
Service innovation activities in e-government initiatives: the Taiwan experience

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Abstract: Information and communication technologies (ICT), particularly the internet, can be leveraged to enhance the offerings of e-government initiatives beyond simply providing access to information and services. The adoption of ICT could foster changes in the service concept, delivery system, and client interface of e-government initiatives. There has been relatively little in-depth research about how the internet enables service innovation in the e-government context. The purpose of this study is to explore the innovation activities of e-government initiatives with respect to how two archetypical website structures provide new benefits for citizens/businesses, in the form of either integrated information platforms or full online transactions.

In this qualitative study, five projects (2002–2009) from e-government initiatives in Taiwan were analysed. We propose a framework to address the adoption of technologies for innovation activities, particularly MMK-style/PSP-style website structure. The findings show that the application of the framework, regarding the use of the internet, by a government currently employing e-government services is suitable.

Keywords: e-government; service innovation; public service value; ICT; website structure; core benefits; delivery benefits; Taiwan.

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1 Introduction

Governments around the world have made extraordinary efforts since the mid-1990s to make services and information available over the internet. Accordingly, information technology (IT) has transformed the nature of service delivery and resulted in many innovations in government services provided via the internet. However, governments are usually perceived as passive adopters of technological innovations. This paper examines how IT can enable innovation activities in the e-government context.

For a decade now, the government of Taiwan has invested heavily in IT for the administrative sector, which accounts for 1% of the overall government budget. Official statistical data shows that almost all government agencies have internet facilities and 68.71% have their own websites (almost 2,000 government websites). However, from 2001 to 2009, although the efforts of The Government of Taiwan in this domain consistently earned it top ranking in the global e-government survey conducted by Brown University, among these 2,000 government websites, the application of technological innovations to service delivery remained unexplored. The stages of e-government services are as follows: online presence, interaction stage, transaction stage, and transformation (Sharma, 2003). The diversity of development in the transaction stage-government services has provided a wealth of data for fieldworkers to examine (Al-Sebie and Irani, 2005). This paper seeks to occupy this gap in the literature by providing a framework that applies service innovation studies to the public sector.

Innovation is defined as the “implementation of a conscious process of change to gain certain effects or results” (Miles, 2000). In the context of public service, the results should not be evaluated in terms of profit-making in the market context but rather in citizen satisfaction and reward-seeking, such as votes in elections for the ruling party, enhancing citizen trust and confidence in public institutions and improving societal well-being (Heintzman and Marson, 2005; West, 2004; Dawson and Daniel, 2010). During the process, new ideas, objects and practices, which are new and novel to the unit of adoption, are created, developed or reinvented (Walker, 2006). Government agencies respond to the invention of new internet technologies and undertake conscious processes of design, development, maintenance and delivery of new electronic services to citizens.

Accordingly, innovation activity in the behaviours of e-government stakeholders and new benefits in cyberspace merits further examination.

The purpose of this paper is to

- 1 propose a conceptual framework for government e-service innovation
- 2 identify the service innovations of different website structures in cyberspace
- 3 propose further studies.

The organisation of this paper is as follows. In Section 2, we review existing literature on the issues and identify research frameworks. In Section 3, we apply an exploratory case study method (Yin, 2003) to five cases and discuss some empirical findings. In Section 4, we present some propositions for further examination. Finally in Section 5, we discuss some managerial implications and conclusions.

2 Literature review

Two basic approaches have been employed in analysing e-governments, with a third one gaining attention recently. The first one mainly appears in public administration literature. Some claim that IT provides the mechanism to redesign governmental organisations and institutions (Norris and Moon, 2005; Roy, 2006). Others claim the role of technology is both the cause and effect of organisational and institutional change (Bretschneider, 2003; Fountain, 2001; Orlikowski, 2010). Others suggest using a structural model (Giddens, 1984) to identify how human actions and social factors interact at every level when IT is introduced into an organisation (Banerjee and Chau, 2004; Davadoss et al., 2002). E-government websites and the potential for e-democracy and e-participation are also examined (Sharma, 2003; West, 2004; Kolsaker and Lee-Kelley, 2008; Chadwick, 2009; Coursey and Norris, 2008). The second approach focuses on information management. Those websites preferred by citizens or businesses are surveyed to evaluate the respondents' perception of the effectiveness of e-government initiatives (Navarro et al., 2007; Moon, 2002; Moon and Kim, 2001; Wang, 2002). The principles of government website design (Huang and Chao, 2001; Nielsen, 2000) and customer-centred performance evaluation of website content (Ifinedo and Davidrajuh, 2005; Sharma, 2003; Morgeson III and Mithas, 2009) are also taken into consideration.

The third approach addresses the innovation activities of e-government initiatives by applying concepts from service innovation literature. For decades, Schumpeter's concept of innovation (Schumpeter, 1934) has been extensively applied in the manufacturing industry. Over the past few years, discussion on the differences between manufacturing innovation and service innovation has burgeoned (Hipp and Grupp, 2005; Miles et al., 1995; Miles and Boden, 2000; Miles, 2000; Tether et al., 2001; Hipp et al., 2000; Chen and Tsou, 2007). Den Hertog (2000) has developed a four dimensional model to conceptualise innovative activities in services, and more recently, the concept of service innovation has been applied to the public sector. Halvorsen and Hauknes discussed the innovation activities of public sectors enabled by the adaptation of relevant technologies (Halvorsen, 2005; Hauknes, 2005).

Innovation has been properly described as complex and contested (Walker, 2006). With respect to the concept of innovation in the public sector, different literatures address different areas of emphasis. Some focus on the formation of innovation policies in order

to foster enterprise innovation (ex. OECD innovation policy), set out in the left column of Table 1; while others focus on strategies to inspire employee innovation [for example, the idea of new public management advocated by Osborne and Gaebler (1992)], set out in the bottom right cell of Table 1. This paper attempts to explain the patterns of innovative behaviour among individuals or groups enabled by IT adoption, as set out in the upper right cell of Table 1. Good innovation practices help governments enhance the value provided to citizens and businesses.

Table 1 Concepts of innovation in the public sector

	<i>Organisation/structure</i>	<i>Individuals (actors)</i>
Behaviour	Innovation explained from an evolutionary perspective, such as national innovation systems (macro-level)	Patterns of innovative behaviour among individuals or groups, enabled by technology adoption
Strategy	Development/formation of innovation policies (macro-level) (ex. Sung, 2010)	Strategies for employee to innovate, mainly from a management perspective (ex. Osborne and Gaebler, 1992)

Sources: Hauknes (2005)

2.1 Service innovation

We assume that those individuals or groups are not considered as passive adopters of technology, but stakeholders collectively conducting creative activities after technology adoption. Major stakeholders in the design, development, delivery and maintenance of e-government services include managers (a role as leaders), domain experts (a role that knows more about domain knowledge), IT staff (staff responsible for IT), application service providers (ASPs, out-sourced private firms who execute an activity-specific service) and end users (receivers of an e-service) (Chen and Gant, 2001; Macintosh and Fraser, 2003). Among these, ASPs belong in the category of knowledge-intensive business services (KIBS), whose roles in innovation processes have been studied extensively by Miles and his successors (Bilderbeek and den Hertog, 1997; den Hertog, 2000; Miles et al., 1995; Sundbo, 2008). Furthermore, it is possible for the various series of changes or innovations to take place in the various areas of technology (new techniques for making products or services), product (modifications of existing products or development of new product lines), administration (changes in organisational structures, goals, information and other systems) or people (changes in leadership abilities, or the capability to use new technology for delivering services) (Bilderbeek and den Hertog, 1997; den Hertog, 2000; Miles et al., 1995; Hauknes, 2005). den Hertog proposes a four-dimensional framework – new service concept, client interface, service delivery system/organisation and technological options – to analyse service innovation. The service concept dimension is an intangible conceptual element which is novel in its application to a particular market. The client interface dimension is the design of the interface between the service provider and its clients. The service delivery system dimension refers to the internal organisational arrangements that have to be managed to empower employees to perform their job properly. The technological options dimension, meanwhile, concerns the degree to which adopters themselves are in practice shaping technological development.

2.2 *Public sector innovation*

Innovation in public organisations is generally seen to reflect the application of technological solutions provided by commercial technology providers. Miozzo and Soete (2001) compared public and private innovation styles and considered public services, such as education, healthcare and public administration to be largely supplier-dominated, where in terms of process technology, innovation often originates with the suppliers of equipment and software. However, Miles (2000) argues that public-sector entities are large organisations, and often conduct their own R&D (e.g., health services), and have better links to the University system than do most private service providers. They also have higher shares of professional staff than most firms in the supplier-dominated sector. So, there is a good case for considering the public service sector to possess a distinctive style of innovation.

Taken from service literature, this approach distinguishes five types of innovation, which may be taken as a departure point for outlining features of innovation in publicly organised or owned activities (Halvorsen, 2005; Hauknes, 2005). Similar to den Hertog's, though with nuanced differences, Halvorsen and Hauknes's concepts of public sector innovation cover the dimensions of concept, delivery, organisation, design, and interaction, all enabled by the adaptation of relevant technologies. The five types of innovation include:

- 1 Conceptual innovation – in the sense of introducing new missions, new worldviews, objects, strategies and rationales. Bureaucratic renovation of the public sector represents a full-scale reform wave commonly called new public management (NPM). This is a typical 'conceptual innovation', where privatisation is employed to introduce private resources into public services – the scale of government is reduced, citizens are considered as 'customers', and technology is used to service these customers. E-government initiatives use the internet to reallocate private resources to public services. Therefore, e-government is a whole complex of innovation, affecting much of the public sector.
- 2 Delivery innovations – involving new or altered ways of solving tasks, delivering services or otherwise interacting with clients for the purpose of supplying specific services. E-government can represent the "new delivery system", since it uses websites, PDAs and other technological artifacts as new customer interfaces and has trained employees to deliver service.
- 3 Administrative and organisational innovations – involving new or altered ways of organising activities within the supplier organisation. Intra-organisational cooperation enabled by information system to share information has become popular among government agencies in the context of e-government.
- 4 Design and process innovation – innovation involving changes in characteristics and design of service products and production processes, including development, use and adaptation of relevant technologies; the case of NHS Direct – a telephone helpline for health services in UK – is an example (Røste and Miles, 2005).
- 5 System interaction innovations – new or improved ways of interacting with other organisations and knowledge bases.

Although the innovation typologies proposed by Halvorsen and Hauknes (2005) are a general profile for understanding the innovation activities after government's technology adoption, we still need to pinpoint the diverse performance among different e-service projects. The following observations aim to develop a refined framework for government e-service innovation in cyberspace.

2.3 Government e-service innovation

How most properly to use the attributes of the internet to create new benefits in cyberspace is an issue that remains untouched in e-government studies. The basic principles of service delivery include the processes, *per se*, of cooperation, trust and social acceptance. They apply whether the service is delivered electronically or not. The recent OECD policy brief on e-government acknowledges that, "the impact of e-government at the broadest level is simply better government – e-government is more about 'government' than about 'e'". However, 'e' requires special attention. The biggest impacts of IT in general are to do with scale, scope, integration, and speed, which can never be reached in traditional ways (Macintosh and Fraser, 2003). Therefore, determining how to make the best use of the web's potential as a means of improving public services will create service value to the citizens and businesses (Bolivar et al., 2006; Dawson et al., 2010).

2.3.1 Service value

IT investment could bring public service with new value (Bannister, 2001). We use the construct of core/delivery benefit to define the value created by new customer interfaces in an e-government context. In cyberspace, online services create new opportunities that differ from traditional services. That is to say, government agencies can innovate by offering an important new 'core benefit' or a new 'delivery benefit' that revolutionises citizens' access to the core benefit. In other words, core benefit connotes providing new services to new users and delivery benefit involves taking existing service and providing it with new accessibility to existing users (Berry et al., 2006).

We believe that if emphasis is placed on what convenience e-government services provide citizens and what kind of opportunities are thus created, these can be viewed in terms of a delivery benefit and of a core benefit (Kolsaker and Lee-Kelley, 2008). The delivery benefit refers to those operations that can be completed online, for instance filing taxes, the procedures for which include verification of identity, calculation of taxes payable (carried out automatically by the system), provision of a variety of methods for payment, and online transmission of this. In this scenario, citizens can complete their tax-filing procedures without leaving home. Therefore, timely, ease of use, accuracy etc. are the criteria that must be followed. As for core benefit, this comes in the form of services citizens can obtain through access to the databases of various government agencies, which saves them having to visit a variety of offices to complete a single, multi-part task. Clearing cargo through customs, for example, may require inspection by a branch of the Council of Agriculture, payment of duty through the Customs Directorate of the Ministry of Finance, approval by the trade offices of the Economics Ministry, etc., and where these various steps can be taken through a single, integrated window, citizens or businesses alike are saved a great deal of effort. With this integrated service, the entire operation is accelerated and trade is made all the more convenient.

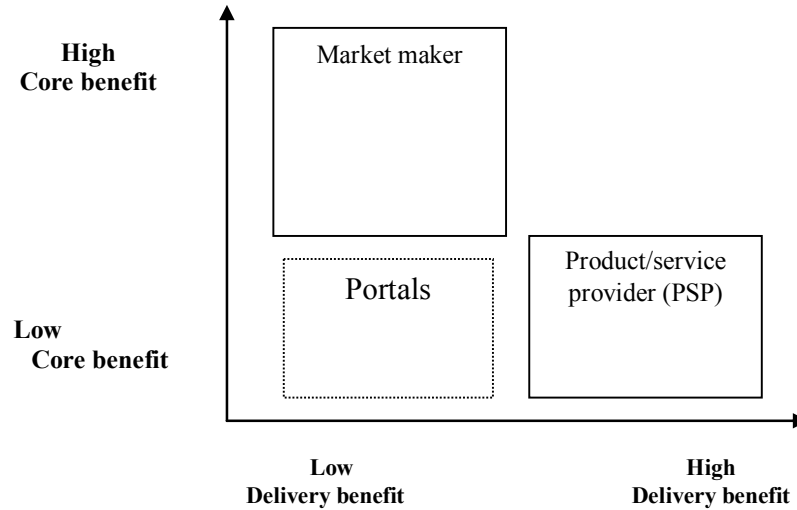
2.3.2 Website structure

Website structures are the various features of e-government single-window service delivery, which can be referred to as a sub-construct of delivery system innovation in den Hertog's framework. We divided the e-government website structure into three types: portals (POR), market makers (MMK) and product/service providers (PSP) (Bent et al., 1999; Norris and Moon, 2005). Portals here engage singly in building a community of consumers of information about products and services and provide static information services (Brown, 2005). The styles of information presentation can feature information-oriented design, user-oriented design and administrative-oriented design (Ho, 2002). Market makers may act as both a platform and delegated delivery agent through a pan-governmental service utility. Their function is to facilitate the transactions that take place between buyers (citizens) and suppliers (other government agencies) while providing no services themselves. Market makers endeavour to provide value to suppliers and to customers through a system of guarantees of security and trust in the business transaction (Mahadevan, 2000). Product/service providers, meanwhile, feature owner-delivery or shared-delivery through integration. They deal directly with their customers when it ultimately comes to the transaction and are responsible for the brand name of a specific government agency. Some website examples of each structure are listed in Table 2.

Table 2 Examples of government website structures and value creation

<i>Website address</i>	<i>Website structure</i>	<i>Value creation</i>
www.president.gov.tw www.tfrin.gov.tw www.cpami.gov.tw	Portals	Open information
www.gov.tw www.e-services.taipei.gov.tw	Market makers	Core benefit
www.moex.gov.tw www.tax.naf.gov.tw www.mvdis.gov.tw	Product/service providers	Delivery benefit

The diagram below integrates the relative strengths of opportunities and website structure, according to their magnitude (see Figure 1). Among these, MMKs feature high core benefits and could move from low delivery benefit to high delivery benefit; PSPs feature a high delivery benefit and could move from low core benefit to high core benefit; PORs are low in both core benefit and delivery. The diagram, thus, proposes the typologies with which to analyse innovative activities in the e-government context. The portal is not an objective of our study as it only provides online information and forms for download (Miles, 2000). The other two structures are studied as our cases.

Figure 1 Website service structure

We think the performances of e-government service projects can be different with the kind of benefit they hope to provide and the website structure for delivery.

3 Research method and summary of the case studies

This is an exploratory case study. Semi-structured interviews were conducted to gather first hand information on each project. The interviewees were selected from among manager, IT staff, domain experts, and application service providers. Twenty-one persons were interviewed: four from the 'manager level', four from the 'domain expert level', ten from the 'IT staff' level and three from the 'ASPs level' distributed across 'market makers' and 'product/service providers'. Each interview lasted about one to two hours on average. The issues discussed focused on the background of each project, the implementation, benefits of each project and the informants' ideas on technology innovation, administrative innovation, etc. during the implementation.

Each interview was tape-recorded, transcribed, coded with the category and then qualitatively analysed. Secondary data were collected to supplement the information gathered through interviews. Information on e-government initiatives was also collected from various documents and sources within the government of Taiwan. The draft of this paper was read by two informants to ensure reliability and validity (Yin, 2003). The cases studied include e-tuition and e-housekeeping as provided by 'market makers', e-tax-filing, e-motor vehicle and e-examination registration as provided by 'product/service providers', all shown in Table 3. One can clearly notice that the diffusion effect of product/service providers is much better than that of market makers.

Table 3 Summary and comparison of service innovation and performance among different single-window service projects

	<i>Service concept</i>	<i>Technological option</i>	<i>Delivery system</i>	<i>New client interface</i>	<i>Performance</i>
E-tuition; platform set-up: 2002–2003 Service set-up: 2005 Launched: 2006	Integrate existing school online payment system into one single window website	Designed by originators, set-up subcontracted. New integrated platform is an innovation. Project services use applications of existing technology. Standard data exchange, less business process integration.	Cooperation between Research, Development and Evaluation Commission (RDEC) and private banks. Trained employee	Online payment of tuition fees.	Among 5,600+ schools in Taiwan, 500+ schools adopted this system in the first year. Currently used by 1,213 univ., primary, middle and high schools. The records are 0.48 million in 2009.
E-house keeping; platform set-up: 2002–2003 Service set-up: 2006 Launch: 2007	Integrate existing several online payment needs of citizens into one single window website	Ditto	Pan-governmental – ministries and central and local agencies create working groups. Trained employee	Provides personalised information services concerning seven items of payments: Water, electricity, tax, roadway, parking, telephone and real-estate fees.	For those who want to enjoy this service, they should register as a member. The registered memberships are 1.5 million in 2008 and 1.6 million in 2009.
E-examination registration: Service set-up: 2005 Launched: 2006	Registration fee using internet as a new delivery system	Applications of existing technology to registration for national examinations.	Ministry of Examination Intra-organisational communication Trained employee	Document download and fees payments can be partially performed online.	Serves approx. 500,000 applicants nationwide by putting existing services online. For the first year, the average usage rate is 36%. In 2009, the average usage rate is around 70%.
E-tax-filing: Service set-up: 1998–2003 Launched: 2002	Tax-filing using internet as a new delivery system	Database download and calculation services made publicly available. Tax-filing software developed for user download.	Ministry of Finance integrate across sub-agencies Trained employee	Full payment procedures can be performed online.	Serves approx. 5 million taxpayers nationwide by putting existing services online. In 2008, the usage rate is 64.7%
E-motor vehicle: Service set-up: 2002–2005 Launched: 2004	Ticket firing using internet as a new delivery system	Applications of existing technology to motor-vehicle registration, etc.	Ministry of Transportation integrate across sub-agencies Trained employee	Full payment procedures can be performed online.	Serves approx. 6.75 million car owners and 13 million motorcycle owners by putting existing services online. From 2004 to 2008, the usage rate rose slowly.

4 Analysis and discussion

4.1 End user participation in e-enabled innovation

The common motivations to implement whole projects are the assumed citizen needs as interpreted by civil servants. For example, one officer from the e-motor vehicle project observed:

“In the past, if people who moved didn’t tell us themselves, we might, for example, send out fines to the old household address, and they would be paid late. People asked why we couldn’t link our databases to the household registry information, so that a single change of address could be implemented across the board and save people running about.”

Referring to online tax-filing, meanwhile, a Ministry of Finance analyst noted that:

“Citizens are in fact not obliged to help the government out by calculating their own taxes – the government should prepare all the necessary information and forward it to each taxpayer to request payment. This is the attitude a government should have.”

E-government services should in fact draw on citizen-centred designs (Bolívar et al., 2006; Ifinedo and Davidrajuh, 2005; Sharma, 2003). A question arises, however, as to the degree of genuine citizen participation in the innovation process, as their input is usually sought only through questionnaire-type surveys. Otherwise matters proceed according to the assumed citizen needs, and it is left to civil servants to interpret public demands (Røste and Miles, 2005). Therefore, even with the facilitation of the internet, end-user (citizens) co-production, as expected in the e-commerce context (Bilderbeek and den Hertog, 1997; Hauknes, 2005), occurs less, depending heavily upon the intermediary roles played by public servants. This is verified by the findings by Scholl et al. (2009) that understanding needs is different from involving the citizen/customer in the process of developing a product or a service, and is also encouraged in Web 2.0 applications.

Proposition #1 Citizen/customer participation in e-enabled service innovation is rare in the e-government context.

4.2 Market-maker-style website structure

Compared to Product/service-provider-style (PSP-style), market-maker-style (MMK-style) establishes a new technology platform, and puts in place a new system that uses this technology platform to overcome the barriers of organisational sectoralism. According to one IT staff member, there are three principal areas of technical innovation in integrated service platforms. These are:

- information security and authentication: using single sign-on (SSO) or digital certificate approach to govern access to all government agency online transaction services
- information visibility – cross-agency integration of transaction processes: this involves upgrading the traditional point-to-point transaction method to a centralised transaction and routing framework that moves interagency operations away from a

simple 1:1 format to a more complex 1:N or even N:N format, while ensuring reliability of document and information transfers

- resource sharing, or integrating existing systems through a standardised interface: this involves linking disparate platforms with traditional proprietary interface attributes through a standardised system interface so as to ensure information visibility between systems.

In addition, as domain experts (i.e., upstream information providers) are other government agencies, the establishment of a cross-agency working group that coordinates market maker, domain experts and ASPs is important. Due, however, to a lack of jurisdictional rights, some agencies will decline to participate. In the e-housekeeping case, for example, the potential domain expert, the Taipei City Government, was unwilling to participate, as it operates its own 'citizen services e-network'. This verifies Bent et al.'s (1999) findings that "protection of departmental jurisdiction has been an impediment to the growth and development of several of the single-window structures", especially in the case of MMK-style. Thus, the promised core benefit cannot be realised.

Therefore, whether or not MMK-style provides citizens with a higher degree of 'core benefit' remains to be seen. In the case of e-tuition, for example, in the first year of its launch, the 500 or more participating schools reported USD 33 million of transactions in the first semester and USD 132 million in the second semester. Among over 5,600 schools in Taiwan, the participating schools were 1,194 in 2008 and 1,213 in 2009 and the records were 0.29 million in 2008 and 0.48 million in 2009, but results were not definitive in the context of the huge student population and schools in the Taipei City and other county areas. Despite the best intentions of the government, citizens/students did not appear to have any great motivation to give up their regular habits for the new delivery channel to enjoy a new integrated service, as claimed as a new core benefit. A similar phenomenon was noted in the e-housekeeping case.

Proposition #2 Voluntary collaboration from domain experts can make MMK-style website structure more likely to deliver core benefits to customers/citizens.

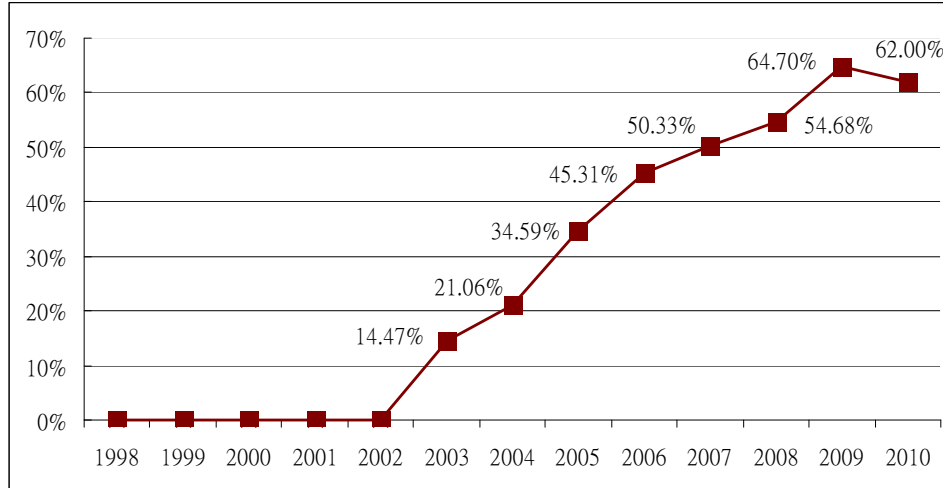
Proposition #2-1 The claimed core benefit provided by MMK-style website structure still needs further efforts to meet the needs of citizens.

4.3 Product/service-provider-style website structure

Comparatively speaking, the diffusion effect of PSP-style website structure is expected. The public seems more willing to accept and experiment with PSP-style online services, possibly because these are services the public in fact needs. In the e-motor vehicle case, for example, the number of citizen enquiries rose from 8.32 million in 2004 to 8.76 million in 2005 and to 9.74 million in 2006, while online fine-payments grew from 0.23 million to 0.31 million to 0.34 million over the same years. In 2005, the average record of online service is 26,041/month, while the record is 34,531/month in 2008. In general, the usage rate of e-motor vehicles rose slowly. In contrast, the usage rate of online tax filing rose tremendously. The percentage of taxpayers filing their reports online grew from 14.46% in 2003 to 21.06% in 2004, 34.59% in 2005 and 45.31% in 2006. In 2009, 64.70% of taxpayers filed individual income tax via the internet (see Figure 2). In the case of online examination registration, for the first 18 examinations for which

registration was offered online, the average facility usage rate reached 36%, which is quite an accomplishment for the first year. In 2009, the usage rate reached 70%.

Figure 2 Online income tax filing in Taiwan (1998~2010) (see online version for colours)



Source: Research, Development and Evaluation Commission, Executive Yuan of Taiwan, 2011

PSP-style website structure provides a higher degree of service delivery benefits in cyberspace (e.g., e-tax-filing). If, however, they only provide form-download services and do not tend towards the goal of full-process online delivery (e.g., e-examination registration), they only achieve a part of their potential and fail to make the best use of the internet to satisfy user needs or provide genuine practical convenience to citizens.

The reasons for this are perhaps to be found in whether the attributes of the service pertain to people's 'rights' or to their 'duties'. In general, changing matters that affect citizens' rights or duties involves stipulations of law, amendments to which can be difficult. We have found that when a service addresses citizen 'obligations', and when failure to comply incurs penalties, no great changes to law are required to implement an e-innovation and it is easier to put the necessary procedures online. In the case of e-tax-filing, for example, as the methods of tax payment are not particularly circumscribed by statutes, such as the income tax law, the Ministry of Finance was able to take a broad interpretation and put in place a 'declaration-free' tax payment system while also making systems for database queries, calculations, etc. available to the public. The public then no longer 'declared' taxes, and the government used appropriate technologies to assist the public in calculating payments due. The same is true in the case of the e-motor-vehicle system, where in the past, the public had to act of its own volition to inform the government of changes of address, etc., now the government is the 'agent', as its own internal database linkages 'helpfully' update information on citizens' behalf.

Services in the e-government which address citizen 'rights', however, are more likely to require amendments of existing law if the objective is to provide a higher degree of delivery benefit (i.e., perform completely electronic transactions), and for this reason it is more difficult to provide a genuine delivery benefit. The purpose is to balance the fairness to the public and the fair use of technology. In the case of the online registration

for national examinations, for example, the government is required to review candidates' qualifications in order to comply with the governing legislation, and must also protect the rights of all candidates in order to ensure fairness. An examinations official interviewed told researchers that the crux of the issue is that there is no way to simplify the necessary procedures of document submission and qualifications review. This latter process is currently governed by provisions of the *Civil Service Examinations Act* and the *Professional and Technical Personnel Examinations Act*, which strictly define the documents required to demonstrate candidate eligibility. One interviewee noted that:

“the current system of qualifications review increases user processing time through our IT systems, and running paper-based and online systems in parallel increases the amount of work for staff. As we have had to bring on additional manpower, it can't be said that technology has allowed us to cut staff numbers.”

As it is not an easy matter to amend the law, and as the current procedures are well-ingrained in popular habit, the entire examination registration process cannot be conducted online until such time as these laws are appropriately updated.

These various examples show that the efficiencies attainable through the use of technology are still subject to the strictures of the prevailing legal framework, and that where standing law does not stipulate the forms of some activity, it is easier to create a greater delivery benefit for the public in the online environment. If standing law represents an obstacle, on the other hand, then it is desirable to 'package' the various amendments that may be required and forward these as a uniform set of recommendations to the legislative organ for deliberation and passage as a general upgrade of the regulatory environment.

Proposition #3 For those websites characteristic of PSP-style website structure, the degree of delivery benefit is determined by the right or duty attributes of online service.

Proposition #3-1 If the online service is pertaining to people's 'rights', it is harder to reach a higher degree of delivery benefit without the amendment of standing law.

Proposition #3-2 If the online service is pertaining to 'duty', it is easier to reach a higher degree of delivery benefit by taking a broad interpretation of standing law.

4.4 *Eligible regulatory/policy environment*

As the upgrade of government services to online availability is progressively realised, greater attention must be paid to the regulatory/policy environment to provide an eligible context for the application for technology innovation.

In the MMK-style website structure, the efficiency of core benefit provision can be affected by policy innovation. Strategically, it can not only increase the incentives of citizens to use it, but also 'force' the citizens to use it. For example, according to BBC News on January 17, 2007, the British Cabinet Office shut down hundreds of government websites and shifted the people's interest to use so-called 'supersites' such as Directgov and the Business Link in order to make access to information easier for people. This policy also saves the budgets for maintaining different government websites. In 2009,

Taiwan had added “sharing information from the domain expert” as one evaluation item for the Government Service Quality Award, attempting to encourage inter-organisational cooperation as one criteria of evaluating organisational performance.

In the PSP-style website structure, the efficiency of delivery benefit provision can be affected by regulatory innovation. If standing law mandates no restrictions, rapid usage growth can be expected, as was the case between 2002 and 2009 in the case of the e-tax filing program, although this was slower over the years of operation of the e-motor-vehicle system. An official of this latter system observed that: *“Even though everything is in place, growth in usage rates has been slow. So now, our main task is in promotion.”* Where existing law does stipulate procedures, however, if no consensus for amendment can be reached at the legislative level, and the necessary regulatory innovation is achieved, the technological feasibility of an initiative is immaterial, as in practical terms the innovation cannot be implemented.

Proposition #4 As the development of e-government continues, consensus at the legislative level will be necessary to exploit the potential of technology.

5 Managerial implications and conclusions

This paper set out to examine how the service innovation activities enabled by ICT in the public sector create value for citizens. The public sector adopted IT to foster changes in the service concept, delivery system, and client interface. After years of practice, however, the diffusion effects of ICT adoption are diverse among different e-service projects. We found factors that explain the different diffusion effects.

We propose a model using the MMK-style and PSP-style website structures which can be considered sub-constructs of the delivery system dimension in den Hertog’s service innovation framework. Our model includes the construct of service value, which is a new construct subdivided into core benefits and delivery benefits. For MMK style website structure, to encourage voluntary coordination from upstream information providers may increase the core benefits to citizens. For product/service-style website structure, to take a broad interpretation of existing law will increase the delivery benefit to citizens, or amending existing law is necessary to reach the potential of technology in delivery benefit.

Our results have three significant implications. First, we extend the service innovation framework in the service industry into the context of the public sector and focus on service innovation practices after ICT adoption in the public sector. Second, our study highlights two service innovation activities in the delivery system dimension, namely MMK-style website structure and PSP-style website structure. They are important because they visualise how different website structures should develop different strategies to shape service value to the citizens. Third, we revised the framework in the context of cyberspace where different website structure may provide different benefits to citizens. MMK-style website structure may bring core benefit to citizens if a mechanism for voluntary cooperation from the upstream domain experts exists. In the case of PSP-style website structure, the structure can be configured to provide delivery benefits according to different service attributes.

Much of the existing literature considers the service contents or service functions of government websites which are crucial for citizens’ usages. However, even if the

function of a government website is well designed, the diffusion effects are not as high as expected. This study tries to resolve this issue. This paper addresses how IT enables service innovation in the e-government context. Concepts from den Hertog's conceptualising framework for service innovation and Halvolsen's idea for public sector innovation are employed to study e-government innovation activities. This paper provides a refined framework with which to analyse how to increase service value for citizens/users in cyberspace. Six testable propositions are presented for further theoretical development.

Empirically, this study provides insight into the potential use of web technology in the e-government context and sheds light on various policy implications. Our paper may help policy makers understand service innovation in the public sector to properly allocate resources to IT. MMK style website structure is highly innovative and new to governments. It should be noted, however, that the depth of information provided by domain experts can influence the effectiveness of market makers. Encouragement of domain experts to coordinate may be a good opportunity to develop core benefits of service value. Accordingly, further initiatives to enlighten citizens regarding the core benefits created by the internet, as well as incentives to seek these benefits, may be necessary. Only with active expert involvement and citizen enthusiasm can a higher degree of core benefit provided by MMK-style website structure be realised. For their part, the PSP-style website structure offers a high standard of delivery benefit, but still requires much effort to amend existing laws and demonstrate political feasibility. Further study should therefore focus on operationalising these concepts.

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