and Low, 1993). Top management support encourages executive involvement (Wixom and Watson, 2001), makes people support the project and overcome the political resistance (Curtis and Joshi, 1998). In addition, the presence of top management support can enhance user’s acceptance of the system (Karahanna, Straub and Chervany, 1999).

The existence of champions is another organizational factor that facilitate information system implementation (Beath, 1991; Reich and Benbasat, 1990). Champions’ personality characteristics, leadership behaviors and influence tactics affect the success at the organizational level and help teams to meet their project level goals (Howell and Higgins, 1990; Wixom and Watson, 2001). Also, successful information system implementation can be contributed to the organization’s change management program, commitment to the project and resources. When political resistance arises, change management program is needed to deal with it and encourage people throughout the organization to embrace the new system (Markus and Robey, 1988). In their longitudinal study, Newman and Sabherwal (1996) find commitment to a project affects the eventual success of the system. Similarly, resources including money, people and the time that are required to successfully complete the project leads to the success of implementation (Reich and Benbasat, 1990).

CSFs in Reinventing Government

While CSFs in information systems development literature are relevant to our study, there are some other factors facilitating public organizational changes and they affect e-government implementation. Different from e-commerce in the private sector, governments face complex social regulatory and legal issues in changing their service delivery models. E-government requires the change of the mindsets of civil servants, a complete paradigm shift in the government processes and possibly the concept of government itself. Hence a proactive change of the organization by the government is a necessary condition for successful e-government development.

Historically public administrations have been centrally concerned with issues of universalism and distributive justice (Harris, 1990). It is required, to stay within the law, achieve fairness or equity, and behave correctly at all times. E-government offers challenges to this universalism commitment. In a general sense, the phrase “digital divide” refers to the gap between those who have access to the Internet and those who do not. Consistent with the norms of public administration, bringing digital divide is another factor important for successful e-government development.

Moreover, the intended users of e-government information system are all citizens. The demographics of the citizenry are most diversified. E-government should be easy to use for even untrained and low computer literacy people. The high level of usability of e-government can only be achieved by integrating government services across different walls. To provide such integrated services, interagency collaboration becomes an important factor in e-government development. Collaboration among agencies is never a simple matter in public administration due to its bureaucratic characteristics (Osborne and Gaebler, 1993). Hence, strong leadership is required to steer such collaboration.

RESEARCH METHODOLOGY

While case studies are usually associated with the interpretivist tradition and used to develop theories inductively (Orlikowski, 1992; Walsham and Sahay, 1999), some studies have been undertaken from the positivist tradition and test theories deductively (Cooper, 2000; Sarker and Lee, 2002). Lee (1991) asserts that neither approach is inherently superior to the other and each is appropriate for different research objectives. Given the substantial research on CSFs in information systems development, developing another of such theory is not of interest here. Rather, what is lacking in IS literature is insights based on public administration theory that provides a greater understanding of the processes and problems involved in e-government development. An e-government development project is, therefore, viewed and described through information systems and public administration lens.
A case study in positivist fashion requires attention to construct validity and reliability (Yin, 1994). Construct validity is supported by employing multiple sources of evidence and data collection methods (Benbasat, Goldstein and Mead, 1987; Yin, 1994). We were allowed access to a lot of written documentation concerning the project, including meeting minutes, interoffice memos, and proposal and presentation materials. In addition, we interviewed 13 people who had high degree of involvement in the e-government project. One week before we conducted each interview, we sent a semi-structured questionnaire to the informant so that he/she could have a rough idea about what questions we would ask in the interview. At the beginning of each interview, we went through the study protocol with the interviewee and emphasized that the purpose of the interview would be kept confidential and was for research purpose only. Each interview lasted between 1 to 2 hours and was tape-recorded whenever possible. During the interview, open-ended questions were asked based on the case study protocol to provide greater insights and reduce biasness. To ensure that the correct facts were communicated during the interview, more specific questions were asked when clarification was needed and paraphrasing was done whenever necessary. After the interviews, further clarifications were conducted via email and tele-conversation to ensure accuracy of interpretations. Hence, the case discussion is based both interview as well as project documents. Construct validity is also supported by having two project managers review the case study report (Yin, 1994). Both of the informants were all highly involved in the project. They reviewed the entire case study draft, gave us their comments and expanded the draft based on their interpretation of the case.

Reliability is demonstrated by the appropriate use of case study protocol (Yin, 1994). The protocol ensured that we follow the same procedures across the multiple investigators. Interviewees were informed of our research objectives at the beginning of

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**Figure 1. Preliminary Model**

A preliminary model of e-government development is presented. The model includes three main stages: Initiation, Infusion, and Customization. Each stage is further broken down into specific activities and factors.

- **Infusion**: Process Reengineering, Transactional Services and Forms Online, Online Payment.
- **Customization**: Organization Transformation, Integration within agency and One-to-One relationship between government and citizen, Citizens have personal profiles for all transactions, Citizens can customize relevant information.

**Critical Success Factors**:
- Top Management Support
- Presence of Champion
- Change Management
- Resources
- Mindsets Changes
- Bridging Digital Divide
- Usability
- Strong Leadership

**Effectiveness & Efficiency**

Activities include:
- Transactional Services and Forms Online
- Online Payment
- Catalogue Presentation
- Organization Transformation
- Integration within agency and One-to-One relationship between government and citizen
- Citizens have personal profiles for all transactions
- Citizens can customize relevant information

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each interview. The interviews were open ended rather than focused. Also, we enhance the reliability of this research by developing an evidence database. This database consists of transcribed copies of the audio recordings, case study notes, manuscripts and files. It allows us to review the evidence directly and not to be limited to written reports, thus increasing reliability of the entire case study.

We increased internal validity by using the pattern matching technique suggested by Yin (1994). This technique essentially involves qualitative but logical deduction (Lee, 1989) wherein an empirically based pattern is compared against a predicted pattern derived from the theory. In particular, we identified the stages of e-government development of the organization under study, based on the documents and information provided by the interviewees. These sequence of events happened in the organization’s e-government development were compared against what was suggested by our preliminary model. Similarly, we identified the factors that were causally related with the organization’s e-government success with the critical success factors suggested by IS and public administration literature.

THE CASE STUDY ORGANIZATION AND PROJECT

The Republic of Singapore has long been regarded as one of the leaders in the information technology revolution, and this position has been confirmed again in its e-government development. ECitizen, Singapore’s e-government portal generates S$23 million savings for the Singapore government annually. This portal was rated second in Accenture’s survey of governments’ use of the Internet to provide services in the world (Accenture, 2001). Hence we chose to conduct a case study with the ministry that is the pioneer in e-government development in Singapore.

The Ministry with which we conducted case study was established in 1966. Throughout the lifetime of their service liability, citizens are required to engage in several services provided by various agencies of the Ministry. These services include registration, overseas travel notification, the booking of dates every six months for Individual physical tests and many more. Traditionally, services provided by the Ministry were characterized by their complex and unwieldy procedures. E-government provided an opportunity to enhance the quality of these services.

The Ministry’s e-Government Development : Initiation

The Ministry started to develop its official Web site in June 1996. The Web site merely published information about the Ministry’s organization structure and some of its services without any online transactional functionality. In response to the government’s call for the delivery of public services over the Internet by the year 2001 under Project PS-Online, the Ministry started its Virtual Town phase I in 1998. The main concern was to make sufficient and correct information available online. With the implementation of Phase I finished and Virtual Town launched in April 1999, the citizen could obtain 12 service packages’ information and perform 18 transactions through the Internet.

Due to the lack of expertise and capabilities in e-government development among agencies at the beginning, Singapore government set up a steering committee to offer guidelines. The steering committee developed an electronic tool to help agencies collect information and determine which of their services were ready for electronic delivery. Also, the Committee drew up a set of technical and user standards to help agencies ensure that the electronic services were efficient, streamlined and customer-oriented. It developed applications and infrastructure common to most agencies and shared applications for electronic forms and payment modules in the form of generators. With these tools, the Ministry was able to quickly create and generate their own electronic forms and online payment modules, as commented by one project manager:

“E-government was a totally new concept to us. Our ministry provided so many services, it was impossible to put them all on-line at the same time... The guidelines set by the Steering Committee were really helpful. It made it possible for us to quickly come up with the list of services to go online first based on the criteria set by the committee. ”

In addition to the champion role played by the steering committee, enhancing usability is another CSF at this stage. The Ministry grouped the services that were logically linked or codependent into service packages according to the citizen’s perspective. Such packages provided a seamless channel to the citizen and make procedures more lucid from the citizen’s perspective. In addition, the Ministry set common standards regarding user interface and electronic services so that a single consistent face of the Ministry was provided to the public.

1 The name of the organization is kept confidential.
Traversing from Initiation to Infusion: Virtual Town

On June 1, 1999, a study team comprising members from all agencies carried out a review of the service delivery processes developed at Phase I. They found that various services offered, either through physical counters or the Internet, were still being processed manually by the servicing agencies. For example, although forms for some services were available on the Internet for download, the citizen still needed to print these forms and submit them via post or personally and the counter staff manually processed transactions for him. The study team decided that fundamental process redesigns should be conducted to maximize benefits of e-government.

After the committed spending three month on redesigning processes, Phase II of development was conceptualized to develop Virtual Town into a fully integrated online service center. A major part of this project involved integrating all the electronic online-transactions with the various backend information systems and databases of the Ministry. The integration of agencies’ databases cut down redundancy in data capturing and automated manual processing, in addition to providing the citizen faster and hassle-free services. For example, in the transaction of “Inform the Ministry of the Change in Bank Account”, the citizen could conveniently submit their applications online where the e-application was integrated with backend information system and update their account information with the Ministry. Electronic acknowledgement replaced the acknowledgement by surface mail and manual updates were no longer required. The entire transaction, which used to take a week, was completed by the next working day, saving great time and labor resources.

By December 2001, Phase II implementation of Virtual Town was almost completed with a total of 36 transactions fully integrated with the respective databases. There is a marked improvement in service cycle time. It freed labor resources for more critical job functions that needed a human interface and reduced the errors in manual processes by incorporating computation and business rule checks into the system.

CSFs in this stage include:

1. Top Management Support: In September 1999, the Permanent Secretary of the Ministry endorsed the paper on the development of Virtual Town signifying his support. Furthermore, heads of agencies firmed a steering committee to oversee the progress of process reengineering. They had personal commitment to excellence in public service and teamwork at the individual level, willing to reform and make fundamental organizational changes.

2. Change Management: The Ministry initiated a change management program to create a loyal, cohesive and integrated workforce. By empowering the staff with IT knowledge, the Ministry ensured its employees that the pursuit of productivity and service excellence would not be at the expense of their livelihood. With the confidence that their welfare and general well-being were adequately looked after, the staff of the Ministry embraced the ideas of streamlining their service delivery to harness the new IT infrastructure.

3. Resources: The project was funded with about S$5million lump sum and around S$1.4 million annually for maintenance of the system. The abundance of resources committed to the project signified the Ministry’s strong commitment to the project and nurtured the top executives’ involvement. The slack resources also allowed the Ministry to afford latest technology, as commented by one of the project managers:

“We didn’t have to worry too much about the cost which was good. It allowed us to try out innovative ideas and get the latest technology in the market. That was important for the project, especially when we didn’t know which was definitely better than the other.”

4. Usability: By integrating e-transactions with backend databases, the Ministry achieved marked increase in convenience for users. Together with upgrading of the system infrastructure the integration with databases provided the citizen responsive, any time and anywhere services. Also, similar to the initiation stage, the services were organized into packages from the citizen’s perspective so they were easy for the citizen to identify the right service needed.

5. Bridging digital divide: Aiming to deliver the public services that are available on-line solely through IT channels, terminals were provided for the public to access the e-applications with help from the counter officers at the counters. Online instructions were clearly documented at the portal to assist the public. Paper based form filling was eliminated. The limited service counters were provided with the rationale that the public would soon learn to perform transactions from a location most convenient to them rather than at the department itself. Moreover, the counters are equipped with terminals so that the public can access the e-services with help from the counter officers. These measures taken to bridge the digital divide made more citizens go online for public services provided by the Ministry.
Traversing from Infusion to Customization: “dot-coming” the Public Organization

In August 2000, while Phase II of the Virtual Town was well in progress, an initiative to “dot com” the Ministry’s e-government was launched. With a vision to operate in a leaner and more responsive “dot com” environment, the initiative aimed to break away from traditional bureaucratic mindsets and to reengineer the structure of administration and the related process of organizational control. It reinforced the Ministry’s commitment to benchmark its services to the private sector and adopt best practices in the public and private sectors.

As the most important part of the “dot com” initiative, the Ministry introduced a one-stop e-service portal and call center for its user groups with business process modified and innovated wherever necessary. Under a five-year contract, Green², an e-business company developing IT systems and solutions for institutional and corporate clients, “builds, owns, and operates (BOO)” the portal and the e-Service Call Center. The agency that had been developing e-transactions for Virtual Town, would transfer existing e-transactions onto the new portal and be responsible for the development of new e-transactions on the portal. Such special arrangement enables the Ministry to leverage on marketing and community building expertise and complement its traditional inflexible hierarchical organization.

After six months of development, the Internet portal and e-services call center were launched on 1st April 2001. The portal was a lifestyle portal, which integrated commercial products and services with the public information and services. Designed to be customer-centric, the portal offers seamless services to the users. In addition to online transactions, users were able to participate in various discussion forums and chat-rooms to build virtual communities among citizens. Integrated with e-Services Call Center, which processes all enquiries and transactions sent via telephone, fax and email, the portal provided every user a lifetime web-based email accounts where all messages converged into one single mailbox. Moreover, under a single log-on console, the citizen only needed to log in once to access all applications and retrieve his personal or transactional profiles.

The implementation of the portal dramatically reduced the time required to process a transaction. System usage was increased drastically since the days of Virtual Town. Virtual Town then had average page views of 15,000 per month. By contrast, MIW had hit page views in excess of 739,000 within three weeks after its launch. Moreover, MIW really attracted the enlistees. As commented by a Green project manager:

“During the last service registration on Nov 18, 2001, 86% of the 6200 enlistees did not go down to the office to register, they clicked on the portal instead.”

CFSs at this stage include:

1. Top Management Support: Despite adopting a commercial approach, the Ministry set up a steering committee directed by the 1st Permanent Secretary and a working committee directed by the Director of Manpower to ensure that the top-level support was present in the push for an efficient e-government. In particular, the chairmen of both committees, together with the CEO of Green personally participated in project management and were perceived to be significantly well informed about IT opportunities in the organizations. Therefore, executive participation and involvement were present in the cooperation mechanisms of the committees and contributed significantly to the timely completion of the project.

2. Usability: To further enhance the usability of the portal, integrated voice response system with speech recognition technology was adopted to facilitate the citizen’s access the e-services. In addition, each citizen was provided with customized transactional and personal profiles with the implementation of Customer Relationship Management (CRM) techniques embedded in the system. As told by one of the mid-level civil servants:

“The integrated center simply made our e-services easy for all citizens. Some senior people were apprehensive of using computers and didn’t want to spend time in acquiring computer knowledge. The Call Center was really good news to them and made them stop coming to the agencies’ counters for services.”

3. Strong Leadership: Throughout the course of implementation, the leadership undertook a proactive and hands-on role in steering the direction of the project. The steering committee imposed a common project methodology across all parties involved to ensure clarity of communication. The exact details of the methodology included one common communication channel, clear and detailed requirements, clarity of roles and responsibilities of each project member, and reasonable project pace. The common master project schedule was used to track the progress of the project. Any delays in the project were required to be highlighted to the top management. In addition to providing cooperation guidelines, the committees

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² The name of the company is kept confidential.
emphasized problem identification and resolution, instead of fault-finding. It nurtured trust among the agencies toward each other and hence facilitated the inter-agency collaboration.

4. Bridging Digital Divide: In addition to the launch event on 1st April, 2001 officiated by Dr Tony Tan, Minister of Defense, the portal engaged in an extensive and aggressive marketing campaign, which included advertisements on radio, newspapers, magazines, buses and taxis. Information pamphlets and step-by-step guides explaining features of the portal were included in pin mailers sent to every individual of the pre-enlistees, active servicemen and employees of the Ministry. Meanwhile, to make the portal more accessible, Green established partnerships with hardware vendors and local ISPs to offer discounted personal computers and Internet access packages to the citizen. Access facilities were also provided at various clubhouses, National Libraries and community centers. In addition to increasing the number of accessing points, Green and the Ministry organized trainings for the employees and the citizen to make their interaction with portal easier.

The chronology of the ministry’s e-government development is summarized in Figure 2.

DISCUSSION AND CONCLUSION

This case demonstrates a chronology of IT-enabled government reform, starting from implementing an informative web site, then moves on to the development of Virtual Town before attaining the customization phase with the portal and integrated call center. The Ministry’s e-government process conforms to the three-phase model of initiation, infusion and customization proposed by Watson and Mundy (2001). One the other hand, the Ministry’s e-government going through information dissemination, on-line transactions and horizontal integration is consistent with what was proposed by Layne and Lee (2001). The phases and activities that were observed in this case may be generalized to other governments’ e-government implementation, though the measures and actions we documented are case specific.

In addition, this case provides a preponderance of evidence that some of the CSFs are casually related to the Ministry’s e-government development success, though at different stages, the importance of certain factors may be different. For example, the champion role of the Steering Committee at the initiation stage was critical in jump-starting the e-government development as e-government was a new concept for the public sector and there existed expertise in this regard at that time. When it came to infusion stage, the agencies had accumulated a certain amount of e-government knowledge and the focus had been shifted to business process reengineering. The top management’s support for such changes and the management of the civil servants’ mindsets became the most important factors. When it moved to customization stage, as services integration across agencies was required for customized personal profile for each citizen, interagency collaboration and coordination became the most challenging task and it required a strong leadership in steering the course. Moreover, as the portal became mature, promoting its acceptance by the citizen and training the citizen to use the portal’s e-services decided whether the Ministry and its user groups could really reap the benefits of e-government, hence bridging digital divide and marketing the portal appeared to be more important than at the other two stages.

By providing a better understanding of the process and CSFs associated with each stage of e-government development, this study provides governments with useful insights into implementing successful e-government. The case result underscores the need for governments to be aware of the radical organization changes required by mature e-government. The smooth cooperation among different public agencies and the low-level civil servants’ alignment with the vision of e-government are critical for e-government development. Adopting effective change management tactics becomes an important task for the government. Also, as more and more governments go for IT project outsourcing, just as what was done by the Ministry, coordination among multiple parties involved in the project is critical for the success. Especially some parties are from private sector and their trade cultures can be very different from the public organizations. Effective and efficient coordination mechanism is challenging and the leader of the government should be well equipped with strong leadership skills.

Last but not least, similar to other single case studies, the findings of our case has limited external generalizability. Further e-government development studies are needed in order to test the applicability of the process model and the extent to which the findings of our case can be generalized. Comparative investigations of governments’ e-government development should be conducted to identify different CSFs at each stage of e-government development in different cultural, political and economic contexts.
Understanding E-Government Development: A Case Study

One-to-One relationship between government and citizen
Citizens have personal profiles for all transactions

Transformation
Inter-agency cooperation

Initiation
Internal Computerization
Single Point of Access to Ministry web site
Online Presence with little Functionality

Infusion
Process Reengineering
Inter departmental Cooperation
Transactional Services and Online Submission of Forms
Integrate existing transactions with backend MIS databases to enhance service delivery

Customization
Transformation
Inter-agency cooperation

Effectiveness & Efficiency

Figure 2 Chronology of the Ministry’s E-government Development

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