Advancing Public Trust Relationships in Electronic Government: The Singapore E-Filing Journey

Eric T. K. Lim, Chee-Wee Tan
Department of Innovation Management and Strategy, University of Groningen, 9747 AE Groningen, The Netherlands
{e.t.k.lim@rug.nl, c.w.tan@rug.nl}

Dianne Cyr
Beedie School of Business, Simon Fraser University, Surrey, British Columbia V3T 0A3, Canada, cyr@sfu.ca

Shan L. Pan
Department of Information Systems, School of Computing, National University of Singapore,
Singapore 117417, Republic of Singapore, pansl@comp.nus.edu.sg

Bo Xiao
Department of Computer Science (Information Systems), Hong Kong Baptist University, Kowloon, Hong Kong, China,
boxiao@comp.hkbu.edu.hk

E-governments have become an increasingly integral part of the virtual economic landscape. However, e-government systems have been plagued by an unsatisfactory, or even a decreasing, level of trust among citizen users. The political exclusivity and longstanding bureaucracy of governmental institutions have amplified the level of difficulty in gaining citizens' acceptance of e-government systems. Through the synthesis of trust-building processes with trust relational forms, we construct a multidimensional, integrated analytical framework to guide our investigation of how e-government systems can be structured to restore trust in citizen-government relationships. Specifically, the analytical framework identifies trust-building strategies (calculative-based, prediction-based, intentionality-based, capability-based, and transference-based trust) to be enacted for restoring public trust via e-government systems. Applying the analytical framework to the case of Singapore's Electronic Tax-Filing (E-Filing) system, we advance an e-government developmental model that yields both developmental prescriptions and technological specifications for the realization of these trust-building strategies. Further, we highlight the impact of sociopolitical climates on the speed of e-government maturity.

Key words: e-government; public trust; calculative-based trust; prediction-based trust; intentionality-based trust; capability-based trust; transference-based trust
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1. Introduction

The restoration of public trust stands as one of the top priorities in the development of e-governments (Bélanger and Hiller 2006, Parent et al. 2005). Two reasons justify this claim. First, the mass migration of public services to virtual media has amplified the risks associated with governmental transactions. Because confidential and sensitive personal information is electronically transmitted and stored when conducting e-governmental transactions, it is not only susceptible to interception and modification by third parties, but can also be easily accessed by unauthorized personnel without citizens' prior approval (Horst et al. 2007). Given that e-governments are service monopolies, citizens' trust in the technological infrastructure and the integrity of governmental institutions is vital to their acceptance (Teo et al. 2008). Second, e-governments have blurred the boundaries between business norms and social responsibilities (Grimsley and Meehan 2007). Spurred by a drive for productivity and cost savings within e-governments (Devadoss et al. 2002), governmental institutions may deploy e-government systems in ways that maximize operational efficiency at the expense of accountability and social inclusion (Grimsley and Meehan 2007). Indeed, the inability of governmental institutions to leverage on the interactive capabilities of the Internet to deliver inclusive public services has culminated in estranged relationships between citizens and governments (West 2004) and contributes to a steady decline in public trust towards the latter (Tan et al. 2008, Welch et al. 2004).

However, there is a paucity of studies examining how technology can be harnessed by governmental institutions in the design of trust-inducing e-government systems. Although prior research attests to the significance of trust as a salient driver of citizens' acceptance of e-governments (e.g., Carter and Bélanger 2005, Horst et al. 2007), few studies, with the notable exceptions of Grimsley and Meehan (2007) as well as Tan et al. (2008), have investigated how e-government systems can be fashioned to induce trust among citizens. Further, given the early stage of trust research in e-government, the majority of past studies have conceptualized trust as a unidimensional construct (e.g., Reddick 2005, Reffat 2003) and/or adopted a variance strategy in investigating the phenomenon (see Sabherwal and Robey 1995). Expanding on the foundation of existing studies, we undertake a process view of the development and impact of e-government systems on multifaceted trust-building efforts targeted at citizenries. Specifically, we endeavor to address the following research questions: (1) *How does the development of e-government systems affect trust building between citizens and governments?*, and; (2) *What are the lessons that inform developmental prescriptions and technological specifications for governmental institutions?*

To answer the above research question, this study investigates the management of public trust in e-government systems through a case study of the Singapore Electronic Tax Filing (E-Filing) system. Singapore has achieved remarkable success in its e-government movement (Chan and Pan 2008), having been ranked by Accenture (2007) as the top nation in terms of e-government maturity. The most recent survey conducted by Accenture (2009) also rated Singapore first on several indicators of citizencentric service leadership such as the availability of personalized services, the proactive engagement of citizens, and the presence of cross-agency service coproduction. Furthermore, it is documented in the Accenture (2009) report that "Singaporeans held more positive opinions about their government's performance than the citizens of any other country in our citizen survey (where we examined government's trust building activities for its citizens, based on eight parameters)" (p. 119).

The E-Filing system is one of the defining e-government systems introduced by the Singapore government to revitalize tax-filing services and reinstate wavering public confidence in its tax-collecting arm, the Inland Revenue Authority of Singapore (IRAS). Through leveraging on technology to build trust between the IRAS and taxpayers, the E-Filing system has succeeded in reversing public disapproval towards the tax agency and fueling acceptance among its target audience. Given the resurrection of the IRAS from an untrustworthy governmental institution to

one with an impressive record of public endorsement within the country, the case of the E-Filing system is appropriate for deciphering the relationship between citizen trust and e-government development. This study contributes to extant literature in four ways. First, synthesizing the typology of Doney et al. (1998) for trust-building processes with Sheppard and Sherman's (1998) characterization of relational grammars, we construct a multidimensional, integrated analytical framework that can be applied to gain an in-depth appreciation of how e-government systems may be structured for trust-building purposes. Essentially, our framework delineates e-government development into four stages that not only correspond to marked improvements in citizen-government relations, but also illuminate the risks associated with each stage and their implications for trust-building efforts. Second, in applying our analytical framework to the case of the E-Filing system, we derive a series of developmental prescriptions for e-government systems that synchronize with the type of trust-building strategy required for each of the four developmental stages. Third, we clarify the role of technology in supporting these developmental prescriptions. Finally, we draw attention to characteristics of Singapore's sociopolitical climate in mitigating trust-building via e-government systems.

2. Trust in E-Government: An Overview

Extant literature on e-government can be broadly classified into four main categories depending on whether the study is descriptive or prescriptive and addresses the supply- or demand side of the phenomenon (see Appendix A in the online supplement).[1] Whereas the *supply side* of e-government explores the actions taken by governmental institutions in rolling out e-government systems, its *demand side* examines citizens' acceptance of such systems. Descriptive studies on the supply side therefore trace the evolutionary journey made by governmental institutions in the development of e-government systems. Such studies typically revolve around: (1) the introduction of e-government maturity models that illustrate the developmental stages of e-government systems (e.g., Chen et al. 2006, Srivastava and Teo 2009); (2) the illustration of challenges faced by governmental institutions in developing e-governments and the steps taken (if any) to overcome these hurdles (e.g., Cordella 2007, Henriksen and Damsgaard 2007, Letch and Carroll 2008, Marco and Sorrentino 2007, Otjacques et al. 2007, Periasamy and Sia 2007), or; (3) the depiction of social, economic, and political factors affecting the diffusion of e-governments

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[1] An electronic companion to this paper is available as part of the online version that can be found at http://isr.journal.informs.org/.

within communities (e.g., Heeks and Stanforth 2007, Huang 2007, Kahraman et al. 2007).

Conversely, prescriptive studies on the supply side deliver actionable advice to governmental institutions in developing e-government systems. Core contributions of this line of work reside in the detailed inspections of contemporary e-government systems to yield "lessons" that inform both theory and practice. Although diverse in their recommendations, these lessons underscore important action points that relate to strategic and operational considerations on the part of governmental institutions in their migration to e-governments (Grant and Chau 2005). Examples of such lessons include engaging relevant stakeholders (e.g., Azad and Faraj 2008, Chan and Pan 2008, Olphert and Damodaran 2007), ensuring service interoperability across multiple governmental agencies (e.g., Gil-Garcia et al. 2007), establishing performance metrics (e.g., Irani et al. 2005, 2008), promoting intraorganizational acceptance (e.g., Gupta et al. 2008), as well as cultivating a corporate environment that fosters organizational learning and innovation (e.g., Moon and Norris 2005, Phang et al. 2008).

Subscribing to a citizen's perspective, descriptive studies on the demand side articulate how citizen-government interactions have evolved in conjunction with progress made in e-government systems (Hamner and Al-Qahtani 2009). Whereas some studies in this category reflect on how issues of digital divide (e.g., Hill et al. 2008, Klecun 2008, Zheng and Walsham 2008) or disabilities (e.g., Huang 2003) affect citizens' reception towards e-government systems, others segregate the evolution of e-governments into distinctive phases that are marked by quantum leaps in IT-enabled service delivery and describe how each of these phases acts as a catalyst to advance the relationship between citizens and governmental institutions (e.g., Chen et al. 2006, Watson and Mundy 2001).

Lastly, prescriptive studies on the demand side emphasize guidelines to be upheld in the development of e-government systems in order to enhance their desirability from citizens' perspective. Essentially, these prescribed guidelines constitute a to-do list of citizencentric measures that increase the appeal of e-governments to their targeted citizenries. Guidelines advocated in these studies are varied and range from principles of service quality (e.g., Tan et al. 2011) to bilateral communication protocols (e.g., Hackney et al. 2007, Reddick 2005, Robbins et al. 2008) to trust-building strategies (e.g., Bélanger and Carter 2008, Carter and Bélanger 2005, Gefen et al. 2005, Grimsley and Meehan 2007, Teo et al. 2008), as well as standards of information privacy and security (e.g., Yao and Murphy 2007).

Summarizing preexisting research streams in e-government literature, Hamner and Al-Qahtani

(2009) alleged that whereas significant advancements have been attained on the supply side of e-government, there is comparatively less progress being made on its demand side (see also Reddick 2005). The same can be said for e-government studies conducted in Singapore. Although a substantial number of studies have touched on the supply side of e-government systems in Singapore (e.g., Chan and Pan 2008, Devadoss et al. 2002, Lee et al. 2005, Pan et al. 2006, Phang et al. 2008, Teo and Wong 2005), studies on the demand side, with the exception of Srivastava and Teo (2009) as well as Teo et al. (2008), are few and far between. In the absence of much progress on the demand side, there exists a somewhat limited understanding of what drives citizens' acceptance of e-governments. Indeed, published statistics on citizens' acceptance of e-governments have been dismal (Tan et al. 2011).

Grimsley and Meehan (2007) attributed citizens' low acceptance of e-governments to the blend of technologically driven inhibiting factors and the sociopolitical climate exclusive to public administration. From a technological angle, e-governments expose citizens to greater transactional risk because the electronic transmission and storage of personal data imply that the data stands a higher probability of being accessed by unauthorized parties (Tan et al. 2008, Teo et al. 2008). Moreover, every governmental institution resembles a monopolistic "business" entity that provides services exclusive to a country (Tan et al. 2008). Without exposure to market forces, governmental institutions are often laden with a supplementary layer of political affinity. With e-governments acting as surrogates (or proxies) for governmental institutions, citizens may be compelled to question the aspirations and motivations behind such systems (Teo et al. 2008, Warkentin et al. 2002, West 2004). To overcome these technological and sociopolitical hurdles, researchers have argued for the necessity of restoring public trust in e-governments (e.g., Bélanger and Carter 2008, Carter and Bélanger 2005).

Our review of extant literature on trust research in e-government uncovers three pervasive trends wherein lies the impetus for this study. First, contemporary studies share a tendency to theorize trust as a unidimensional construct (e.g., Carter and Bélanger 2005, Horst et al. 2007, Reffat 2003) despite its well-acknowledged multidimensionality (see Doney et al. 1998). Grimsley et al. (2003) hence called for e-government trust research to move beyond its conventional unidimensional conception to embrace a multidimensional view of its manifestation. By delineating trust into multiple facets, Grimsley et al. (2003) demonstrated that richer insights can be gleaned on how to devise and tailor e-government systems to

augment trust-building strategies for different kinds of citizen-government relationships.

Second, there is a lack of developmental prescriptions and technological specifications to guide governmental institutions in structuring e-government systems. However, with overwhelming empirical evidence attesting to the importance of trust in e-government (e.g., Bélanger and Carter 2008, Carter and Bélanger 2005, Dashti et al. 2009, Gefen et al. 2002, Reddick 2005), the time is right to delve deeper into how e-government systems can be designed for trust-building purposes. The pertinence of such a research stream can be witnessed through the work of Tan et al. (2008), who empirically proved that the service quality of e-government websites, as measured via attributes of assurance, empathy, reliability, responsiveness, and tangibility, positively influences citizens' perceived trustworthiness of these websites.

Third, the majority of studies on trust in e-government have adopted the variance strategy in their execution (e.g., Dashti et al. 2009, Tan et al. 2011). The *variance* approach to research construes social reality as a system of interrelated variables and advances knowledge through depicting social phenomena as nomological networks consisting of relationships among dependent and independent variables (Sabherwal and Robey 1995). Although the variance strategy is invaluable for discovering variations in dependent variables due to change of states in related predictors, it does not offer explanations for why these variations occur. Sabherwal and Robey (1995) have thus advocated a process strategy approach to supplement findings from variance-based studies. *Process* strategy views social phenomena as a sequential chain of events occurring over time, and opens up the "black-box" for any given pair of independent and dependent variables by explicating the process through which the former effects a change in the latter (Sabherwal and Robey 1995). Evidence of such complementarity between process and variance research strategies can be found in e-government trust literature. Although the variance study of Welch and Hinnant (2003) has alluded to citizens' satisfaction with the interactivity and transparency of public e-services as salient predictors of their trust in e-governments, explanations for these observed relationships were only made apparent through the process-oriented work (e.g., Grimsley and Meehan 2007). More specifically, citizens are more likely to place their trust in e-governments when they are empowered to engender control over the governance of governmental institutions.

The aforementioned shortcomings also hold true for e-government trust research within the Singapore context. Although Teo and his colleagues have

testified to the pivotal role of trust in influencing Singaporeans' acceptance of e-governments (e.g., Srivastava and Teo 2009, Teo et al. 2008), they have neither gone beyond a unidimensional conceptualization of trust nor arrived at actionable prescriptions for designing e-government systems to inculcate trust in citizens.

This study therefore sets out to accomplish several research objectives. First, we opt to preserve the multidimensionality of trust in comprehending how e-government systems can be fashioned to augment various trust-building processes. Second, we attempt to identify actionable developmental prescriptions and technological specifications that supplement the trust-building efforts of governmental institutions. Third, although multiple variance studies having been conducted on trust in e-government, we believe that a process-oriented view of the development of e-government systems is timely in probing the subtleties found in earlier studies. Finally, we aim to highlight how the sociopolitical climate of Singapore influences trust-building measures embodied within e-governments.

3. Proposed Analytical Framework

To achieve the preceding research objectives, we synthesize (Doney et al. 1998) typology of trust-building processes with Sheppard and Sherman's (1998) characterization of relational grammars to construct a multidimensional analytical framework that decomposes the development of e-government systems into four progressive stages. Each stage reflects discernable improvements in citizen-government relations that evolve through trust-building mechanisms embedded within e-government systems.

In a comprehensive review of trust literature across multiple disciplines, Doney et al. (1998) identified five trust-building processes that are engaged by the trustor to determine the trustworthiness of the trustee (see Table 1).

However, the Doney et al. (1998) framework fails to account for how these processes vary with the degree of relational interdependency between the trustor and the trustee. Conversely, Sheppard and Sherman (1998) offer a rich characterization of trust relationships in the form of four relational grammars. According to Sheppard and Sherman (1998), relationships are distinguished by their form and depth of dependency. Based on the interplay of these two dimensions, four discrete relational forms are proposed: *shallow dependence*, *shallow interdependence*, *deep dependence*, and *deep interdependence*. A major distinction between shallow and deep relational forms resides in the ability of the trustor to monitor the actions of the trustee. Although the trustee may be subjected to scrutiny by

Table 1   **Trust-Building Processes and Implications**

Trust-building process	Evaluation criteria of the trustor	Implications for the trustee
Calculative	Trustor calculates the costs and rewards associated with the trustee for acting in an untrustworthy manner.	Trustor will trust the trustee when the former perceives that the net return from opportunistic behavior leads to forbearance for the latter.
Prediction	Trustor derives confidence from the predictability of the trustee's behavior.	Trustor will trust the trustee when past actions of the latter provide a basis from which to predict future behavior.
Intentionality	Trustor assesses whether motivations of the trustee are altruistic and benevolent.	Trustor will trust the trustee when the former deems the actions of the latter to be altruistic and personally beneficial.
Capability	Trustor assesses the trustee's ability to fulfill his or her promises.	Trustor will trust the trustee when the former deems the latter to be competent in achieving desired outcomes.
Transference	Trustor draws on referent sources from which trust is transferred onto the trustee.	Trustor will trust the trustee when third-party references trusted by the former attest to the trustworthiness of the latter.

Source: Adapted from Doney et al. (1998).

the trustor for shallow relational forms, the trustor's ability to regulate the trustee's actions is limited in deep relationships. In addition, each relational form entails distinct risks that must be mitigated by qualities of trustworthiness projected through trust-building efforts on the part of the trustee (Sheppard and Sherman 1998). Sheppard and Sherman (1998) claimed that the four relational forms are sequenced such that the risks associated with each form accumulate as relationships deepen. That is, shallow interdependence and deep dependence encompass risks associated with shallow dependence other than their own, whereas deep interdependence is vulnerable to the entire range of risks for the other three.

Shallow Dependence
Shallow dependence manifests when outcomes for the trustor are contingent on the actions of the trustee, i.e., there is a *unidirectional* dependency of the trustor on the trustee. Due to the asymmetrical nature of this relationship, the trustor is exposed to two primary risks: (1) the risk of *unreliability* (Coursey and Norris 2008) and (2) the risk of *indiscretion* (Horst et al. 2007).

The risk of unreliability is a concern of the trustor that the trustee will not act as anticipated. This risk may be more pronounced in e-government for two reasons. First, because governmental institutions have a lower degree of market exposure as compared to private enterprises, scholars speculate that there is greater incentive for these institutions to take advantage of e-government systems for pursuing partisan gains at the expense of public consumption (e.g., Cordella 2007, Coursey and Norris 2008, Grimsley and Meehan 2007, Torres et al. 2005). Teo et al. (2008) echoed similar warnings for e-government development in Singapore, claiming that "if a government shows sincere care for the citizens and is able to effectively conduct its services, citizens are more likely to believe that the e-government websites developed and maintained by the government will be able to serve their needs" (p. 104). Second, with e-governments poised to replace physical media (Accenture 2007), citizens run the additional risk that Web-enabled public services may be unreliable in fulfilling the same expectations and transactional requirements compared to their paper-based predecessors (Gefen et al. 2005).

Conversely, the risk of indiscretion—the preconception of the trustor that sensitive information will be shared indiscriminately—is a general worry of citizens in conducting e-government transactions (Bélanger and Hiller 2006, Carter and Bélanger 2005). Given the service monopolies of governmental institutions and the mandated nature of e-government transactions, citizens are fearful that personalized transactional data may be leaked to unauthorized entities (Horst et al. 2007, Tan et al. 2008). Such concerns are equally prevalent in Singapore and prompted the government to launch a nationwide program called TrustSg (http://www.trustsg .com.sg/). This program is aimed to boost public confidence in e-government transactions by holding governmental institutions to a stringent code of conduct in processing confidential personal information (Srivastava and Teo 2009).

To counter the risks of unreliability and indiscretion, Sheppard and Sherman (1998) emphasized the necessity for trustees to project qualities of competency, discretion, and reliability through the establishment of mechanisms that either "incite reliable, discrete behavior or deter unreliable, indiscrete behavior" (p. 428). In a way, Sheppard and Sherman (1998) admitted to the criticality of calculative- and capability-based trust-building processes—as defined by Doney et al.

(1998)—in maintaining shallow dependence relationships. Shapiro et al. (1992) noted that trust in any relationship is initially founded on a calculative basis. Calculative trust is deterrence based in that both parties conform to agreed behavioral protocols due to the fear of repercussions. It is sustainable as long as the deterrent is clear, feasible and likely to be activated whenever trust is violated (Doney et al. 1998). Embedding calculative-based trust-building mechanisms is hence deterministic in assuring citizens of the discretion or reliability of e-governments. Further, if e-governments are ill equipped to meet desirable service standards, then citizens are unlikely to forsake the physical medium (Teo et al. 2008). Therefore, the fusion of capability-based trust-building mechanisms with public e-services is important to instill confidence in citizens towards the competency of e-governments and to generate value over and above conventional media (Tan et al. 2008).

Shallow Interdependence

In shallow interdependence relationships, both parties rely on effective synchronization of behavior to fulfill desired goals (Sheppard and Sherman 1998). Because of this interdependency, such relationships may not only succumb to vulnerabilities that plague shallow dependence relationships, but they face the risk of *poor coordination* as well. Poor coordination—what Sheppard and Sherman (1998) referred to as "the risk of too little too late" (p. 424)—is a harmonization problem whereby the trustee is unable to deliver on his or her promise at the request of the trustor. Devadoss et al. (2002) presented an example of a coordination problem that arises in the e-procurement system of the Singapore government, GeBIZ. Devadoss et al. (2002) explained how initial resistance to GeBIZ was caused by misguided expectations for both vendors and the development team. Whereas vendors often compare the functionalities of GeBIZ to their own in-house procurement system, the development team assumes that vendors are aware of procurement and approval rules as built into the system. Poor coordination in e-government hence arises whenever transactional outcomes are varied and unpredictable based on past system performances (Warkentin et al. 2002). Sherman and Sheppard (1998) alleged that behavioral consistency for the trustee is instrumental in alleviating the risk of poor coordination.

Prediction-based trust-building process (Doney et al. 1998) are indispensable to the cultivation of shallow interdependence relationships in that the trustor confers trust on the trustee based on previous experiences that reinforce the predictability of the latter's behavior. Prediction-based trust is rooted in the consistency of the trustee's prior actions and the extent to which these actions are congruent with promised obligations (Doney et al. 1998). It is synonymous with both knowledge and process-based trust. Further, with more opportunities to observe a trustee via repeated transactions, the greater is the knowledge base of the trustor and the more predictable the trustee becomes (Bhattacherjee 2002, Shapiro et al. 1992). Whenever the trustee behaves responsibly to fulfill his or her obligations, the trustor increases his or her confidence towards the trustee and vice versa when the trustee fails to adhere to such obligations (Gefen et al. 2002). Prediction-based trust creation in e-governments is hence accomplished through repeated guarantees of service performance that deliver reliable transactional outcomes to citizens.

Deep Dependence

A deep dependence relationship is manifested when the trustor is entirely reliant on the trustee to attain desirable outcomes, and yet the trustee's actions are outside the purview of the trustor (Sheppard and Sherman 1998). Under such conditions, the trustee acquires immunity from any form of behavioral control that may be imposed by the trustor. As a consequence, the trustor runs the risk of *abuse* or *neglect*. There is a higher probability for the trustee to exploit such asymmetrical relationships to the disadvantage of the trustor (Eisenhardt 1989). With excessive powers of sanction and coercion, resorting to intimidation tactics can be an appealing option for governmental institutions (Henriksen and Damsgaard 2007, Vonk et al. 2007)—the extent to which technology may simply exist as novel channels for the perpetuation of bureaucratic formalization (Kraemer and King 1986). This may also happen in Singapore e-government systems, as inferred from Chan and Pan's (2008) portrayal of the legal permit application system for foreigner students. In this instance, the permit-granting government agency decides unilaterally to proceed with the development of the system before consulting relevant stakeholders. Despite competent execution of the decision (Chan and Pan 2008), this form of top-down management style in e-government development may breed complacency and culminate in the mistreatment of citizens.

Trustworthiness in deep dependence relationships stems from ensuring the accountability and integrity of the trustee to safeguard against the abuse or negligence of the trustor (Butler 1991). Conceivably, trust originating from a binding relational network (involving arbitrators and/or neutral third parties) would sustain deep dependence relationships by creating a community that collectively acts to enforce obligations and punish untrustworthy behaviors (Sheppard and Sherman 1998). When strong bonds exist in a relational network, a transference trust-building process may be triggered to allow trust to flow freely among

participants (Doney et al. 1998). The trustor transfers trust from a known entity to an unknown one—what Strub and Priest (1976) described as the *extension pattern* of acquiring trust by employing "third party's definition of another as a basis for defining that other as trustworthy" (p. 399).

The importance of such transference trust-building processes is indisputable for e-governments due to citizens' entrenched perceptions of obscurity surrounding governmental institutions (Vonk et al. 2007). As contended by Gefen et al. (2002) as well as Warkentin et al. (2002), the existence of independent institutional structures can serve as unbiased seals of assurance and external legitimization to assure citizens in conducting e-government transactions (see also Srivastava and Teo 2009).

Deep Interdependence

Deep interdependence relationships originate from extensive systemic and temporal linkages between the trustor and the trustee such that each is heavily dependent on the other for his or her preferred outcomes (Sherman and Sheppard 1998). Due to this mutual interdependency, both parties face the risk of *misanticipation*—that without specific instructions, one will not be able to anticipate the needs of the other (Sherman and Sheppard 1998). With the growing recognition that public consultation is vital to the development of citizencentric e-government systems (Hackney et al. 2007), the risk of misanticipation becomes critically relevant. Scholars have suggested that e-government may represent a window of opportunity through which continuous dialogue can be sustained between citizens and governmental institutions (Robbins et al. 2008) such that both parties eventually acquire the foresight, intuition, and empathy needed to maintain a deep interdependence relationship (Sheppard and Sherman 1998). Chan and Pan (2008), as well as Phang et al. (2008), have similarly called for citizens' participation to counter potential misanticipation that may emerge for e-government systems in Singapore.

Internalization (i.e., adopting another's beliefs and integrating them with one's own) is the process endorsed by Sheppard and Sherman (1998) to bind deep interdependence relationships, because through internalizing each other's preferences and desires, one's needs can be deduced without articulation. Internalization thus resonates with the Doney et al. (1998) theorization of intentionality-based trust-building processes in that trust is determined by the trustor's (unsubstantiated) expectation of the extent to which the actions of the trustee are altruistic and personally beneficial. The interpretation and assessment of empathetic intentions are bolstered whenever both parties share norms and values, which

enables one to better understand the other's goals and motivations (Grimsley et al. 2003). This mitigates the risk of misanticipation. Through internalization or intentionality-based trust-building, it is possible to cultivate a communal culture via e-governments such that participants from the same service community are unanimous in their beliefs regarding socially acceptable behavior (Grimsley et al. 2003).

Table 2 summarizes our integrated analytical framework. The analytical framework aligns with our research objectives for four reasons. First, the analytical framework subscribes to a multidimensional conception of trust that would yield valuable insights into how e-government systems can be engineered to support various trust-building processes. Second, by relating the risks affiliated with each of the four relational forms to the kind of trustworthiness qualities to be projected via e-government systems, the analytical framework can shed light on the developmental prescriptions and technological specifications that must be put in place to address these risks. Third, the progression of relationships from shallow dependence to deep interdependence, as captured in the analytical framework, translates to a process-oriented view of e-government developments. Finally, it is apparent from our earlier discussion that the analytical framework is applicable to trust-related issues for e-government systems housed in Singapore.

Utilizing the analytical framework illustrated in Table 2, we analyzed the proliferation of the E-Filing system and the IRAS' efforts to reorganize its tax practices for deepening its relationship with taxpayers from shallow dependence to deep interdependence. Particularly, we elaborate on how the E-Filing system, as a technological platform for enacting trust-building strategies, caters to the growing sophistication of risks experienced by taxpayers as their relationship with the IRAS deepens over time.

4. Methodology

An in-depth case research method is adopted for data collection. According to King (1996), case studies afford "a deeper understanding of the underlying process of organization change [within the context of] an information system" (p. 174). That is, they offer an opportunity to engage in theory building for areas where there is relatively little prior knowledge and demand rich descriptions of the social environment (Eisenhardt 1991, Yin 1994). Throughout data collection and analysis, we adhere to Klein and Myers' (1999) seven principles of interpretive field research.

4.1. Data Collection

Site selection began in 2001 with the shortlisting of governmental institutions that house e-government

Table 2   Taxonomy of Relational Forms and Corresponding Risks, Trustworthiness Qualities, and Trust-Building Processes

Relational form	Risks	Trustworthiness qualities	Implications for trust building
Shallow dependence	Due to the asymmetrical dependency of the trustor on the trustee, the former is exposed to risks of *indiscretion* (sensitive information released to the trustee may be shared indiscriminately with uninvolved parties), and *unreliability* (the trustee will not behave as obligated)	To counter associated risks, the trustee should exhibit qualities of *competence*, *discretion*, and *reliability*	To project desired qualities, the trustee should engage in *calculative-* and *capability-based* trust building such that the trustor will not only deem the trustee to be competent in fulfilling promised obligations, he/she can also be assured of the absence of opportunistic behavior
Shallow interdependence	Due to reliance on behavioral synchronization, the trustor is subjected to the risk of *poor coordination*, whereby the trustee is unable to deliver on his or her promise	To counter associated risks, the trustee should exhibit qualities of *consistency* and *predictability*	To project desired qualities, the trustee should engage in *prediction-based* trust building such that the trustor can affirm the dependability of the trustee through past interactions
Deep dependence	Due to the inability of the trustor to monitor the behavior of the trustee, the trustor is exceedingly vulnerable to exploitative actions by the trustee such as *abuse* and *neglect*	To counter associated risks, the trustee should exhibit qualities of *accountability* and *integrity*	To project desired qualities, the trustee should engage in *transference-based* trust building such that the trustor can rely on neutral third parties to testify to the trustworthiness of the trustee
Deep interdependence	Due to strong mutual dependency between the trustor and the trustee, the trustor runs the risk of *misanticipation* (i.e., without specific instructions, one will not be able to anticipate the needs and actions of the other)	To counter associated risks, the trustee should exhibit qualities of *empathy*, *foresight*, and *intuition*	To project desired qualities, the trustee should engage in *intentionality-based* trust building such that even without communication and/or observable evidence, the trustor can attest to the altruism of the trustee's actions

systems catering to a broad citizenry and establishing contacts with these institutions. Of the three sites shortlisted (i.e., the IRAS, the Central Provident Fund (CPF) Board and the Infocomm Development Authority of Singapore (IDA)), we were granted a preliminary interview with the CIO in October 2001 to assess our study requirements, and permission was eventually granted to investigate the E-Filing system. Site visits and the bulk of the interviews took place between 2002 and 2004. The site visits include firsthand observations of how the E-Filing system operates at close proximity during two annual tax cycles, and field notes were taken.

Concurrent with these site visits, focused, semistructured interviews were conducted with organizational members responsible for various developmental phases of the E-Filing system. In conducting the interviews, we remain vigilant against potential confounds warned by Myers (2008), such as the artificiality of the interview, the lack of trust, the lack of time, elite bias, and the presence of Hawthorne effects. Appendix B in the online supplement outlines our interview strategy. We began by consulting the chief information officer (CIO), who guided us through a detailed roadmap of how the tax-filing process has evolved over the years, eventually culminating in its migration onto the virtual medium. From the CIO's narration, the entire E-Filing journey can be divided into four distinctive milestones, each reflecting a quantum leap in the tax-filing process. These four phases can be further split into two categories, depending on whether they represent modifications to business functions (i.e., internal focus) or target interactions with extrinsic stakeholders (i.e., external focus). For phases with an internal focus, we interviewed senior executives from the IRAS, who are well positioned within the corporate hierarchy to offer insights into the structural changes imposed for the tax-filing process and the rationale behind them. For phases with an external focus, interviews were arranged with frontline staff, who can best relate the merits of the E-Filing system in streamlining communications and transactions with taxpayers. Through iterative interviews between the CIO (who supplied a high-level strategic overview) and other employees (who gave details on discrete developmental phases), we glimpsed a holistic picture of the IRAS' e-transformation journey, which led to the induction of the E-Filing system.

Due to the sensitivity of the IRAS as the national tax agency, interview requests for internal staff must be cleared by management. A detailed breakdown of the interviewees is shown in Appendix C (in the online supplement). Interviews generally lasted two hours for internal staff and followed a semiformal protocol.

We began with generic questions (see Appendix B) and then, building on responses to these questions, interviewees were further probed to clarify relevant issues. Particularly, attention has been paid to scrutinize the interaction of interviewees with the E-Filing system such that responses are not "[deflected to] the environment around the phenomenon rather than the phenomenon itself" (Silverman 1998, p. 11).

Apart from the site visits and interviews, in 2004 we were also granted access to a community center that was converted into a temporary e-filing hub to accommodate taxpayers who wished to e-file but were unable to do so at home. This gives us a chance to interview taxpayers and understand their motivations for utilizing the E-Filing system, despite having to expend the extra effort to journey down to the community center. Although approval from the IRAS management is required to conduct interviews at the community center, there are no restrictions placed on whom we contact. We thus practiced convenient sampling by interviewing any taxpayer in the community center who was free and consented to the interview. A total of 55 taxpayers were interviewed. Appendix D in the online supplement outlines our interview protocol for these taxpayer interviewees. Like the organizational interviews, interviewees were asked basic questions about why they opted to e-file and their evaluations about the E-Filing system. Depending on their answers, these taxpayers may be prompted to further elaborate on certain topics pertinent to our research objectives. Particularly with reference to our analytical framework, we were on the lookout for specific key words that may be mentioned by the interviewees in response to Questions 3 and 5 of our interview protocol (see Appendix D). The detailed demographic distribution of taxpayers interviewed is tabulated in Appendix E (in the online supplement). On average, interviewees are 35% females, between 30–49 years of age, have college education or higher, and income levels around SGD\$ 50,000–75,000. Paired t-tests reveal no significant differences in demographics between our taxpayer sample and e-government participants surveyed in academic (Tan et al. 2010) (i.e., $t_{(15)} = 0.000$, $p = 1.000$) and industrial (Pew Internet and American Life Project 2004) (i.e., $t_{(15)} = -0.041$, $p = 0.968$) studies. This indicates that our convenient sample is comparable to those reported in existing e-government studies.

Notes were taken during every interview to ease the transcribing process. All interviews were digitally recorded and transcribed. For each transcript, an outline was also drafted to sketch out the flow of the interview. Interview transcription occurred from 2002 to 2005. To ensure the integrity of the transcripts, intermediate drafts were reviewed by the interviewees involved and revised accordingly. Through these activities, we assembled a qualitative collation of 89 data points within the case environment that focus specifically on developmental prescriptions and technological specifications pertaining to the trust-building measures embodied within the E-Filing system (Eisenhardt 1991).

After transcribing the interviews, we gathered data from 2005 to 2006 in the form of archival records (e.g., annual reports), press releases, and news reports from various online sources to triangulate facts and events mentioned by interviewees. Due to the IRAS' practice of clearing interviewees, we deem the independent verification of interview transcripts to be a vital step in preventing confounds from biasing our empirical findings. Although data collection was completed by September 2006, we continued to stay in touch with the interviewees to remain updated on enhancements made to the E-Filing system.

4.2. Data Analysis
Thematic analysis was employed to analyze the data (Boyatzis 1998). Thematic analysis is a data-driven technique where codes are generated inductively from raw data (Boyatzis 1998), i.e., codes are created to explain the data rather than forcing a fit between data and predefined ideas (Orlikowski 1993). To perform thematic analysis, the initial step is to reduce the unprocessed data and identify patterns of interest among different interviewees. Because the unit of analysis for this study is the E-Filing system, the outline created for each transcript serves as a summary of raw data. Comparisons among the transcripts uncovered recurring patterns pertaining to how the IRAS functioned in the past, and the organizational changes brought about by the refurbished tax filing system. For instance, in one way or another, most interviewees expressed opinions regarding how relationships between the IRAS and taxpayers are reshaped by the E-Filing system. Although the CIO regards the E-Filing system as an ingenious innovation in redefining the role of taxpayers, frontline tax officials view it merely as a digital replica of conventional tax-filing processes aimed at streamlining operations. As a rule, related ideas were combined and categorized based on their perceptual proximities to a specific pattern.

Next, we consolidate and group related patterns into subthemes. Subthemes are units derived from patterns such as "conversation topics, vocabulary, recurring activities, meanings, feelings, or folk sayings and proverbs" (Taylor and Bogdan 1984, p. 131). Subthemes are identified by "bringing together components or fragments of ideas or experiences, which often are meaningless when viewed alone" (Leininger 1985, p. 60). Continuing with the previous example, it can be inferred that attitude was one of the

patterns associated with the subtheme of *"Purpose of E-Filing System"* in altering the tax-filing process. There were other patterns that collectively can be collated under subthemes such as the pros and cons of the E-Filing system, as well as its impact on stakeholder relations. In total, we developed 43 subthemes that match our research objectives. Known as *Open Coding*, this exercise represents an unpolished classification of identified patterns (Orlikowski 1993). However, subthemes isolated in the open coding phase of analysis were still very much disjointed and must be reassembled into meaningful theoretical concepts (Orlikowski 1993). Associations among subthemes were made primarily by referencing constructs from our analytical framework (see Table 2). Termed *axial coding*, this step acts as a foundation for conceptual interpretation. Essentially, subthemes from open coding were generated from general sociotechnical constructs related to system implementation and then pieced together, via axial coding, to yield themes that confer a meaningful comprehension of the phenomenon of interest. Furthermore, as a modification to traditional axial coding procedures, we organize themes and their associated subthemes in chronological sequence, thereby preserving the order in which risk and trust events manifest. This in turn enables the reconstruction of a process-oriented view of the development of the E-Filing system (Sabherwal and Robey 1995). Appendix F (in the online supplement) illustrates the process of open and axial coding, whereas Appendix G (in the online supplement) summarizes the extent to which concepts in our analytical framework were mentioned by interviewed taxpayers based on open and axial coding. All risk and trust constructs were covered in the interviews with calculative- and capability-based trust having the highest hit rate at 96%, and the risk of indiscretion being the least mentioned with a hit rate of 13%. For interpretive coding, it should be stressed that the "coherence of ideas rests with the analyst who has rigorously studied how different ideas or components fit together in a meaningful way when linked together" (Leininger 1985, p. 60).

Eliciting informants' feedback on identified themes in conjunction with coding activities is crucial because it aids in verifying events within the case. As stated by Yin (1994), even though disagreements may arise over interpretations and conclusions, there should not be any dispute over the facts of the case. Consequently, whenever conflicts do arise over investigators' interpretation of case data and informants' recollection of events, it signifies an obligation to search for extra evidence. Our data collection and analysis thus adheres to an iterative process whereby preliminary themes discovered in the first half of the study were infused into subsequent interview sessions to stimulate a deeper scrutiny of emerging themes (Boyatzis 1998). This strategy helps to extract neglected information from interviewees because they may recall events that have been forgotten during earlier conversations. Data collection was concluded when themes became repetitive and information appeared to have reached saturation.

In the final stage of analysis, selective coding was employed to integrate and refine concepts in order to ascertain the central premise of the study (Strauss and Corbin 1990). By connecting themes that emerged from axial coding, we formulated explanations for relationships that describe the underlying "story" (Strauss and Corbin 1990). The development of a focal premise also ensures thematic consistency and reliability (Yin 1994). From selective coding, themes corresponding to developmental prescriptions for the E-Filing system were linked with the type of trust-building process for which they are affiliated.

4.3. Validity of Methodological Procedures

Klein and Myers (1999), responding to calls for a set of evaluative criteria in assessing qualitative methodologies within information systems, prescribed seven principles for interpretive field research. They further applied these principles to the assessment of three published interpretive field studies to demonstrate their validity in gauging qualitative research (Klein and Myers 1999). Because the seven principles of Klein and Myer's (1999) represent one of the most comprehensive and systematic frameworks to unify interpretive field research, we have endeavored to adhere to these principles in conducting our case study. Table 3 explicates our efforts at aligning the case methodological procedures with those seven principles advocated by Klein and Myer (1999).

5. Case Analysis

Singapore has pursued a sociopolitical system that assimilates the tenets/principles of Western-style democracies with Confucian values (Neher 1994, Roy 1994). Such a system has two distinguishing characteristics: (1) it combines a market-oriented economic system with "a kind of [paternalism] that persuades rather than coerces," and (2) it is communitarian in that it emphasizes "conformity to group interests over individual rights" (Roy 1994, p. 231, see also Neher 1994). Although often criticized for its pursuit of economic development at the expense of deep liberties, George (2005) acknowledged that the Singapore government is backed by a significant degree of consent on the part of the citizens due to "their not-unfounded faith that the government will continue to deliver rising standards of living" (p. 905). This is reflected in high levels of political apathy among Singaporeans (Skoric et al. 2009). Although the Singapore government is in favor of greater

Table 3   Comparison of Methodological Procedures to Klein and Myer's (1999) Seven Principles of Interpretive Field Research

Principle	Evaluative criteria for principle [as summarized from Klein and Myers 1999, p. 72]	Methodological procedure for our study (adheres to the principle by...)
Fundamental principle of the hermeneutic circle	"Requires that understanding is achieved by iterating between considering the interdependent meaning of parts and the whole that they form"	Shaping our appreciation of the IRAS' e-filing journey through iterative interviews being conducted between the CIO (who supplied a high-level strategic overview) and other employees (who elaborated on details of discrete developmental phases) (see Appendix B)
Principle of contextualization	"Requires critical reflection of the social and historical background of the research setting, so that the intended audience can see how the current situation under investigation emerge"	Interviewing not only the CIO (who bears witness to the historical evolution of the E-Filing system from start to end), but also representatives involved throughout different developmental phases to gain an appreciation of the organizational events and decisions leading up to the introduction of the E-Filing system (see Appendix B)
Principle of interaction b/w researchers and participants	"Requires critical reflection on how the research materials (or 'data') were socially constructed through the interaction between the researchers and participants"	Following an iterative interview strategy whereby preliminary themes isolated in the earlier half of the study were incorporated into subsequent interviews to obtain informants' feedback and ensure that disputes do not occur over the facts of the case
Principle of abstraction and generalization	"Requires relating the idiographic details revealed by the data interpretation through the application of principles one and two to theoretical, general concepts that describe the nature of human understanding and social action"	Drawing on our integrated analytical framework to identify marked changes in the type of risk experienced and shifts in trust-building efforts that are brought about by incremental enhancements to the E-Filing system (see Appendix F)
Principle of dialogic reasoning	"Requires sensitivity to possible contradictions between the theoretical preconceptions guiding the research design and actual findings (the story that the data tell) with subsequent cycles of revision"	Generating subthemes from general sociotechnical concepts related to system implementation for the open coding phase before combing these subthemes to form a holistic picture of the phenomenon under investigation via the application of our analytical framework (see Appendix F)
Principle of multiple interpretations	"Requires sensitivity to possible differences in interpretations among the participants as are typically expressed in multiple narratives or stories of the same sequence of events under study; similar to multiple witness accounts even if all tell it as they saw it"	Gathering data from multiple sources including the CIO (who is privy to the strategic mission of the E-Filing system), organizational employees (who are knowledgeable about details of discrete developmental phases), and citizens (who experienced the resultant E-Filing system firsthand) (see Appendix C)
Principle of suspicion	"Requires sensitivity to possible biases and systematic distortions in the narratives collected from the participants"	Triangulating multiple data sources (i.e., site visits, fields notes, semistructured interviews, archival records, and press statements) to verify the consistency of organizational events and facts. We also acknowledge that the sensitive nature of the IRAS precludes us from ruling out the possibility that a certain degree of data censorship is practiced even though it is undetectable through our data analysis

political openness, it insists that such changes must be incremental and carefully managed (George 2005). True to this philosophy, the Singapore government has progressively introduced e-government systems that support the proactive engagement of citizens (Chan and Pan 2008). It is against such a backdrop that the E-Filing system was conceived.

The Singapore government was confronted with an escalating amount of outstanding tax revenue during the 1980s. Unprocessed tax returns stockpiled in the Singapore Income Tax Department (SITD) and caused administrative lags that agitated both organizational staff and taxpaying citizens. The IRAS was inaugurated in 1992 to clear the bureaucratic backlog and repair the tarnished image inherited from its predecessor. This corporate mission guided the IRAS in its reengineering of the tax administration process as an integrated information system, which led to the lowering of staff turnover and a general increase in public confidence. With the launch of the SGD\$ 1.9 million E-Filing system on February 16, 1998, taxpayers have since been able to file their income returns entirely via the Internet. In a service quality survey conducted by Forbes Research in October 2003, 2,466 respondents expressed great satisfaction with the IRAS' e-filing services. Over 80% of respondents agreed that the time and money spent on fulfilling tax obligations were reasonable. When respondents were further asked to

rate their satisfaction with the IRAS compared to other business and governmental establishments, the tax agency emerged third in the nation. The IRAS has recovered its investment in the E-Filing system with a take-up rate of 961,806 taxpayers in 2010, constituting 62% of the taxpaying population (IRAS 2010).

Applying our analytical framework to the case of the E-Filing system, we can segregate its evolution into four sequential developmental phases that comply with progression in citizen-government relationships from shallow dependence to deep interdependence. Appendix H (in the online supplement) highlights key milestone events associated with the four developmental phases. The remainder of this section will: (1) describe each of the four developmental phases in greater detail, (2) explicate the risks inherent to the type of citizen-government relationship for a particular phase, and (3) analyze how the strategic deployment of technology by the IRAS translates into trust-building measures aimed at alleviating these risks.

5.1. Phase I: Centralization of Database via Digital Imaging

Inherited from the days of its predecessor, the IRAS initially supports *shallow dependence* relationships with taxpayers. Taxpayers are unable to exert much control over the IRAS' actions:

> In the past, we view taxpayers as people who owe us money. To be honest, it is difficult to see taxpayers as customers because they are bonded by law to pay taxes . . . In fact, if they don't pay us, we will jail them. (Tax Officer)

This unilateral dependency of taxpayers on the tax agency reinforces a rigid establishment with unsatisfactory service performance and casual business operations. Taxpayers' records were kept in physical folders and tax officers had to take turns going through every case file, culminating in lengthy delays and frustration for everybody involved:

> We had difficulty clearing all the returns . . . it took us a year and a half to clear the lot, so a lot of people got angry. Also, at the end of each year, we always had about 300 tax returns we could not collect and it just kept snowballing. (Senior Tax Officer)

Above all, there is no proper authorization system to restrict illegitimate access to these folders, and taxpayers face the risk of *indiscretion* in that there is no stopping any employee from the tax agency from gaining access to and tampering with sensitive personal information. Further, due to a lack of documentation on the location of tax folders, the risk of *unreliability* becomes a genuine concern for taxpayers because they cannot be properly served despite making the trip to the IRAS:

> The problem with paper folders is the need to search for them; you do not know who has the documents. Taxpayers

can come unannounced. Whenever they are here, you will have to retrieve their folders. Because not everything was online in the past, we had great difficulties in locating the folders . . . . It became embarrassing and taxpayers got very agitated. 'Why did you lose my file?' That was their reaction. (Senior Tax Officer)

To counter public perceptions of indiscretion and unreliability with the tax administration, the IRAS ushered in an entirely new corporate vision that redefines its role as the government tax collector:

> Our vision is to be the leading tax administration in the world. While taxpayers have no choice about paying taxes, we believe in making that experience as pleasant as possible . . . We believe that through excellent taxpayer service, we can bring about higher levels of compliance. (CIO)

True to its renewed mission, the IRAS installed a digital imaging system in 1992. The imaging system houses digitized images of documents on a centralized database accessible only to authorized tax officials. Details of every interaction (including complaints and feedback) that transpired between the IRAS and taxpayers are recorded. The centralized database benefits both the IRAS and taxpayers alike.

For taxpayers, the centralized database epitomizes a symbolic move towards transparency for a governmental institution that has long been shrouded in bureaucratic secrecy. Through strict abidance to digitally archived information when dealing with taxpayers, a central repository of transactional data provides a visible and legally enforceable deterrence mechanism binding both parties:

> Our staff will use the Incident Report Database to log any complaints or system problems experienced by taxpayers. We can then take appropriate action based on the incident report. (IT Specialist)

In this sense, the centralized database represents an e-government system introduced by the IRAS to impose self-censorship and fosters *calculative-based* trust with taxpayers because the former is now compelled to exercise *discretion* concerning interactions with the latter.

A database of digitized tax information also enables the IRAS to project an image of competency and reliability. With the central database, the inefficiencies of previous years were reduced substantially through authorizing multiple and concurrent access for any digitized tax profile. In turn, this augments the *reliability* of the tax agency by eliminating delays and ensuring service continuity for taxpayers.

Leveraging on the centralized database, the IRAS can also offer "one-stop" tax-filing services because every tax officer is now sufficiently equipped with the relevant information to instantaneously respond to taxpayers' enquiries. Such "one-stop" tax-filing services improves the *competency* of the tax agency in

answering spontaneous inquiries by taxpayers and even preempts probable enquiries at times:

> The IRAS e-filing portal is easy to use. I can click on the help buttons for further information on each field. The e-filing website helped me to understand the steps and procedures in filing tax here in Singapore sometimes even without having to talk to a representative. (Taxpayer)

In transforming the IRAS to become more competent and reliable in serving taxpayers, the centralized database serves the dual role of a *capability-based* trust-building mechanism as well.

5.2. Phase II: Development of Inland Revenue Integrated System (IRIS)

The digitization of taxpayer information fuelled the possibility of a majority of the submitted tax returns to be processed without physical intervention. The IRAS estimated that 80% of tax returns are "normal" and do not require further verification by tax officials. The desire for more-efficient human resource allocation thus gave birth to the Inland Revenue Integrated System (IRIS) in 1995. The IRIS embodies a set of predefined criteria used to process 80% of normal tax returns. The remaining 20% are then routed via an automated Workflow Management System (WMS). The WMS is a subsystem within the IRIS that employs a series of complex case-matching rules to channel unique tax cases to appropriate tax officers. This streamlined tax valuation system thus frees manpower resources to deal with more-complicated tax returns while simultaneously enforcing stringent controls modeled after physical tax administrative procedures. The induction of the IRIS thus advances the relationship between the IRAS and taxpayers to that of *shallow interdependency* where the successful enactment of the 80/20 policy is shouldered by both parties. However, in a shallow interdependence relationship the risk of *poor coordination* predominates. Whereas the IRAS has to believe that taxpayers are truthful in their income declarations, taxpayers must be convinced that the IRIS can accurately process tax returns if it is supplied with correct income figures. Unfortunately, this mutually trusting relationship does not come easily.

For the IRAS, there exists significant organizational inertia towards the 80/20 tax filing model:

> The main idea is that we must accept the new tax filing model [80/20 rule] and so there must be a change in mindset ... there are a lot of obstacles when you have to throw the old thinking out. A number of tax officers have argued that: "No, this [manual tax return verification process] is the right way. We must still check and things like that. (CIO)

The same can be said for taxpayers as interviewees expressed doubts over their limited knowledge of the tax-filing process. As remarked by one of the taxpayers:

> I really don't have a clue as to what happens when I submit my tax return ... I would feel more reassured if the tax agency can provide more information on the tax filing process.

To address the risk of poor coordination, the IRIS is equipped with tracking capabilities to guarantee *consistency* and *predictability* in tax processing:

> Whenever a taxpayer approaches us, the first thing we do is to retrieve his record. Using IRIS, entering their identity card number will get us a record of their last correspondence together with whom they have spoken to. In the past, we wouldn't have known who the last person to handle the case was, unless the taxpayer himself had taken down the name of the officer he had contacted. (System Engineer)

Conversely, through the deployment of the IRIS, the tax agency is able to monitor the transactional history of taxpayers closely in order to remain vigilant against any distortions or false declarations of tax returns. To a large extent, this safeguards the IRAS from delinquent taxpayers:

> The IRAS website has a transaction history section where I can look back on all my past transactions ... IRAS has records of my past year relief claims ... In short, there is peace of mind knowing that filing is complete upon acknowledgement from the IRAS. (Taxpayer)

Clearly, the IRIS provides both parties with records of the chronological chain of events leading to specific consequences. This fosters *prediction-based* trust between the IRAS and taxpayers through conferring knowledge for how future outcomes may be precipitated by current/past behavioral actions.

5.3. Phase III: Induction of E-Filing System with Autoinclusion Scheme

Even with the digital imaging system, physical data entry is still unavoidable, which prompted the IRAS to seek out ways to automate the data input function. The growing popularity of the Internet around that period hence caught the attention of the IRAS, and a decision was made to replicate the physical filing experience virtually. The E-Filing system was launched in 1998 for salaried employees, and its service base was enlarged in subsequent years to include all individual taxpayers. In a bid to make e-filing effortless for taxpayers, the IRAS coordinated with other governmental institutions and business organizations to submit employment information on behalf of their employees every tax cycle—which the tax agency termed the autoinclusion scheme. The autoinclusion scheme is initiated by the IRAS to secure employers' endorsement of the revised E-Filing business model. The design of the E-Filing system is such that once a taxpayer's employment information has been uploaded to the

database, all that remains for the taxpayer is to submit a series of "zero" returns. A critical reason behind this unidirectional data transfer policy, as explained by the CIO, is that it reduces the likelihood of transferred tax information being intercepted by hackers:

> *A lot of information is already captured by the system, so what we need for e-filing is for the taxpayers to complete the remaining portions. As such, the information [available via the E-Filing system] of the taxpayer is never a complete picture; it would be meaningless to anyone without the rest of the data [retained by the IRAS].* (CIO)

To date, the autoinclusion scheme has been supported by data transfer agreements with a total of 6,576 organizations, or 11% of all Singaporean companies. These companies account for more than 50% of all employees in the country according to statistics released by the IRAS. Arguably, the inauguration of the E-Filing system and the autoinclusion scheme marks a new relationship between the IRAS and taxpayers that resembles *deep dependency*, i.e., taxpayers are forced to accept the E-Filing system and its data transfer arrangement whenever the tax agency secures the consent of their employers. For the IRAS, the autoinclusion scheme signifies significant mutual benefits for both the tax agency and the taxpayers by improving the accuracy of filed tax returns and resolving perplexing tax administrative matters at their source (employers):

> *We prefer [auto-inclusion] because first of all it is very accurate. [Before], the taxpayers sometimes enter the information wrongly . . . [Now,] whether an item is taxable or not, we will arrange with the employers to spare taxpayers the trouble.* (Tax Officer)

These views are not necessarily shared by taxpayers. The autoinclusion scheme imposes another layer of procedural obscurity over and above physical tax administrative processes. Miscalculated tax payments in the E-Filing system have become harder to detect for taxpayers. Furthermore, due to "behind-the-scene" arrangements between the IRAS and employers, taxpayers are often unaware of how taxes are computed. This gives rise to dangers of data integrity and probable causes for *abuse* or *neglect*:

> *I am wary of the accuracy of the information being transmitted by my employer. The implication or interpretation for certain income may be a bit different.* (Taxpayer)

Working together with taxpayers and their employers, the IRAS has taken significant strides in recent years to strengthen the credibility of the autoinclusion scheme and the integrity of the E-Filing system. It reversed the unidirectional data transfer policy by permitting taxpayers to review transmitted employment information and also collaborated with these stakeholders to ameliorate interpretation issues:

> *We need to go through the whole process and let taxpayers see it the way we do . . . When we perform testing of the*

> *system, we will involve taxpayers. If we obtain unexpected results, we will ask the taxpayers to explain their interpretations* (System Engineer)

Involving employers who are impartial to the tax-filing outcome holds the IRAS to greater *accountability* and subjects the E-Filing system to magnified scrutiny that corroborates its *integrity*:

> *Since my company has an arrangement with IRAS, I don't have to worry about keeping track of my income information . . . My employer has all my income information and they should be the most accurate.* (Taxpayer)

The E-Filing system together with the autoinclusion scheme is tantamount to the creation of a virtually integrated enterprise e-government solution that allows the IRAS to capitalize on the credibility of neutral third parties (e.g., employers) to foster *transference-based* trust with taxpayers.

5.4. Phase IV: Cultivation of Extended Knowledge-Sharing Network

Following inception of the E-Filing system the IRAS maintained 24-hour customer service during every tax cycle to monitor the system. Besides system maintenance, the IRAS spared no expense to enhance the E-Filing experience. At the end of each tax cycle, a postmortem is performed to review the problems that occur during the tax-filing period, and which includes addressing the large number of customer queries. These measures form the basis for devising improvements for the next financial year.

> *The post-mortem exercise is to gather taxpayers' opinions . . . to put ourselves in their shoes and incorporate their views in whatever we do, so as to deliver improvements that will be well received by taxpayers.* (Customer Service Representative)

An independent taxpayer feedback panel was created in 1999 consisting of a representative cross section of taxpayers. The panel convenes quarterly to assess e-filing services, to generate fresh ideas, and to deliberate on suggestions to meet the changing needs of taxpayers. Relevant information is gathered through digital communication avenues (e.g., feedback forms and online forums) accessible from the e-filing website. The cultivation of a knowledge-sharing network between the IRAS and taxpayers marks the transition to a *deep interdependence* relationship whereby both parties become equally reliant on each other to move forward. This subjects both parties to the risk of *misanticipation*. For the IRAS, taxpayers' feedback is crucial in guaranteeing that investments in future enhancements to the E-Filing system will not be in vain:

> *We may receive up to hundreds of customer enquiries daily . . . We see these as learning opportunities. It is accessible to every tax officer so that we may all learn from the*

mistakes. We do keep track of comments from taxpayers on things we did not do well, and the staff will come up with possible solutions. (Customer Service Representative)

Conversely, taxpayers have grown increasingly dependent on the IRAS for advice and guidance whenever they encounter difficulties during e-filing. With the Internet being readily accessible, taxpayers are no longer constrained by the means through which to make enquiries or voice their displeasures:

Taxpayers just treat emails like a chat room. They keep sending and complain of lateness or failure to respond. They expect instant replies. (CIO)

Through bidirectional communication avenues made available via the E-Filing system, both the IRAS and taxpayers revisit each other's priorities on a regular basis. In so doing, both parties acquire the *empathy*, *intuition*, and *foresight* necessary for *intentionality-based* trust to be manifested. Whereas the IRAS gains a better appreciation of taxpayers' service expectations, taxpayers can also better comprehend the organizational constraints behind the E-Filing system. With each passing tax cycle, the E-Filing system becomes more aligned with taxpayers' service expectations:

There is excellent service at the e-file helpline. Also, there are user-friendly fields with help buttons. The entire set up in e-filing is meant to be easy for taxpayers. The system has user-friendly navigation, simple interface, easy for anyone to get tax filing done without adding more grief to the already undesirable task. (Taxpayer)

The same sentiments were echoed by another taxpayer:

The [*E-Filing*] *system seems to get simpler every year. I think initially we had to calculate our taxes manually and enter it into the system. Now, all calculations are done by the system. Also, with the system, we don't have to do lots of deduction ourselves. Before, we have to enter personal allowance ourselves. Now we don't.* (Taxpayer)

Grounded in our integrated analytical framework, Appendix I highlights the core analytical findings from our case analysis of the IRAS' E-Filing system.

6. Discussion and Conclusion

Theoretical and pragmatic lessons can be drawn from the case of the IRAS' E-Filing system in crafting e-government systems that restore trust to citizen-government relationships. In this section, we will relate our empirical findings to extant literature in deriving generic developmental prescriptions and technological specifications that are applicable to e-government systems in general before summarizing the theoretical contributions, pragmatic implications, and limitations of this investigation.

6.1. Discussion of Analytical Findings

In line with recent advances in design theory (Gregor and Jones 2007), we differentiate between the *design process* and the *design product* in presenting our findings. Whereas the design process is concerned with the developmental aspects of an artifact, the design product relates to actual technological features of the artifact that satisfy these developmental considerations. In the context of the E-Filing, the system not only exhibits properties of enterprise systems by cutting across the functional hierarchies of the tax agency to create a unified information architecture, but it also possesses extended enterprise capabilities through the establishment of relational and knowledge-sharing networks with external entities. Therefore, whereas the design process deals with the developmental prescriptions to be gleaned from the E-Filing system, the design product is analogous with its technological specifications.

6.1.1. Calculative-Based Trust. Cost-benefit analysis is integral to building calculative-based trust because trusting another "implicitly mean[s] that the probability that he will perform an action that is beneficial or at least not detrimental to us is high enough for us to consider engaging in some form of coordination with him" (Gambetta 1988, p. 217). From a managerial standpoint, our case findings testify to the necessity of building calculative-based trust under conditions of shallow dependency for which the dependent party is unlikely to trust its dominant partner. This is especially so for governmental institutions given their natural service monopolies (Teo et al. 2008). For e-government systems to build calculative-based trust, our analysis indicates that the design process must include options for citizens to challenge the decisions of governmental institutions while concurrently offering fair grounds for litigation and resolution. This observation coincides with Grimsley and Meehan's (2007) contention that e-government systems are trusted by citizens whenever they instill a sense of control. To realize such a developmental prescription our analysis suggests that e-government systems should contain deterrence mechanisms like a centralized database, in which the details of every transactional activity are documented with a result to bind both parties during disputes—what Gefen et al. (2002) referred to as institutional guarantees.

6.1.2. Capability-Based Trust. Inheriting a paper-based tax administration system, the IRAS had its share of service irregularities due to sloppy business practices. In failing to meet its service obligations, the IRAS was originally viewed by taxpayers as being incompetent in fulfilling its responsibilities.

Therefore, building capability-based trust is imperative for the IRAS to redeem itself in the eyes of taxpayers. Trust derived from a capability-based trust-building process is founded on an expectancy held by the trustor that he/she can count on the trustee to discharge his or her duties (Doney et al. 1998). By the same reasoning, the IRAS has bolstered its competency and reliability through delivering quality tax-filing services, such that even though taxpayers are obliged to file taxes, they will not find the experience to be unpleasant. Our case findings not only echo previous empirical work (e.g., Parent et al. 2005; Tan et al. 2008, 2010) in which service quality was found to be a salient predictor of citizens' trust, but also point to the pivotal role of "one-stop" services in ensuring service quality.

6.1.3. Prediction-Based Trust. Although the induction of the IRIS has streamlined business processes for the tax agency, adoption of the new [80/20] tax-filing model has tilted the scale in taxpayers' favor. Although taxpayers are still very much dependent on the IRIS to process tax returns credibly, the success of the IRIS is equally dependent on taxpayers to correctly input income figures. Cultivating prediction-based trust between the IRAS and taxpayers is thus instrumental in reassuring both parties that it is improbable for the other partner to engage in deviant behaviors that might distort tax-processing outcomes (Doney et al. 1998). Through incorporating tracking capabilities into the IRIS, both the IRAS and taxpayers are able to scrutinize the entire workflow process such that abnormalities on either side can be detected early. In this sense, the IRAS is pursuing the ideal of complete procedural transparency in the design process, which was proved by Welch and Hinnant (2003) to be predictive of citizens' trust in governments. To attain transparency, the agency is acting as a trans-active memory (Wegner et al. 1991) for both parties through which every aspect of taxpayers' interactions with the IRAS is monitored. This process serves to reference previous correspondences with the purpose to detect deceitful actions and/or predicting future outcomes with a high degree of congruency (Bhattacherjee 2002, Shapiro et al. 1992). Our findings corroborate the untested proposition of Warkentin et al. (2002) that citizens' knowledge of the interactional process engenders trust perceptions.

6.1.4. Transference-Based Trust. The autoinclusion scheme is an ingenious component of the design process to streamline tax-processing activities. By automating data input functions via the E-Filing system, employers can directly transfer employment information for their employees into the IRAS' centralized database for speedier processing. However, as shown in our case analysis, the induction of the autoinclusion scheme forces taxpayers into deep dependency because they are compelled to unilaterally accept the E-Filing system and any prearrangements (e.g., unidirectional data transfer policy, predetermined income taxability issues) the moment the tax agency secures the endorsement of their employers. Transference-based trust must be present to allay taxpayers' fears of abuse or neglect by the tax agency. Transference-based trust originates from indirect sources of assurance, such as intermediate arbitrators or mediators (Warkentin et al. 2002). From our case analysis there is an obvious spillover effect from the autoinclusion scheme, such that trustworthiness of employers positively influences perceptions of the E-Filing system over manual tax filing. Through the creation of an extensive data-sharing network centered on the E-Filing system, the IRAS builds transference-based trust by exploiting the credibility of trusted third parties like employers (Gefen et al. 2002).

6.1.5. Intentionality-Based Trust. Intentionality-based trust is founded on trustor's conviction that the trustee's actions are altruistic and personally beneficial (Doney et al. 1998). Intentionality-based trust is especially pertinent in advanced stages of e-government maturity. This can be witnessed from the deep interdependence relationship described in our case analysis, whereby both the IRAS and taxpayers are hesitant to move forward without input from each other. Whereas the IRAS is reliant on taxpayers' feedback to recover its investments in future enhancements to the E-Filing system, taxpayers have grown accustomed to seeking advice and guidance from the IRAS for when they encounter difficulties during e-filing. To build intentionality-based trust, the IRAS has leveraged on the technological capabilities of the E-Filing system to offer convenient channels of communication and to cultivate an atmosphere conducive to candid interactions. The significance of such a move has been justified by Grimsley et al. (2003) as well as Grimsley and Meehan (2007), who acknowledged that citizens' sense of being well informed is indicative of their trust in government. Further, by sharing knowledge with each other taxpayers can make known their expectations about the E-Filing systems, and the IRAS can better communicate its organizational constraints in hopes of gaining taxpayers' empathy for unattainable service standards. An extended knowledge-sharing network, as captured in the design process of e-government systems, thus offers the perfect opportunity for citizens and governmental institutions to internalize each other's values and preferences such that consensual e-government solutions can be found (Chan and Pan 2008).

Table 4 depicts our proposed model for restoring public trust through e-government development.

Table 4   E-Government Developmental Model for Restoring Public Trust

Mode of trust	Implication for trust building	Developmental prescriptions for e-government systems [design process]	Technological specifications for e-government systems [design product]
Calculative-based	Derived from the extent to which the trustor believes that the costs incurred by the trustee for deceitful behaviors outweigh the benefits	Governmental institutions must permit citizens to challenge the decisions of public administration while concurrently offering fair grounds for litigation and resolution through e-government systems	To faithfully capture the details of every transactional activity for validation in cases of disputes such that these institutional guarantees act as self-imposed deterrence mechanisms to bind the actions of governmental institutions
Capability-based	Derived from the extent to which the trustor believes that the trustee possesses the abilities to fulfill his or her promises	Governmental institutions must guarantee service quality in e-government systems in order to make the service experience a satisfactory one for citizens	To offer "one-stop" services that not only ensure a single point of contact for citizens to resolve any enquiry, but also maintain a homogeneous level of quality in serving any citizen
Prediction-based	Derived from the extent to which the trustor is able to predict future outcomes based on the current actions of the trustee	E-government systems must render the entire workflow process transparent to both governmental institutions and citizens such that both parties are fully aware of how outcomes are precipitated on past events that have transpired	To not only capture every aspect of citizens' interactions with governmental institutions, but also the chronological order with which correspondences occur such that both parties are knowledgeable of how certain outcomes may surface from performing particular actions
Transference-based	Derived from the extent to which the trustor has assurances from neutral third parties attesting to the trustworthiness of the trustee	Governmental institutions must exploit the technical capabilities of e-government systems to reach out and connect with credible external entities in order to secure their endorsement for public e-service offerings	To incorporate the range of carrier technologies and be versatile in accommodating varied technological architectures of external organizations so as to become the backbone of an extended enterprise e-government solution
Intentionality-based	Derived from the extent to which the trustor believes the actions of the trustee to be altruistic and benevolent	E-government systems must entail the entire spectrum of IT-enabled communication channels in order to eliminate any inhibitions for citizens to participate in knowledge-sharing networks	To leverage on readily accessible and inexpensive information technologies in innovating novel methods of engaging citizens in candid interactions

6.1.6.   Impact of Sociopolitical Climate. It can be deduced from our case analysis and the preceding discussions that the sociopolitical climate of Singapore does not invalidate the generalizability of our developmental prescriptions and technological specifications for e-government systems (see Table 4). Instead, the Singaporean climate *accelerates* the speed with which these recommendations become reality. As can be inferred from our case analysis, the E-Filing system qualifies as an extended enterprise e-government solution that benefits tremendously from network externalities (Heeks and Stanforth 2007), i.e., the greater the number of stakeholders who participated in the network, the more beneficial it is for all. However, such advanced e-government solutions are rare in practice due to the blend of sociopolitical barriers that prohibit collaboration among stakeholders (Coursey and Norris 2008) and an absence of visible benefits (Irani et al. 2005, 2008). A key finding from our case analysis is that governments may need to adopt an authoritative stance to push through acceptance barriers and generate the critical mass necessary to produce tangible benefits. For

instance, the autoinclusion scheme was a unilateral decision made by the IRAS, but with the growing number of employers who participated in the scheme, its advantages gradually become apparent to taxpayers. Evidence of the merits of such hard-selling methods in e-government developments can also be seen in the Danish government's e-Day system, whereby it dictates that communications among governmental institutions must adhere to digital formats (Henriksen and Damsgaard 2007). Since its inception, there has been a noticeable increase in the number of electronic messages exchanged among Danish governmental institutions (Henriksen and Damsgaard 2007). Of course, the danger of a top-down leadership style is the tendency to prioritize organizational concerns above stakeholders' voices—as evidenced by enforcement of the unidirectional data transfer policy when the autoinclusion scheme was first introduced. However, our case analysis demonstrates that it is possible to achieve mutual understanding between taxpayers and the IRAS based on the latter's subsequent willingness to listen to taxpayers' opinions for how to improve the E-Filing system.

6.2. Theoretical Contributions

In a comprehensive review of e-government developmental models, Coursey and Norris (2008) stated that existing frameworks are neither founded on a strong conceptual base nor are supported with empirical evidence, and hence have grossly underestimated the obstacles involved in developing e-governments. These authors have thus challenged future inquiries to present e-government developmental guidelines that are theoretically grounded and incorporate citizens' service expectations. Answering their call, this study advances an e-government developmental model that can potentially reinstate trust among citizens as previously shown to be a salient driver for service utilization (e.g., Bélanger and Carter 2008). This study hence contributes to theory in four ways. First, in synthesizing Doney et al. (1998) trust-building processes with Sheppard and Sherman's (1998) relational grammars, we construct a novel analytical framework that breaks down the developmental processes of e-governments into four stages—each corresponding to marked differences in citizen-government relations, the type of risks experienced, and the trust-building strategies to be enacted. The framework can be applied beyond the context of this study to the dissection of other e-government systems in future investigations. Second, we applied our analytical framework to a case study of the IRAS' E-Filing system to glean insights into how a national tax agency has utilized technology to develop a deep trusting relationship with its taxpayers. This validates the feasibility of our analytical framework in unraveling different perspectives held by citizens and governmental institutions in building trusted relationships. Third, we derive a series of developmental prescriptions and technological specifications that inform the design of e-government systems for trust-building missions. Although a few of these recommendations are not entirely new, this study is the first to organize them in a progressive fashion that illuminates the order in which e-government developments could proceed. Finally, this study unveils the intimate relationship between the sociopolitical climate of a country and the speed of e-government maturity—an interesting finding that may account for the relatively stagnant pace of e-government development as observed by Coursey and Norris (2008).

6.3. Pragmatic Implications

Pragmatically, our case analysis has yielded a series of generic developmental prescriptions together with complementary technological specifications that can be harnessed by practitioners when designing e-government systems (see Table 4). Evident from the case, trust-inducing e-government systems not only generate efficient back-end business processes with matching front-end user interfaces, they also act as platforms for extraorganizational relational linkages and extended knowledge-sharing networks. However, concurrently, we caution practitioners against rushing into deep interdependence relationships with citizens because the IRAS has taken years to attain the current level of trust it shares with taxpayers. Further, the tax agency is still engaged in an ongoing struggle to meet the everchanging service demands of its customers. In subscribing to the developmental prescriptions and technological specifications outlined in Table 4, practitioners must be aware that our recommendations are deliberately framed as broad guidelines applicable to e-government systems in general. While specific technological features can be elicited and replicated from the E-Filing system, our findings are best applied to e-government systems that share contextual similarities with those in the case under investigation.

6.4. Limitations and Future Research

Two caveats exist with regards to our study. First, we admit to the restrictions of a single-case analysis and propose that future inquiries of a similar nature be duplicated across other e-government systems (e.g., application and renewal of driver's license) to validate our findings through theoretical replication (Yin 1994). According to Yin (1994), the generalizing properties of a case differ from those of quantitative studies and "case studies rely on analytical generalization [in that] the investigator is striving to generalize a particular set of results to some broader theory." (p. 36). However, we are confident that our case findings are useful as a starting point for further investigations into multifaceted trust-inducing measures in e-government systems. Second, the IRAS' stipulation of clearing interviewees prior to the interviews precludes us from ruling out the possibility that a certain degree of data censorship is practiced. Although every precaution was taken to triangulate our findings through multiple data sources, we believe that future case studies conducted in less-sensitive government institutions are necessary.

6.5. Conclusion

Although both academics and practitioners acknowledge the urgency of restoring citizens' trust in e-government systems, few studies have gone beyond theorizing trust as a unidimensional construct. Even fewer have offered actionable guidelines that can be harnessed by governmental institutions in e-government development. In advancing an e-government developmental model for the restoration of public trust (see Table 4), this study: (1) preserves the multidimensionality of trust in exploring e-government systems as a technological platform for enacting trust-building strategies,

and; (2) derives viable developmental prescriptions and technological specifications for developing trust-inducing e-government systems. By leveraging on these developmental prescriptions and technological specifications in the development of e-government systems, governmental institutions could benefit from extensive knowledge-sharing networks brought about through deep interdependence relationships with citizens.

7. Electronic Companion

An electronic companion to this paper is available as part of the online version that can be found at http://isr.journal.informs.org/.

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