E-governance competence: a framework

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Abstract: While there is abundance of research on e-governance readiness and convergence, there is lack of research and theoretical understanding of competencies that governments must have to develop and deploy effective e-services and ensure usage of the deployed e-services in a manner that leads to effective e-governance. In this research, we draw from business/IT alignment framework, innovation literature, and coordination theory and propose a framework of e-governance competence that highlights the importance of technical and administrative alignment capability at strategic and operational levels for effective e-governance. We validate the proposed model in the context of immigration-related e-services provided by the Hong Kong SAR, P.R.C. The theoretical and practical implications are discussed.

Keywords: e-governance; e-government; technology capability; administrative capability; coordination theory; business/IT alignment; smart card technology; e-services.

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1 Introduction

Most studies on e-government have focused on e-readiness and user interactions as indicators of e-governance competence. Some studies have identified demographic and other factors that determine e-readiness in terms of deployment of e-services and e-governance convergence (for example, Banerjee and Chau, 2004). Industry studies have also focused on e-readiness index as a measure of e-government competence and findings indicate that most countries may not reach e-governance convergence because of their low e-readiness index (refer to Appendix 1). However, e-readiness and user interactions in themselves do not necessarily translate to e-governance convergence. Banerjee and Chau (2004) mention that in developing countries, especially the poorer and emerging economies, administrative processes are not transparent and there is little coordination amongst government departments/agencies in providing e-services to citizens and businesses. Lack of transparency creates pockets of power that are not easily relinquished and are often associated with malpractice and corruption. Thus even if resources and infrastructure create e-readiness, specific competencies must exist in governments to coordinate technical and administrative issues to structure effective e-services and ensure their usage by citizens and business organisations.

Banerjee and Chau (2004) show that in addition to resources and infrastructure for structuring e-services, it is also necessary to ensure that the e-services are of high quality, are used, and they effectively contribute to citizen and social well-being and lead to e-governance convergence. In this context, prior research (for example, Saxena, 2005) make the distinction between ***e-government*** – which is provisioning of e-services with available technology, and ***e-governance*** – which is the vision to use resources and technology and deliver e-services that are appropriate to the political, social, and economic contexts and are effective in creating citizen well-being and economic gains for the government. Karokola et al. (2012) show that security services (technical and non-technical) are lacking in e-government maturity models, since the focus was on measuring the quantity of offered e-government services than the quality of security services.

It therefore becomes important to understand the specific competencies necessary for both e-government and e-governance, since both are necessary for achieving

e-governance convergence. This aspect has not received serious academic attention. Industry reports (for example, Griffin and Schuppan, 2010) mention technical, social, personal, and methodological competencies required of e-government project leaders and executives for successful e-governance (Figure 1). However, there is a lack of theoretical knowledge in regard to which of these competency factors are important and how they play out in effective delivery of e-services and convergence.

Figure 1 E-government competencies

		Roles		
		Project Leader	**Working Level**	**Executives**
Competency Types	**Technical**	Detailed design knowledge (legal, technical, organisational technological)	Critically questioning their own technical working processes	Knowledge of processes and IT knowledge
	Social	Good negotiation skills, persistence	Participation competency, teamwork ability, self-organisation ability	"Tolerance" for reduction in hierarchy cooperative leadership, persuasive power
	Personal	Thinking in terms of networks, stress resistance	More ability for self-reflection	Increasing abstraction ability
	Methodological	Implementation-competencies and design competencies	Methods for the content-based redesign of their work	Design methods

Source: E-Government Expert Group Meeting – WSIS Forum 2010

In this research we use the tenets of the coordination theory and business/IT alignment and propose a model of e-governance competence that highlights the role of technical and administrative coordination competencies in effective e-governance and validate the proposed model in the context of immigration-related e-services provided by the Hong Kong S.A.R government of P.R.C. We have taken the positivist case study-based methodological approach in our study in that relevant existing theories inform the issue being investigated and to the development of the proposed model of e-government competence. The case analysis helps to validate the proposed model.

2 Literature review

2.1 Distinguishing e-government and e-governance

The Commonwealth Centre for Electronic Governance states that "e-governance is the commitment to utilise appropriate technologies to enhance governmental relationships, both internal and external, in order to advance democratic expression, human dignity and autonomy, support economic development, and encourage the fair and efficient delivery of services". Thus e-governance, according to this definition, is a government's commitment towards assessing existing available technology in the market and determining the most appropriate technology for e-services that contribute to citizen well-being and economic development. Sheridan and Riley (2006), however, define e-governance as a "concept that defines and assesses the impacts technologies are having on the practice and administration of governments and the relationships between public

servants and the wider society, such as dealings with the elected bodies or outside groups such as not for profits organisations, NGOs, or private sector corporate entities". According to this definition, e-governance is an activity aimed at ensuring that existing e-services provided by the government are used effectively. Sheridan and Riley (2006) state that ***e-government*** is "a narrower discipline dealing with the development of online services to the citizen", implying that 'e-government' activity is confined to the development of e-services; it does not extend to effective deployment and usage of such e-services which falls in the realm of '***e-governance***'. Godse and Garg (2007) also make similar distinction between e-governance and e-government, and state that they are aimed at achieving different objectives. In this research, as mentioned by Sheridan and Riley (2006), we view 'e-governance' in a broader sense which subsumes 'e-government' activities. We specifically argue that effective e-governance requires competencies that help in

- providing the right administrative and technology infrastructure, systems, and processes that facilitate development and deployment of appropriate e-services which help to achieve citizen well-being and state transformation
- creating conditions that ensure effective usage of the e-services.

2.2 Technical and administrative coordination for e-governance

Governments face inherent challenges in the development and deployment of ICT-enabled e-services. Competing agencies, jurisdictions, and power seats in the government's administrative structure puts pressure on policy makers, who struggle to get bureaucrats to work together in promoting technology-based innovation. Cultural norms and patterns of behaviour in different departments of a country's government structure and intense group conflict over scarce resources affect coordination across different government departments, posing hindrance to efficient sharing of resources and information necessary for effective public e-services (Janssen and Kuk, 2009). Kassim and Hussain (2013) suggest that the ePerolehan – a Malaysian government to business e-procurement system led to improved efficiency and service performance because the system was designed to meet supplier and buyer expectations of information requirements and compatibility with existing processes. Thus user participation was fostered by the coordination ability of technical and administrative government domains to meet the administrative compliance requirements of the government and technical requirements for the system.

In one study, Saxena (2005) distinguishes between techno-centric and governance-centric approaches, and mentions that techno-centric focus could lead to failure of e-government projects if it does not align well with government vision. Thus, there is indication that a shared vision of effective e-services, as well as capability to share and manage technical and administrative resources, is necessary for realising the shared vision. Business/IT alignment and innovation literature, and the coordination theory provide the theoretical background for technical and administrative collaboration and specific competencies necessary for such collaboration and their effects on e-services delivery and usage.

2.3 Theoretical background: business/it alignment, innovation and coordination theories

The Business/IT alignment theory (Henderson and Venkatraman, 1993) suggests that firms derive benefits and competitive advantage from IT when strategy (business strategy and information technology strategy) and operational aspects of firms (information technology infrastructure/process, business infrastructure/process) are in alignment with each other. Several studies in the IS literature have found empirical support for the enhancing effect of IT/Business alignment on organisational performance (Kohli and Devaraj, 2003; Sabherwal and Chan, 2001; Reich and Benbasat, 2000). Yayla and Hu (2012) mention that IT and business alignment leads to positive effect on firm performance, particularly in highly uncertain environments. Thus, in the e-governance context, it is logical to assume that alignment in terms of shared vision of e-services goals and resource sharing between technical and administrative departments would lead to deployment of e-services that are useful for citizens and businesses in the particular demographic context of the country and are likely to be used by them.

Coordination theory (Malone, 1988) states that when multiple human actors and systems pursue a common goal, the competence to collaborate is crucial, and this competence is influenced by capability to install a collaborative process and to use related information for efficient execution of the process. Collaboration enables effective resource allocation for realisation of strategic vision. In the organisational context, inter-firm rivalry and mistrust are stated to limit resource and knowledge sharing in private networks (Adner, 2006). The same is expected to be true in governments where departments do not interact with each other and may be unwilling to share knowledge and resource to retain power and sometimes maintain secrecy of practices that may be in violation of prescribed norms. Cordella (2007) mentions that mechanisms in bureaucratic institutions not only influence work activities in the public sector, they also determine enforcement of democratic values of equality and impartiality.

Prior research indicates that competence to collaborate is influenced by leadership style (Doz and Kosonen, 2008). Banerjee and Chau (2004) also mention that leadership (administrative competence) in government helps in efficient resource sharing by different government departments – a requisite for achieving a common public service goal. In this research we argue that leadership in e-governance context may be viewed in two dimensions:

- coordination competence for ***administrative collaboration*** to work towards a shared vision of e-services and to effectively (re)configure, (re) allocate, and (re)deploy non-technical (or administrative) resources for development and deployment of IT-enabled e-services for achieving the shared vision
- coordination competence for ***technical collaboration*** to provide the government with a vision of ICT-enabled e-services and understand what technical resources could be deployed for ICT-enabled e-services without inter-departmental friction in the government's administrative set-up.

In e-governance, apart from collaboration competence for shared technical and non-technical resources and a shared vision of e-service deployment and usage, technical

competence to develop and manage the ICT infrastructure which is at the core of e-services also assumes importance. In organisational literature, this competence has been mentioned as a crucial determinant of organisational technology project success (Cetindamar et al., 2009; Best, 2001) and has been broken up into

- strategic capability to identify new technology for competitive advantage (Rush et al., 2007; Lall, 1990)
- operational capability to make effective use of organisational technical resources such as technical knowledge and skills to improve products and processes to meet challenges of a competitive business environment (Jin and von Zedtwitz, 2008).

Logically, the same technical competencies must be present for ICT-enabled e-services. This means that governments must have competence to estimate and procure appropriate technical resources and knowledge for development and deployment of innovative technology-based services, and competence to deploy the technical and knowledge resources effectively and efficiently for realisation of strategic e-governance goals.

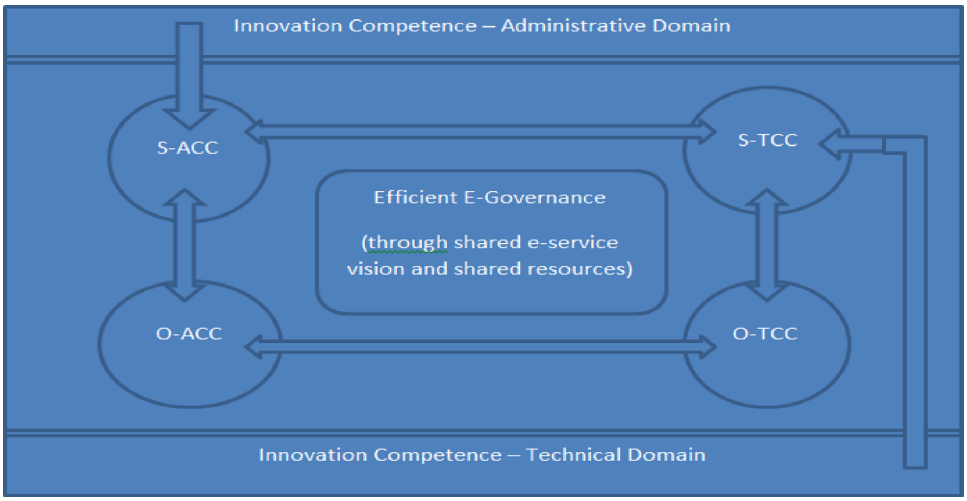
There is evidence in prior research that an important component of successful management practices is innovation capability (Ritter and Gemunden, 2004). In the context of technology management (TM), prior research mentions that TM processes embody innovation processes such as producing scientific and technological knowledge, transforming knowledge into working artefacts, and matching artefacts with user requirements, whether internal or external, and structuration of organisational support routines (Pavitt, 2002; Levin and Barnard, 2008). Thus there must be innovative capability at strategic levels for the competencies identified and defined above.

Based on the above review of related literature and theories, we specify the framework of e-government competence shown in Figure 2. The framework suggests that the following competencies are required for shared vision and effective deployment and usage of e-services:

- Strategic Administrative Coordination Competence (**S–ACC**) – to enable the administrative counterpart of e-governance to provide vision of possible areas of e-service deployment and plan for sharing non-technical resources that must be arranged to match the strategic technical vision, in collaboration with technical personnel
- operational administrative coordination competence (**O–ACC**) – to deploy inter-departmental non-technical resources (finance, non-technical administrative skills, process ownership, and revised responsibility) etc. to support the strategic e-governance vision
- strategic technical coordination competence (**S-TCC**) – to provide technical vision in terms of technical architecture, integration requirements, interfaces etc. for e-services, both in terms of concept and deployment feasibility in collaboration with administrative personnel
- operational technical coordination competence (**O–TCC)** – to deploy inter-departmental soft technical resources (technical skills, project management competence etc.) to support the strategic technical vision.

In the next section we validate the proposed framework with a case study of Hong Kong Special Administrative Region's (HKSAR) initiative in development and deployment of two innovative and effective smart card-based e-services – automated vehicle clearance (AVC) and automated passenger clearance (APC).

Figure 2 Framework of e-governance competence (see online version for colours)



3 Case scenario

3.1 Hong Kong government's smart ID card initiative

In keeping with the objective of the 'Digital 21' Information Technology Strategy (ISS–1) to develop Hong Kong into a leading digital city in the globally connected world, the HKSAR Government planned to deploy similar systems in Hong Kong for better administrative control and governance. A new initiative was therefore undertaken by HKSAR towards a secure infrastructure for immigration-related services as well as providing other government services with the smart ID card serving as a secure authentication medium. In 1976, the Immigration Department of the HKSAR took IT-based initiatives to replace the punch card system with a computerised system for maintenance of passenger travel records. The strategic consideration was management of growth in passenger traffic at immigration checkpoints. A registration of persons (ROP) system was installed in 1982, followed by further business process reengineering and introduction of a paper-based ID card system in 1987 to reduce time and cost for immigration clearance work. However, there were security issues with the paper-based ID card because of illegal duplication.

There were challenges in development and delivery of new smart ID card-based services to the public. Switching over from an existing system to a new smart ID card-based application system and making such systems amenable to usage required careful planning and execution. It was also important that all personal data collected and held in the different databases were handled in accordance with the provisions of the Personal Data (Privacy) Ordinance and other relevant laws and regulations. Public trust in usage of

the smart ID card for e-services was a crucial determinant of its success. Planning for a region-wide ID card replacement exercise was necessary so that all residents of Hong Kong could obtain the new, secure HKSAR smart ID card within a reasonable time frame.

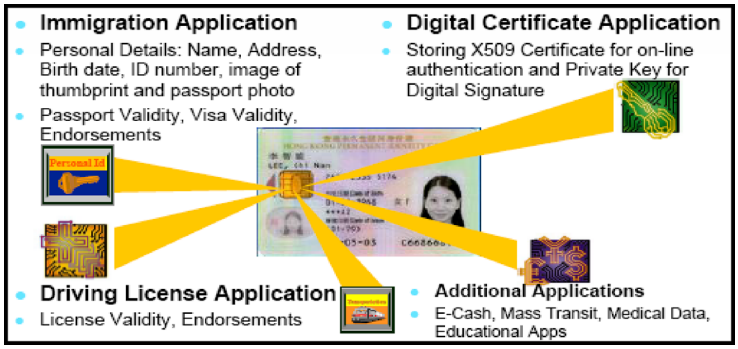
3.2 The smart ID card project

3.2.1 Planning phase

In November 1999 an updated information system strategy (ISS–2) was formulated to adequately meet growing demands for high quality public e-services. A Steering Committee (SC) made up of technology experts from governments IT department and senior officers from other departments identified the smart card technology and worked on strategies for development, deployment, and management of multiple applications of smart card-based public e-services while ensuring flexibility of the systems to adapt to ongoing developments in smart card technology. Based on detailed discussions of the SC with various governmental departments on the potential of e-services deployment in strategic areas of governance, the SC recommended development and deployment of immigration-related e-services, financial e-services, and other e-services like driver's licence issuance and renewal, medical history data storage, library services usage etc. Authentication of users of such services was planned for by using individual's biometrics stored in the smart ID card and matching it with data stored in the back-end systems distributed across governmental departments like the Inland Revenue Department, Registration and Electoral Office, Transport Department, etc. The suite of applications is shown in Figure 3.

Through information kiosks installed in popular public locations, card holders could report changes such as current address, employer etc. The storage of digital certificates in smart ID cards was aimed at providing incentive to card holders to use it for accessing online government provided e-services and other commercial e-commerce services which required user authentication, in turn driving the adoption of e-commerce in Hong Kong as per the Digital 21 manifesto and contributing to global competitiveness and economic prosperity of Hong Kong.

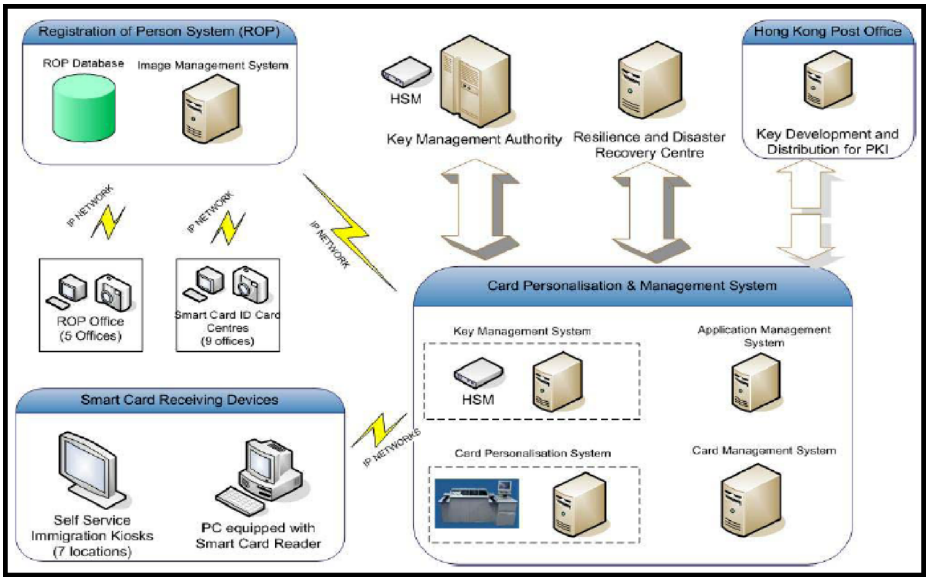
Figure 3 Smart ID card applications (see online version for colours)



3.2.2 Development phase

In February 2002, an international consortium of technology companies led by Pacific Century CyberWorks (PCCW) won the contract to help with the production of the smart ID cards and development and delivery of smart card-based system and e-services.[1] The contract was valued at US$21 million (HK$163 million). A dedicated PCCW team of more than 120 experienced IT professionals in project management, system design and software development, data security, workflow, biometrics, database design, imaging, engineering, operations, and support services managed the entire project. Leveraging on this expertise and that of its international partners, PCCW created a state-of-the-art solution based on the latest technological developments in multi-application smart card operating systems, public key infrastructures, electronic workflows, digital imaging, microelectronics, biometrics, messaging, and databases. The turnkey solution included the design, implementation, and maintenance of the complete smart ID card solution which included the provision of smart cards, front-end system (ROP system) and back-end system (card personalisation and management system, key management authority, etc.). An integral part of development was to assess the possible infringements of data privacy of individuals arising from the usage of data stored on smart ID card. To this end, a privacy impact assessment (PIA) study was conducted and adequate safeguards to ensure data privacy were taken. The technical architecture planned for the smart ID card system is shown in Figure 4.

Figure 4 Smart identity card system (SMARTICS) technical architecture (see online version for colours)



3.2.3 Implementation phase

Despite minor concerns in the development stage, PCCW managed to overcome difficulties with full support from the Hong Kong Immigration Department. As a preliminary to the introduction of the new smart ID card, the old ROP records starting

from 1987 were collected and digitised. Outdated records were updated prior to digitisation. Before the launch of the new smart ID card scheme, the Registration of Persons Ordinance required amendment as appropriate, to provide for the mandatory replacement of ID cards in accordance with a specified call-up programme and the invalidation of the old form of paper-based ID cards. A two-phase approach was adopted for the implementation of the new SCT-based e-services. The roll-out of phase one began in early 2003 on a live trial basis. Members of the public who applied for registration (for e.g., new arrivals into Hong Kong, minors reaching the age of 11 years, juveniles reaching the age of 18 years, etc.), were issued the new smart ID card. After the system had been fully tested, phase two of the implementation began in mid-2003, when all residents of Hong Kong were invited to come forward in phases, to have their existing paper-based ID cards replaced with the new smart ID cards. New Identity Card Issuing Offices (NICIOs) were set up in convenient locations to deal exclusively with the region-wide smart ID card replacement exercise.

3.3 Case analysis

There is evidence of innovative capability of the Steering Committee team in terms of strategic vision of the potential of IT and IT-based e-services that could contribute to economic prosperity and social well-being of smart ID card holders as well as the deployment feasibility, which was crucial for success of the smart ID card project. The vision for biometrics-based authentication and the conceptualisation of services such as automated vehicle and passenger clearance at immigration checkpoints ensured highly secure and fraud-resistant fast e-service immigration-related e-transactions. The constitution of the Steering Committee with senior members of administrative and technical government staff and representatives of PCCW helped in shared understanding of the potential of IT and resource requirements (both technical and non-technical) and their deployment feasibility. The constitution of the Steering Committee also provided a leadership role in the smart ID card project which contributed towards effective coordination of work and responsibilities of different government departments in delivery of immigration-related and other e-services. ***Thus the presence of S–ACC and S–TCC and their interactions are evident.***

The conceptualisation of APC and AVC systems to enhance and improve the existing clearance systems are indications of ***innovativeness in both administrative and technical domains that steered administrative and technical visions of innovative e-services.*** The AVC was the very first of its kind in the world, enabling drivers holding smart ID cards to make use of self-service immigration clearance by utilising their cards to gain entry into and exit from Mainland China by providing user-friendly visual messages. It reduces clearance time for each vehicle processing, to four seconds, thereby significantly reducing traffic congestion at all control points. The APC system was also an effective automated mechanism that prevents illegal entry into Hong Kong through immigration control points, thus helping immigration governance. Both of these smart card-based e-services contributed to citizen well-being by way of less waiting time and less traffic congestion, as well as faster throughput of cargo-laden vehicles, logistics efficiency, and increased trade volumes for companies in both Hong Kong and China, contributing to their economic prosperity.

The development and deployment of effective and efficient AVC and APC systems and competent technical resource deployment (by outsourcing to PCCW), as well as

support to PCCW provided by all government departments for these projects, provides ***evidence of O–ACC and O–TCC*) *and their interactions***.

Alignment of the administrative process of immigration and vehicle clearance and their enabling operating technologies can be seen here. When the smart ID card holder places his or her thumb flat against the centre of the e-channel-based scanner for fingerprint analysis, the card holder's status is verified by checking data in the back-end data bases of several government departments. In the event of an error or accident, the system sends out a warning message to customs personnel through wireless communication, to inform them of this error and to take subsequent action. When a transponder system installed in front of an immigration kiosk receives a signal from the electronic tag issued to drivers by the Hong Kong Immigration Department (ImmD), the AVC system transmits the essential data required for self-service immigration clearance from the back-end database to the workstation in the kiosk concerned. This saves the driver the time and effort required to insert and remove the smart ID card from the card reader. Before a vehicle proceeds to the AVC kiosk gate, a scanning device first checks the vehicle number plate. When the driver stops at the clearance kiosk, he or she merely places his or her thumb onto the reader for fingerprint verification. In a latest addition, drivers can send their card details with an SMS when they are close to the immigration checkpoint and drive through without waiting for clearance.

The successful time-bound conversion of old ID card application records (stored in microfilms) to digital images to facilitate the online retrieval of records, as well as the shared vision of criticality of data privacy and the technical means to address the issue, indicates ***S–ACC and S–TCCas well as O–ACC and O–TCC.*** Conceptualisation of technology-enabled security authentication of the smart ID system and its efficient deployment contributed to data privacy measures, indicating presence of both **S–TCC and O–TCC**. The right of individuals to preserve the privacy of their personal data stored on the smart ID card was an issue that had to be constantly monitored because of its criticality in determining usage for purposes beyond identification such as availing public services with the card. With personal data beyond that required for ROP purposes stored in the ID card, there was a concern amongst the public of possible use of the data by other government departments and law enforcement agencies for their own purposes. Potential for infringement of privacy existed because of the risk that data could be used for purposes beyond those for which the data were originally collected. These administrative issues were recognised and addressed, providing evidence of **S–ACC and S–TCC**.

The electronic authentication function of the smart ID card also had the potential to support a large number of future customer-oriented e-services that required authentication. More complicated applications such as electronic voting and access to health records to facilitate medical decisions in emergency situations were planned for implementation with the smart ID card. ***This is an indication of innovativeness in strategic thinking in both administrative and technical dimensions.***

4 Discussion and conclusion

In this research we used the positivist case study-based methodological approach and relevant existing theories to highlight the importance of technical and administrative

competence at strategic and operational levels for effective e-governance. The analysis of the case validates our proposed theoretical framework of e-governance competence.

The case analysis provides evidence that the constitution of the Steering Committee contributed to effective leadership and coordination of work and responsibilities of different government departments in delivery of immigration-related and other e-services, signifying the importance of S–ACC and S–***TCC and their interactions as depicted the proposed framework. Innovativeness in both administrative and technical domains helped in creating the vision of t***he AVC immigration e-service that helped to reduce traffic congestion and vehicle waiting time at immigration checkpoints. Effective technical resource deployment (by outsourcing to PCCW), as well as support to PCCW provided by all government departments, validates the ***O–ACC and O– TCC and their interactions, as shown in the proposed framework***. Shared vision of criticality of data privacy and the technical means to address the issue, and successful time-bound conversion of old ID card application records (stored in microfilms) to digital images validate the importance of ***S–ACC and S–TCC as well as O–ACC and O–TCC.*** Conceptualisation of technology-enabled security authentication of the smart ID system and its efficient deployment contributed to data privacy measures, indicating presence of both **S–TCC and O-TCC**), as well as **S–ACC and S-TCC**.

The proposed framework is useful in that it enhances prior framework of e-government convergence (Banerjee and Chau, 2004) by demonstrating the importance of alignment of administrative and technical resources and infrastructure for conceiving effective e-services and delivering them effectively to users. The theoretical significance of the proposed framework is in terms of delineating the technical and administrative competencies at the strategic and operational levels and highlighting the interactions of these competencies so that they act in concert. This research also provides empirical support to the work of Saxena (2005) who makes the important distinction between techno-centric and governance-centric approaches to e-governance and mentions the need for fusion of the two approaches. Our finding indicates that for effective e-governance, the two approaches must mesh with each other.

Brucher (2002) refers to the reference model of e-government competence model developed by the E-Government Competence Centre at Berne University of Applied Sciences and suggests that it helps to support the planning process from a strategic to an operational level, and helps in the definition of concepts and translation of concepts to effective implementation. Our research extends this framework by highlighting how technical and administrative coordination play a role in effective planning and implementation components of the framework, thus adding to the body of work on e-government and e-governance.

Factors in our proposed framework may assume different levels of significance in different governments. For example, in highly structured government environments like the USA and some countries of EU, coordination and sharing of resources may not be a major handicap, since government mandates, once agreed upon, may be followed without much hindrance. However, in other countries where governments are known to function slowly in addressing citizen needs, coordination may well be the most important factor. Future research may be undertaken to examine how administrative structures, incentive mechanisms for innovation, distributed and centralised control of resources, and power equations influence technical and administrative coordination at strategic and operational levels. Studies in different countries could provide interesting insights on how culture can affect administrative and technical coordination.

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Note

[1]PCCW coordinated and managed a diverse group of technologically sophisticated companies that collectively provided security and technology systems for security and credit cards as well as services to the HKSAR Government and large corporations.

Appendix 1: List of top 20 countries according to the UN's 2008 e-Government Readiness Index (see online version for colours)

Rank	Country	Index
1	Sweden	0.9157
2	Denmark	0.9134
3	Norway	0.8921
4	United States	0.8644
5	Netherlands	0.8631
6	South Korea	0.8317
7	Canada	0.8172
8	Australia	0.8108
9	France	0.8038
10	United Kingdom	0.7872
11	Japan	0.7703
12	Switzerland	0.7626
13	Estonia	0.7600
14	Luxembourg	0.7512
15	Finland	0.7488
16	Austria	0.7428
17	Israel	0.7393
18	New Zealand	0.7392
19	Ireland	0.7296
20	Spain	0.7228