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Abstract:

Despite the vast amount of research conducted and knowledge accumulated to explain the adoption of electronic public services, the issue of how to design high quality e-government Web sites remains an unresolved and relatively understudied topic. This study aims to address this theoretical and pragmatic gap by differentiating service content from service delivery in prescribing technological solutions for enriching the service quality of e-government Web sites. Grounded in Ives and Learmonth's [1984] *Customer Service Lifecycle*, this article explicates a series of functional specifications that may be superimposed onto basic government transactions to enhance the overall functionality of e-government Web sites. It also articulates six interface design principles that are pertinent to addressing citizens' expectations associated with the delivery of public services via the Internet channel. Together, the resultant dimensions depict a comprehensive set of IT-enabled content functionalities and interface design principles that may direct future research into fully interactive and executable e-government services. Practitioners could also benefit from the utilization of these content and delivery dimensions both as a reflective mirror to isolate inadequacies in e-government Web site designs, and as a benchmarking mechanism to assess the level of maturity of existing public e-services as compared to other leading exemplars.

Keywords: information systems development, transaction systems, IT innovation and adoption

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I. INTRODUCTION

E-government is the application of Information and Communication Technology (ICT) to automate interactive exchanges between public institutions and their external stakeholders by redeploying conventional public services through the Internet [Gefen et al. 2002; Jorgensen and Cable 2002; Marchionini et al. 2003; Sharma and Gupta 2003; Turban et al. 2002]. The emergence of e-government Web sites not only liberates citizens from the prerequisite of collocation in accessing public e-services [Cohen and Eimicke 2003; Lawson 1998], it also opens up transactional opportunities for conventionally neglected social entities, such as citizens with disabilities or those from less-privileged communities [Coates 2003; Huang 2003].

Service quality in the delivery of public e-services is paramount in encouraging their adoption by citizens [Ancarani 2005; Buckley 2003; Hazlett and Hill 2003; Teicher et al. 2002]. Service quality in public e-services comprises combination of *content* and *delivery* components: *service content quality* is concerned with *what* functionalities should be offered on e-government Web sites, whereas *service delivery quality* emphasizes *how well* these functionalities can be accessed by citizens [Ancarani, 2005]. While ***service content quality*** is dictated by the effectiveness of IT-mediated service functionalities—made available via e-government Web sites—in realizing promised transactional outcomes, ***service delivery quality*** describes the efficiency of the underlying Web-based communication medium through which such functionalities are made accessible to citizens. Ancarani [2005] thus reasoned that any conceptualization of e-government service quality should entail both *content* and *delivery* elements: "The quality of the medium is often confused with the quality of the content [when in reality] both should be considered in defining e-service quality" [p. 8].

In keeping with the previous statements, this paper endeavors to explore constituent components of service content and delivery quality for e-government Web sites. We prescribe what we term as the *Electronic Government Service Life Cycle* (EGSLC), our adaptation of the Customer Service Life Cycle (CSLC) [Ives and Learmonth 1984; Ives and Mason 1990], which details 31 functional specifications catering to the service expectations of citizens transacting via e-government Web sites. Organized around typical customer-oriented activities associated with e-government transactions, the EGSLC identifies functional areas within e-government Web sites whereby ICT may be strategically leveraged to accommodate citizens' transactional needs. These functional specifications not only encompass traditional services representative of "face-to-face" governmental transactions, but they also reflect Web-enabled transactional functionalities, which are *otherwise infeasible* to implement via physical media [Barnes and Vidgen 2003; Cenfetelli et al. 2008; Fagan and Fagan 2001]. By employing the EGSLC as an analytical framework, we examine the Electronic Tax Filing (e-Filing) portals of Singapore and the United States to compare and contrast how prominent e-government Web sites fare in fulfilling the prescribed functional specifications. By specifying exemplary IT-mediated service functionalities which facilitate the achievement of desirable transactional outcomes the EGSLC serves to guide the design of citizen-centric e-government systems.

Furthermore, by accentuating the need to consider the *mode of service delivery* for the aforementioned IT-mediated transactional functionalities [Ancarani 2005], we arrive at six pervasive interface design principles for *Information Technology Mediated Customer Service Delivery* (ITMCSD) that citizens will come to anticipate from the delivery of public services via the Internet medium. To demonstrate the viability of our proposed ITMCSD design principles, we showcase pragmatic examples from actual e-government Web sites that illustrate disparities in the manner by which public e-services are being delivered, despite having almost identical content functionalities.

The paper is organized as follows: Section II presents a theoretical overview of e-government. Section III discusses contemporary service quality research in order to illuminate the necessity of segregating service content and delivery into two distinct but complementary factors in the design of high-quality e-government Web sites. Sections IV and V depict the constructs of service content and delivery, together with their constituent IT-mediated sub-dimensions. Finally, Section VI summarizes the theoretical and pragmatic contributions of our proposed e-government service quality framework.

II. E-GOVERNMENT: A THEORETICAL OVERVIEW

From a technological perspective, Milford [2000] considered e-government to be the means by which IT is utilized to simplify and to automate transactions between public organizations and their external constituent entities such as citizens, businesses, or even foreign governmental agencies [see also Marchionini et al., 2003]. Therefore, from the

standpoint of technologists, e-government is the process of transacting business between the public and the government through the use of automated computerized systems [Sharma and Gupta 2003]. This in turn has popularized the notion that e-government is no different from that of pursuing "electronic commerce" within the context of public services [Stratford and Stratford 2000].

Tapscott [1996], however, provided an alternative appraisal of the role of IT in revamping public services. He visualized an "inter-networked government" in which public institutions thrive on the collaborative potential of networking technologies in forging virtual alliances to create strategic value for collaborators [Tapscott 1996]. Zweers and Planque [2001] further expanded on this idea and suggested that e-government is the provision and attainment of information and services through electronic media, by and from any public institution, such that extra value is generated for all participating partners [see also Ho 2002]. Incidentally, this line of argument parallels the views of Nadler and Tushman [1997], who argued that technology is the means but not the end for e-government.

Yet this is not an all-encompassing viewpoint; amidst these discourses on the technicalities of e-government, there are other scholars who have adopted a more communal outlook on its mission. Embracing a societal perspective, Lawson [1998] put forward the idea that e-government is the provision of public services in a "one-stop, non-stop" manner where "power is transferred to the people." This is reinforced through the work of Robbin et al. [2005] and Torres et al. [2005], where it is again emphasized that the core responsibility of e-government is to ensure convenient access to public information and foster dialogic communication channels between public institutions and citizenries [see also Kaylor et al. 2001; Tan and Pan 2003; Turban et al. 2002]. Quoting O'Neill [2001], "The new technologies will allow the citizen new access to the levers of power in government. As more information reaches the citizen, the greater the potential for them to influence and make informed choices regarding how government touches their lives. That potential gives new meaning to a 'government of the people, by the people and for the people'" [p. 6]. Wimmer and Traunmuller [2000] therefore allege that e-government serves as the guiding vision of a modern genre of public administration and democracy where citizens are substantially empowered to contribute toward policy formulation and legislation.

From the previous discussion, it is clear that e-government can be characterized in three ways (see Table 1):

Table 1. E-Government Definitions and Their Implications

Definition (e-Government defined as…)	Role of Citizens	Implication for Development
IT Artifacts employed by public institutions to achieve effective and cost-efficient business transactions	***Customers*** of governmental transactions	Consistently deliver improved products and services through electronic media
Virtual Value Chains between public institutions and their stakeholders to streamline governmental processes and administrative procedures	***Business Partners*** of public institutions	Creating additional value by exploiting the collective strength of stakeholders through digital alliances
Virtual Socialization Process between public institutions and citizens to create responsive governments	***Participants*** in the democratic system	Amplify citizens' voices in governance through easily-accessible virtual communication channels

Of particular interest to this study is the artifactual perspective of e-government as ongoing research continues to testify to the inadequacy of existing public e-services. For instance, a recent report published by the European Public Administration Network indicates that of the 436 e-government Web sites evaluated across the 25 member states in the European Union, only 3 percent achieved Level A conformance with the Web Content Accessibility Guidelines (WCAG 1.0). This implies that for 97 percent of the evaluated e-government Web sites, one or more groups of stakeholders within their target audience will fail to gain access to relevant information and public services.

III. SERVICE QUALITY IN E-GOVERNMENT: DIFFERENTIATING SERVICE CONTENT FROM DELIVERY

The design of e-government Web sites remains challenging despite extensive research [see Barnes and Vidgen 2003; Fulla and Welch 2002; Ho 2002; Huang 2003; Scavo 2003; United Nations 2004; Zhang et al. 2001]. Empirical evidence has pinpointed the inability of e-government Web sites to move beyond informational offerings and to provide fully interactive transactional capabilities as the reason behind lethargic adoption by citizens [Holden et al. 2003; United Nations 2004]. Surveys conducted by the International City/County Management Association [ICMA] [International City/County Management Association, 2004] and the Pew Internet and American Life Project [Pew Internet and American Life, 2002] documented equally low usage patterns for e-government services, with information dissemination being the dominant form of Web-based interactions between public institutions and

citizens. A recent Accenture report further revealed that citizens' willingness to embrace more engaging and encompassing e-government services outpaced public institutions' ability to deliver them [Accenture 2006].

Results from the aforementioned surveys highlight a perceived service quality gap caused by an imbalance between the demand and supply sides of public e-service offerings [Reddick 2004]. In other words, existing e-government Web sites are primarily focused on cataloging information as opposed to enabling citizens to execute governmental transactions [Moon 2002; Thomas and Streib 2003]. The survey by the ICMA [2004] further suggests that the lack of interactive transactional functions can be attributed to an absence in service standards [Gant and Gant 2001; Kaylor et al. 2001]. These findings are corroborated by West [2004] who, in reviewing 1,935 government Web sites across 198 nations, concluded that much progress is still desired in deciphering citizens' notions of service quality in the development of public e-services. Conceivably, what is missing is a design blueprint for e-government Web sites from a citizen-centric, service quality perspective [Ancarani 2005; Barnes and Vidgen 2003; Buckley 2003; Gant and Gant 2001; Hazlett and Hill 2003; Piccoli et al. 2004; Scavo 2003].

Research has consistently demonstrated that service quality elicits a host of positive attitudinal responses such as loyalty [Gefen 2002], trust [Reichheld and Schefter 2000] and satisfaction [Cenfetelli et al. 2008; Cronin et al. 2000; Cronin and Taylor 1992; Robinson 1999] from customers. These are the exact same attitudes which have been established in prior studies as salient drivers of citizens' adoption intentions toward public e-services [see Bélanger and Carter 2005; Gefen et al. 2002; Treiblmaier et al. 2004]. Because online consumers can readily exit a transactional relationship and switch to an alternative service provider with the click of a button, the quality of e-services is paramount in attracting and retaining customers [Holloway and Beatty 2003], especially for the predominantly service-oriented domain of e-government, which faces an uphill battle in differentiating itself from physical transactional services [Ancarani 2005; Hazlett and Hill 2003]. We thus define *e-government service quality* as the extent to which an e-government Web site facilitates the efficient delivery of effective public e-services to assist citizens in completing their anticipated governmental transactions.

To establish service quality for public e-services, we posit that it is necessary to distinguish IT-mediated *service content* from *service delivery* as distinct, but complementary, elements constituting the overall quality of an e-government Web site [Ancarani 2005; Grönroos 1990]. Following Ancarani's [2005] appeal for clear demarcations between IT-mediated service content and delivery in conceptualizing e-government service quality [see also Grönroos et al. 2000], we henceforth refer to *service content quality* as the extent to which IT-mediated functionalities provided via an e-government Web site assist citizens in accomplishing their intended governmental transactions, and define *service delivery quality* as the manner in which these IT-mediated functionalities are made accessible to citizens via the e-government Web site as a delivery channel.

Empirical evidence also reinforces the delineation between service content and delivery. Findings suggest that IT-mediated service content is rendered meaningless if it cannot satisfy customers' transactional requirements [Cenfetelli and Benbasat 2002; Cenfetelli et al. 2008; van Riel et al. 2001]. Similarly, Homburg et al. [2002] observed that the breadth and depth of service offerings are vital in shaping customers' attitudes throughout the entire transactional process. Nevertheless, without leveraging the capacity of the Internet to overcome the physical limitations of service delivery, critics countered that the provision of omnipresent assistance from pre- to post-transactional stages may be impractical in online situations, especially in regards to the nurturing of personalized consumption experiences [Cenfetelli et al. 2008]. IT-mediated service delivery is therefore a vital component of e-government Web sites because without access to appropriate service content, citizens' accomplishment of transactional activities can be compromised even when superior functionalities have been competently developed [van Riel et al. 2001]. In this aspect, e-government Web sites can not only circumvent conventional resource constraints by tailoring content to accommodate citizens' service expectations, but they can also grant ubiquitous access to such content, which would not have been possible if delivered via physical media [Gant and Gant 2001; 2002]. Gil-Garcia [2006] echoed a similar argument in proposing a separation between enacted technologies (i.e., delivery interface) and expected outcomes (i.e., transactional content) in structuring e-government services.

IV. IT-MEDIATED CUSTOMER SERVICE CONTENT IN ELECTRONIC GOVERNMENT: THE ELECTRONIC GOVERNMENT SERVICE LIFE CYCLE (EGSLC)

Service content quality is synonymous with the spectrum of IT-mediated customer service content functionalities that appeal to citizens' transactional needs. An analytical framework is therefore indispensable in establishing a coherent direction for diagnosing citizens' service expectations in order to tailor e-government Web site functionalities to meet these basic demand requisites. Within e-government literature, numerous stage models and process frameworks have been devised to guide the development of public e-services. Marchionini et al. [2003], for example, recommended that e-government service portals should go through three phases of evolution from providing *initial access to informational resources* to moving into *interactive transactional services* and ultimately to *attaining proactive citizen participation*. Another three-stage framework that is popular among e-government scholars starts

with *initiation* (delivering a single point of access to integrated electronic public services), followed by *infusion* (digitizing all governmental activities), and then moves on to *customization* (constructing personalized profiles for every citizen in each e-government transaction) [Donnelly and Merrick 2003; Ke and Wei 2004].

Apart from the stage development models detailed previously, other e-government scholars have proposed more refined process frameworks that extend beyond three phases. By plotting e-government development along the dimensions of integration and complexity, Layne and Lee [2001] claimed that e-governments evolve through four stages, *catalogues* (simple web presence with categorical presentation of information), *transactions* (working databases supporting digital public services), *vertical integration* (integration of local and higher level systems with similar functionalities) and *horizontal integration* (assimilation of systems across different functionalities), thus achieving "one-stop shopping for citizens" [p. 124]. In the same vein, Tan and Pan [2003] prescribed a five-stage model that captures the evolutionary path undertaken by public institutions in pursing e-government reforms along the strategic considerations of communication, customer satisfaction and value creation.

While each of the aforementioned frameworks may prove to be equally valid in the strategic planning of e-government initiatives on a broader scale [Holden et al. 2003], they are not suited to our research objective of prescribing actionable guidelines for designing e-government Web sites. First, these e-government process frameworks exist on a level of abstraction that is unsuitable in generating actionable guidelines for developing service content functionalities within e-government Web sites [see Sabherwal and Robey 1995]. Furthermore, a majority of these frameworks are contrived out of organization-centric performance metrics for public institutions rather than citizens' service indicators, which should be the primary motivational force behind e-government Web site developments [Gant and Gant 2002; Oberer 2002; Wimmer and Traunmuller 2000]. Finally, these models generally depict a descriptive evolutionary path for practitioners and do not sufficiently elucidate the transactional process experienced by citizens, thereby rendering them inappropriate for the diagnosis of content functionalities that are reflective of generic service expectations when performing e-government transactions.

The Electronic Government Service Life Cycle (EGSLC)

The Customer Service Life Cycle (CSLC) is a "detailed descriptive model for identifying and categorizing strategic applications of ICT by focusing on the possible differentiation of a firm's product from competitors' products on the basis of customer service" [Ives and Learmonth 1984, p. 1201; see also Ives and Mason 1990; Lightner 2004]; it comprises four essential stages encountered in typical transactions, namely *requirements, acquisition, ownership* and *retirement*. These four stages illuminate facets of a generic transactional process for which the application of ICT serves to "build and maintain the loyalty of a firm's customer base" [Ives and Learmonth 1984, p. 1201]. Though the CSLC model was initially conceived for commercialized product differentiation, its past applications to a myriad of online phenomena imply that its diagnostic and prescriptive properties can, to a large extent, be adapted and transplanted onto e-service contexts such as e-government [e.g., Cenfetelli and Benbasat 2002; Cenfetelli et al. 2008; Lightner 2004]. The CSLC model is thus invaluable in uncovering service areas where technological support can truly make a difference: "The Customer-Service Life Cycle (CSLC) is intended to help you to think creatively about how technology can be integrated into your products and into your customer's experience (because) the most innovative ideas are often not the most costly or resource-intensive, but simply those based on an understanding of how customer needs can effectively be satisfied" [Piccoli et al. 2001, p. 45].

Although public administration may be precluded from interorganizational rivalry, the advent of e-government has necessitated the differentiation of public e-services from their physical paper-based predecessors. The EGSLC is an adaptation of the CSLC model to the predominantly service-oriented nature of e-governments. The EGSLC retains three of the transactional stages of the CSLC: *requirements*, *acquisition* and *ownership*. The *Requirements* stage emphasizes the provision of Web site functionalities to aid citizens in establishing the range of e-government services most suited to their transactional needs [Cenfetelli et al. 2008; Ives and Learmonth 1984; Ives and Mason 1990; Lightner 2004]. Since the mandatory nature of governmental transactions makes it difficult for citizens to be fully conscious of the transactional requirements stipulated for specific administrative purposes [Tan and Pan 2003; Tan et al. 2005], the functional capability of e-government Web sites to enlighten these requisite expectations is of key importance [Fagan and Fagan 2001]. The *Acquisition* stage consists of Web site functionalities that automate and mimic basic transactional mechanics of government services [Gant and Gant 2002; Poon 2002]. If e-government services were to truly replace traditional paper-based procedures in public administration, the former must, at the very least, encompass the same level of functionality granted by the latter [Reddick 2004; 2005]. The *Ownership* stage comprises Web site functionalities that transfer partial ownership of e-government transactions from public agencies to citizens [Lawson 1998; Tan et al. 2005]. In so doing, it becomes feasible to acclimatize the usage of public e-services such that citizens' participation is more proactive than reactive [Tan and Pan 2003].

Though this paper positions the EGSLC as a guiding template for the design of e-government Web sites, it is not meant as a recipe for implementation. In other words, the prescribed functionalities are intended as guidelines for

what should be present and not *how* they should manifest in actual technical terms. We hence preface each of our proposed functional specifications with the phrase, "Ability to…" to amplify the distinction between the *ability* of an e-government Web site to fulfill specific functional needs versus the *method* by which it satisfies those needs. Table 1 illustrates the functional specifications embodied in the EGSLC. In grounding our proposed functional specifications in the well-acknowledged CSLC model and referencing multiple e-government Web sites for their pragmatic instantiations, the resultant EGSLC mirrors a deductive-inductive effort to address service content quality in e-government with consideration for future alterations.

Evaluating E-Government Websites

We evaluate the validity and applicability of the EGSLC by examining how these functional specifications manifest through the e-Filing Web sites of Singapore and the United States. The two countries being used as illustrations for best practices in e-government Web-interface design are chosen based on the latest Accenture [2004] report in which they were ranked prominently on e-government service maturity. Further, tax filing can be deemed to be the most common transactional activity in public administration, so much so that it is usually the forerunner in e-government migration. Therefore, the capacity of the EGSLC to elucidate how these e-Filing Web sites are able to better serve taxpayers in electronically filing tax returns for personal income lends weight to its credibility as a design blueprint for a broader array of e-government services. Table 2 depicts our assessment of how prescribed functional specifications have been met by these e-Filing Web sites.

Each e-government Web site is assigned a score every time a particular functionality is judged to have been incorporated. Because we are concerned with the fulfillment of each prescribed functional specification and not how they are implemented, a score of 1 is assigned whenever service functionalities incorporated by the Web site correspond to a specific functional need, and 0 otherwise. On average, the e-Filing Web site of Singapore satisfies 96 percent of the functional specifications advocated in the EGSLC and outperforms its United States counterpart, which achieves only 71 percent service satisfaction level in the provision of IT-mediated content functionalities.

Overall, the two e-Filing Web sites have attained reasonable success in identifying citizens' transactional needs and providing comprehensive services to address the majority of taxpayers' service expectations. Nevertheless, due to steps undertaken by the Singapore government in providing taxpayers with their own personalized domain within the e-Filing Web site, it can better accommodate specialized transactional preferences and requirements. Such personalizable domains allow the government to seek out and interact with taxpayers on an individual level, and vice versa should any problems arise during the e-Filing process. The Singapore government has also made remarkable progress in archiving all transactional proceedings between taxpayers and the tax agency (available for review to both parties) within the personalized domain such that potential disputes can be resolved amicably. Contrastingly, the absence of such functionality within the United States e-Filing Web site has failed to engender a sense of ownership and empowerment because the Web site is unable to empathize with taxpayers as unique entities with evolving needs. Without the personal touch, the United States e-Filing Web site merely resembles a virtual replica of its conventional tax filing paradigm.

Additionally, the Singapore e-Filing Web site facilitates proactive participation by allowing citizens to initiate the e-Filing process using a unique password without having to go through an intermediary. Conversely, the United States e-Filing system is only accessible through authorized commercial third-party vendors offering tax-related services. In the absence of these third-party vendors, taxpayers are unable to accomplish their tax filing through the United States e-Filing Web site. This in turn compromises the citizen-centric purpose of the e-government movement.

V. IT-MEDIATED CUSTOMER SERVICE DELIVERY IN ELECTRONIC GOVERNMENT: SIX INTERFACE DESIGN PRINCIPLES

The availability of net-enabled public services has fueled citizens' demand for these e-services to be delivered conveniently and efficiently. To this end, we advocate six interface design principles for service delivery in e-government, which have been derived from an extensive review of extant literature as demonstrated through the discussion below and portrayed in Table 3.

Together, the six ITMCSD design principles reflect facets of Web-based transactional channels that may be strategically leveraged by practitioners to efficiently deliver e-government services to citizens. Specifically, they play a critical role in encouraging e-government adoption among citizens by dramatically reducing the amount of cognitive resources expended in accessing public e-services.

Table 2. A Comparison of E-Filing Web Sites between Singapore and the United States

Functional Specification (Ability to…)	Description (Provide IT-mediated customer service functionalities allowing citizens to…)	Technical Implementation	
		Singapore	United States
Requirements			
1. Anticipate common needs	Seek clarification regarding common transactional needs	Hyperlinks to information addressing common transactional concerns are situated on an easy-to-locate menu bar	Hyperlinks to information addressing common transactional concerns are situated on an easy-to-locate menu bar
2. Address common needs	Access content addressing common transactional needs	Downloadable PDF document detailing procedural steps to e-file tax returns correctly	Downloadable PDF document detailing procedural steps to e-file tax returns correctly
3. Clarify transactional prerequisites	Comprehend the minimum requirements for an e-government transaction	Checklist to ensure the satisfaction of prerequisites before actual e-filing	Checklist to ensure the satisfaction of prerequisites before actual e-filing
4. Create online personal identity	Establish individual identity in the e-government domain	Online registration for a SingPass (generic e-government pass) to access my_Tax_Portal	None
5. Create personal web domain	Conduct personalized e-government transactions	Logging into my_Tax_Portal creates a personal web domain	None
6. Modify personal information	Update personal information to maintain the relevance of e-government service offerings	my_Tax_Portal allows the modification of personal information	Phone numbers of local IRS offices are provided online for taxpayers to notify of changes to personal information and/or specify special tax administrative requirements
7. Specify administrative preferences	Specify administrative procedures for an e-government transaction	my_Tax_Portal permits balance transfer from Parenthood Tax Rebate accounts to spouses	Alternative Minimum Tax (AMT) Assistant software inputs taxpayers' responses to a few simple questions to determine the steps required to resolve the payment of AMT
Score		**7/7 = 100%**	**5/7 = 71.4%**
Acquisition			
8. Explain involvement of third-party in transaction	Appreciate the need for the involvement of any third-party (commercial entities and/or other public agencies) for an e-government transaction	Hyperlink to information pertaining to the convenience of applying for SingPass	Clarification is provided on the efficacies of employing third-party tax service providers to prepare tax returns
9. Identify third-party involved in transaction	Identify any third-party involved in an e-government transaction	Hyperlink to eCitizen Web site [http://eCitizen.gov.sg] where online application of SingPass is provided	Search program is provided to narrow down the list of tax service providers catering to taxpayers' transactional needs based on demographics
10. Provide information on involved third-party	Review information on the credentials and role of any third-party involved in an e-government transaction	eCitizen Web site offers information on the variety of e-government services accessible to SingPass holders	Hyperlinks to Web sites of tax service providers are accessible to taxpayers to obtain more information
11. Offer various trial-run options	Choose among different trial-run options for the intended e-government transaction based on specified preferences	Choices between downloading PDF format of quick guide to e-filing or online viewing of virtual 'walkthrough' (html) are provided	Choices among different tax service providers are provided
12. Provide virtual trial-run	Perform a complete walk-through of the intended e-government transaction	Quick-guide displays a virtual walkthrough using sample pictures of Web pages to be encountered during actual e-filing	Selected tax service provider will guide taxpayers in preparing tax returns before actual e-filing
13. Allow access of transaction online	Conduct the intended e-government transaction	Taxpayers access the e-filing system through my_Tax_Portal using either the SingPass or the IRAS pin sent through postal mail	None
14. Submit service request online	Submit necessary information and requirements for an e-government transaction	Tax returns, automatically prepared on the Web site, can be submitted using the e-filing system	Tax returns can be e-filed on behalf of taxpayers by authorized tax service providers [i.e., Electronic Return Originators (EROs)]

Functional Specification (Ability to…)	Description (Provide IT-mediated customer service functionalities allowing citizens to…)	Technical Implementation	
		Singapore	United States
15. Offer different payment options	Choose among various payment options for an e-government transaction	Payment can be made through GIRO, Cheque, Cash, NETS, SAM/AXS Station (Multi-Function Kiosks), eNETS, vPost, Internet Banking, ATM/Phonebank Service or Telegraphic/Fund Transfer	Payment can be scheduled through electronic funds withdrawal from checking or savings account, paying by credit card, or registering to use the Electronic Federal Tax Payment System (EFTPS) (http://www.eftps.gov) offered by the Treasury
16. Provide at least one mode of direct electronic payment	Have at least one mode of payment authorizing fund transfer via the internet and/or other electronic means	Tax balance payment can be made online through eNETS by connecting major internet banking services to the Inland Revenue Authority of Singapore (IRAS) as a payee	Tax balance payment can be made online through: ▪ Credit Card using third-party service providers such as Official Payments Corporation [http://www.officialpayments.com] or LINK2GOV Corporation [http://www.pay1040.com]; ▪ EFTPS by connecting major internet banking/financial institution services to the Treasury as a payee while automatically updating the tax record at the IRS, and; ▪ EROs by making arrangements to obtain the necessary information to be provided to the taxpayers' financial institutions to authorize a one-time electronic withdrawal by the Treasury from their financial accounts for payment
17. Provide personalized tracking system	Track the processing status of e-government transactions	my_Tax_Portal contains hyperlinks to view the status of e-filing returns	EROs representing the taxpayers will be alerted via an IRS electronic notice within 48 hours of receiving the electronic tax return; this notification in turn will be forwarded by EROs to taxpayers through email
18. Provide summary of transactional activities	Review archival records of completed e-government transactions	my_Tax_Portal allows taxpayers to retrieve information such as account statements, outstanding tax balances and installment plans	Providing personal information to an enquiry system [https://sa.www4.irs.gov/irfof/lang/en/irfofgetstatus.jsp], taxpayers can obtain instant confirmation on whether the IRS has received their tax returns and processed any due refunds. If not, taxpayers will be prompted on actions to take to rectify the situation
19. Provide privacy protection statement	Review clarifications on how disclosed transactional information will be utilized and protected	Concise privacy statements are provided on how disclosed personal tax information will be used and safeguarded to protect taxpayers' privacy	Concise privacy statements are provided on how disclosed personal tax information will be used and safeguarded to protect taxpayers' privacy
Score		**12/12 = 100%**	**11/12 = 91.7%**
Ownership			
20. Profile services	Customize e-government services based on individual and/or demographic profiles to facilitate ready access from a consolidated web-space	my_Tax_Portal facilitates access to and management of a set of tax-related administrative tools relevant to taxpayers within a familiar domain	Specialized section containing links, administrative tools and tax-related information pertinent to the needs of individual taxpayers is provided
21. Control administrative procedures	Control aspects of public administration when conducting e-government transactions	New administrative tools or e-service improvements will be added to my_Tax_Portal on a continuous basis	None
22. Prompt news updates regarding transactional matters	Authorize proactive prompting of new e-government service developments through various electronic means (email alerts, mobile phone messages etc)	None	None

Functional Specification (Ability to…)	Description (Provide IT-mediated customer service functionalities allowing citizens to…)	Technical Implementation	
		Singapore	United States
23. Localize press releases regarding transactional matters	Review, from a single localized domain, updates or information regarding new service developments	Section containing latest e-tax guides and press statements pertinent to tax administrative matters is provided	Section containing news updates and summaries of governmental announcements pertinent to tax administrative matters is provided
24. Modify online service request after submission	Change aspects of an e-government transaction (information submitted and/or services requested) even after it is deemed to have been completed	Taxpayers are only required to file zero returns (consent) during e-filing, thereby allowing the tax agency to prepare the tax returns on their behalf and to automatically impose necessary adjustments and re-process the tax returns should any sudden amendments in tax legislation arise	None
25. Provide comprehensive schedule on availability e-government services	Review time schedule pertaining to the availability of e-government services due to system maintenance and/or upgrades	A Hours of Service section is provided to indicate the time frame within which net-filing service is available	None
26. Provide deadlines for specific transactions	Review deadlines for the completion of specific e-government transactions	IRAS tax calendar (html) is available to remind taxpayers of important dates/deadlines for different tax administrative matters	Deadline for tax filing can be found in tax topic section 300 under the topic area of general information
27. Provide proactive prompting of transactional deadlines	Authorize proactive prompting of e-government transactional deadlines through various electronic means (email alerts, mobile phone messages etc)	None	None
28. Pre-authorize recurring transaction/payments	Choose among various options by which recurring transactions and/or payments is to proceed	Downloadable application for the General Interbank Recurring Order (GIRO) service whereby pre-approved monthly payment will be automatically deducted from taxpayers' bank accounts to settle tax balances over a maximum of 12 interest-free monthly installments	Hyperlink to the EFTPS allowing pre-approved authorization and scheduling of future dated payment for tax balance installments; the EFTPS automatically deducts payment on the due date indicated by taxpayers and scheduled payments can be altered or cancelled up to 2 business days in advance of the scheduled payment date
29. Register disputes with transactional outcomes	Communicate and log disagreements with transactional outcomes	my_Tax_Portal offers email templates that register common disputes with tax return valuations	Information is provided on various legal channels by which taxpayers may resolve tax-related disagreements
30. Record transactional proceedings	Archive transactional proceedings in a personalized domain that is accessible by all involved parties	All transactional disputes, complaints and concerns pertaining to e-filing are archived in my_Tax_Portal to be made accessible for future reference	None
31. Collect feedback	Interact proactively with public agencies to offer comments and feedback	Contact details of officials from the tax agency are provided such that taxpayers can easily voice their opinions and concerns to administrators possessing relevant authority and expertise	Contact details of officials from the tax agency are provided such that taxpayers can easily voice their opinions and concerns to administrators possessing relevant authority and expertise
Score		**10/12 = 83.3%**	**6/12 = 50.0%**
Mean Score		**96.1%**	**71.0%**

E-government services should accommodate diverse physiological and/or technological requirements to guarantee unbiased accessibility.

The provision of unbiased access to public services has been plagued by geographical barriers and infrastructural deficiencies [Dippo 2003; Ho 2002; Jaeger 2003; Kuk 2004]. By utilizing the Internet as a delivery medium, government institutions are not only able to transcend spatial and temporal boundaries in delivering public services, but also to extend the reach of these e-services to a broader range of constituents, especially with respect to

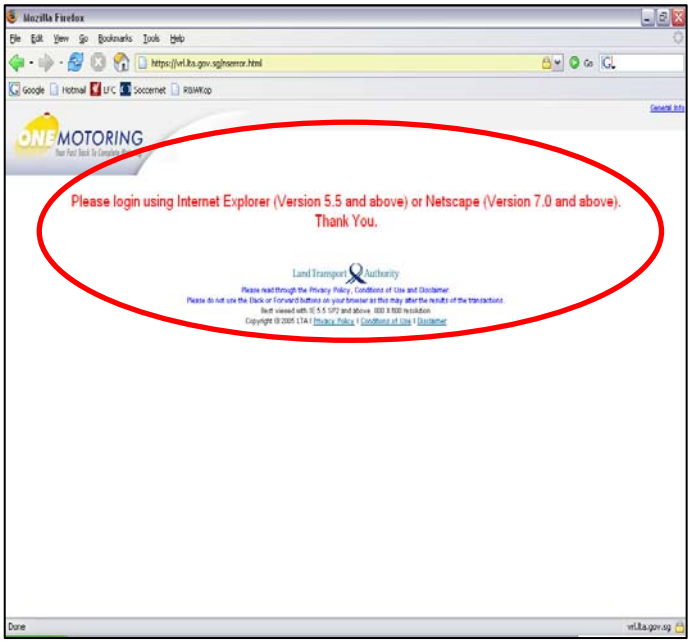
Table 3. IT-Mediated Customer Service Delivery (ITMCSD) Design Principles	
Web-based Service Delivery Expectations	**Interface Design Criteria for the Delivery of IT-Mediated Customer Services in e-Government**
Accessibility	Extent to which service content of an e-government Web site is accessible to citizens with diverse physiological and/or technological constraints
Navigability	Extent to which the navigational structure of an e-government web portal can be readily traversed to locate appropriate service content efficiently
Interactivity	Extent to which an e-government Web site proactively engages the citizen in an online transaction
Interoperability	Extent to which affiliated service content is delivered via the same web interface window of an e-government Web site
Adaptability	Extent to which an e-government Web site is synchronized with and amenable to service content amendments
Security	Extent to which service content of an e-government Web site is safeguarded against unsanctioned intrusions

generally neglected social entities such as citizens with disabilities or less advantaged communities [Coates 2003; Huang 2003]. Yet, as practitioners endeavour to maximize the potential of Internet technologies to overcome physical limits in delivering public services, the impact of diversity in the physiological capabilities of their target citizenry (e.g., dyslexia, visually impaired) as well as disparities in web-interface presentations caused by citizens' adoption of divergent technologies (e.g., Personal Computers versus Macintoshes, or Microsoft Internet Explorer versus Mozilla) are sometimes overlooked as a fundamental elements affecting the accessibility of e-governments [Tan and Pan 2003]. Such inconsistencies in Web-interface design are common even among mature e-government Web sites, and they reduce the effectiveness of the Internet as an impartial delivery medium. For instance, irregularities are apparent in the Singapore e-government Web site created for citizens to access governmental services related to motoring. Electronic services for the payment of parking fines and road tax become inaccessible when other popular internet browsers (e.g., Mozilla Firefox) are used in place of Internet Explorer or Netscape (see Figure 1). In another example, it is noted that the primary governmental Web site of the Montgomery County, which consists of consolidated links to fundamental e-government service offerings, supports speech-enabled content via Browsealoud [www.browsealoud.com], a free downloadable software provided by Texthelp Systems Ltd [www.texthelp.com]. Conversely, a Web site of similar content by the Singapore government was tested and found to be incompatible with the same application and no suggestion of other speech-enabled capability is offered (see Figure 1). With the emergence of such disability-friendly technology, the onus of enhancing the accessibility of service content within e-government portals thus lies on public institutions, and is dependant on their willingness to comply with these technological standards. Specifically, the government of the United Kingdom is commendable for enacting the Disability Discrimination Act in 1995, which prompts the majority of e-government Web sites to be Browsealoud compatible.

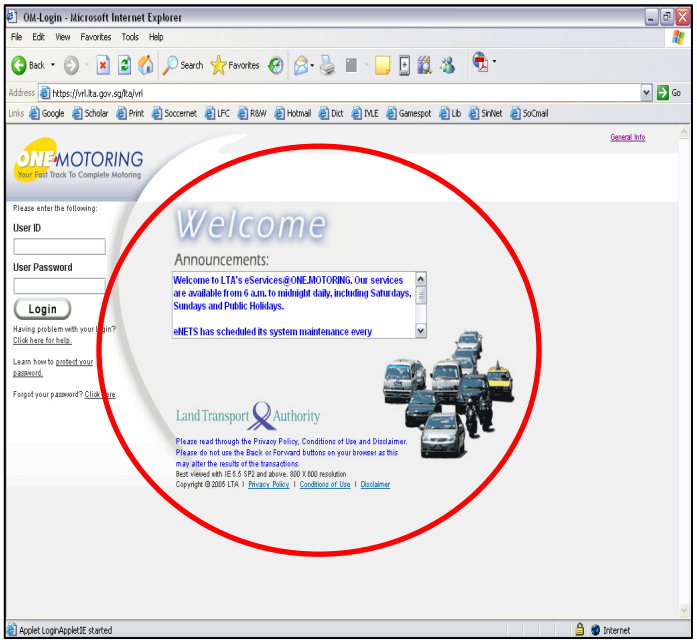
E-government services should be organized in an intuitive and systematic format to ensure ease of navigability.

The quality of navigability influences the effort-performance expectancy of system users. Particularly, the complexity of the given navigational structure determines the ease by which a Web site can be readily traversed by an inexperienced user, which in turn affects the cognitive effort necessary to accomplish a specific net-related task [Korthauer and Koubek 1994]. In the same vein, the sophistication of the navigational structure has a significant bearing in the context of e-governments [Beynon-Davies 2004; Treiblmaier et al. 2004; Yao and Houston 2002]. Because governmental transactions are usually *mandated* by regulations [Tan et al. 2005], it is rare for citizens to be familiar with the procedures for performing a particular administrative duty. Therefore, if e-government Web sites were to add to users' transactional burden through complex navigational trees, it would lead to heightened levels of cognitive effort and eroded perceptions of service delivery quality among citizens. Conversely, if e-government Web sites were to adopt an intuitive, user-oriented format in displaying available services, it could help in alleviating the cognitive demands on citizens performing mandated administration [Carter and Bélange, 2004; Fernandes et al. 2001; Gant and Gant 2001, 2002; Gaston 2005]. As such, given a fixed number of end nodes for an e-government Web site, a designer can either adopt a "broad" strategy by increasing the number of hyperlinks available on each page while decreasing the number of clicks and page loads or a "deep" strategy with fewer links per page but with more hierarchical levels [Chae and Kim 2003; Katz and Byrne 2003]. For instance, even though there is theoretically no inherent advantage in adopting one strategy over the other, the level of thoughtfulness in managing information layout within an e-government Web site poses significant influence on its perceived navigability. To illustrate, a reasonably common e-governmental activity, such as the online query of deadlines for a specific public administrative task (tax-related), was executed. It was extremely difficult to locate the needed information within the Internal Revenue Services (IRS) Web site of the United States as it employs a deep navigational structure, while concurrently containing huge quantities of data and an overabundance of links on each page. It took at least *four*

[https://vrl.lta.gov.sg/lta/vrl]

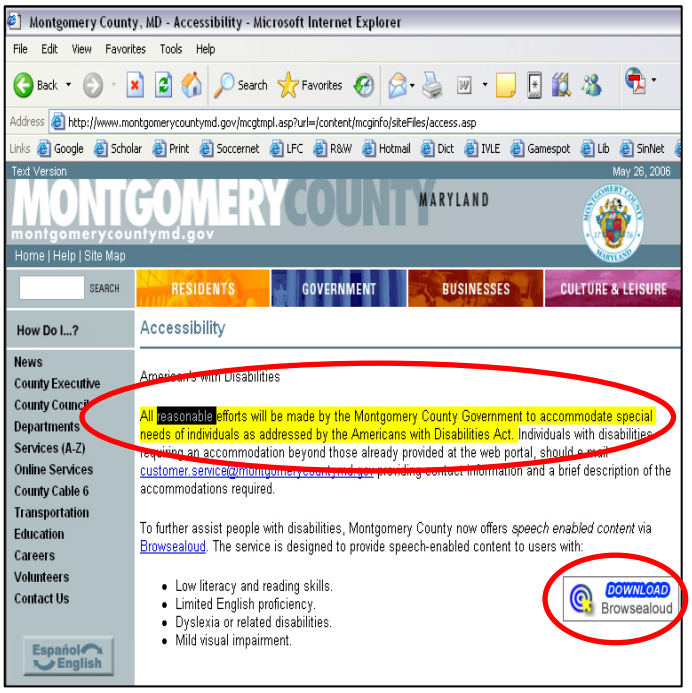


Unavailability of e-services on Web site (Singapore) when viewed using Mozilla Firefox 1.5.0.3



Availability of e-services on Web site (Singapore) viewed using Internet Explorer 7

[http://www.montgomerycountymd.gov]



The Web site of the Montgomery County Government makes allowance for easy access by people with vision impairment by supporting the text-to-audio feature provided by the Browsealoud software (free)

[http://www.ecitizen.gov.sg]

The main Web site of the Singapore Government does *not* support the text-to-audio feature provided by the Browsealoud software (free)

Figure 1. Comparison of the Accessibility Interface Design Principle – Inaccessible vs. Accessible E-Government Services when Faced with Differing Physiological and/or Technological Requirements

clicks to actually locate the deadlines for the tax administration in question, and even then they were further embedded among copious amount of other administrative instructions. In contrast, the Web site of the Inland Revenue Authority of Singapore (IRAS) offers a direct link to the needed information in anticipation of this common query. Furthermore, the deadlines are presented clearly in a table, which can be further organized according to either the month or the types of taxation duties (see Figure 2).

Interactive e-government services should allow citizens to customize web-based features in specifying individualized transactional requirements.

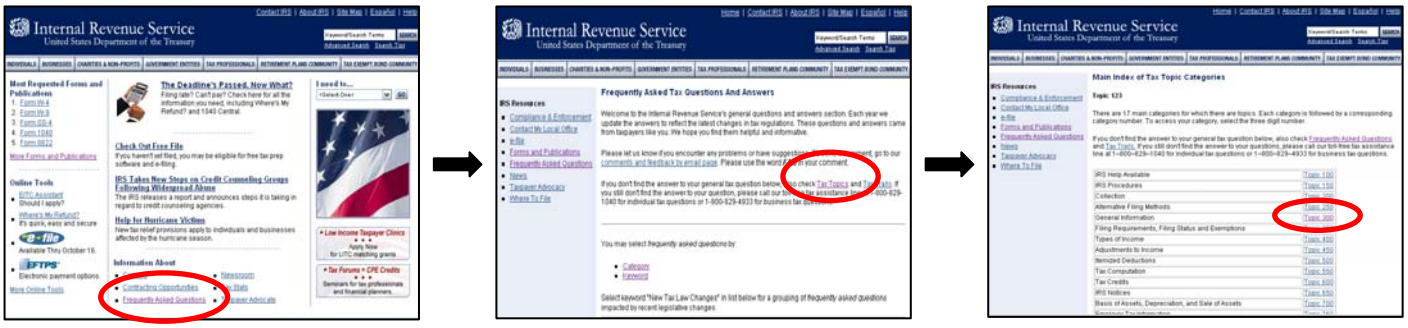
Interactivity is the cornerstone of public e-service delivery. Undeniably, the strongest appeal of the Internet as a delivery medium for public services resides in its capability to personalize governmental transactions according to unique administrative requirements stipulated by the citizens [Ancarani 2005]. Such customization of service content on an e-government Web site, however, is contingent on whether offered functionalities are delivered in a manner that facilitates dynamic engagement and interaction with their target audience throughout the duration of the governmental transaction [Burns and Robbins 2001; Cagurati et at. 2005; Katz and Byrne 2003]. Without interactivity, transacting via the Web is no different from physical exchanges, as the Internet cannot effectively distinguish itself as a delivery medium which is more responsive to citizens' individualized transactional profiles and/or specifications [Sundar 2004]. In fact, at times, e-government services with low interactivity may even impose unnecessary transactional constrictions as opposed to their traditional counterparts. For instance, the Web site of the Immigration and Customs Authority of Singapore possesses interactive online mechanisms through which a new passport application is delivered to the citizens (see Figure 3). Applicants can provide personal information within the Web site and submit the application online. In contrast, the Web site of the Travel State Department of the United States requires citizens to download and print a physical copy of the digital form to be posted for the actual application of a new passport. Alternatively, even when the Web site allows citizens to provide requested personal information for the form to be created online, the completed document must still be physically printed and submitted via postal mail (see Figure 3).

E-government services should be interoperable to provide convenient access from a single transactional window.

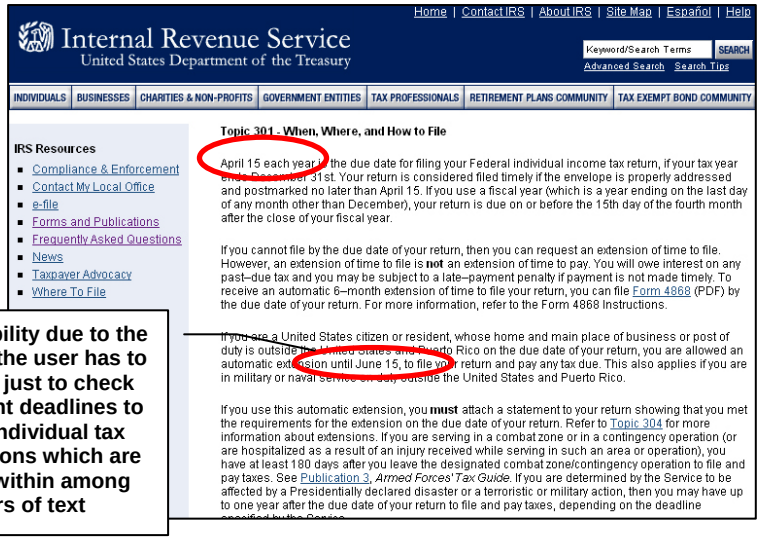
The induction of public e-services has given birth to the growing popularity of one-stop e-government Web sites whereby affiliated service content underlying a single governmental transaction is delivered via the same interface window [Tan and Pan 2003]. By capitalizing on the cost efficiency by which web linkages may be readily fostered across multiple service functionalities, the Internet creates a conducive environment for interoperable e-government Web sites [Andersen et al. 2003; Elgarah and Courtney 2002; Poon 2002]. Though scholars have also alluded to the necessity of back-end infrastructural integration for assimilating public e-services, it is naive to assume that the attainment of seamless cross-agency system coordination will automatically culminate in consolidated e-government Web sites. Rather, it is only due to the properties of connectivity embedded within Internet technologies that the consolidation of service functionalities within a singular transactional window or portal is possible [Siau and Long 2004; Treiblmaier et al. 2004]. Arguably, such emphasis on front-end delivery mechanics resonates with citizens' service expectations as it is unlikely that customers transacting online will ever go beyond the Web interface layer and be exposed to the backroom operations of public agencies. This in turn lends weight to the importance of calibrating the Internet in ways that optimize its ability to deliver interoperable e-government service. For instance, the United States Web site of the Electronic Federal Tax Payment System cuts through the interdepartmental boundary between the Internal Revenue Service and the Department of Treasury in offering an integrated electronic payment system within a singular web interface window for citizens to settle any outstanding tax balances (see Figure 4). In contrast, the Web site of the Canada Revenue Agency (CRA) does not encompass such delivery mechanisms that allow the tax agency to be directly connected to third-party financial institutions via an integrated payment system. Rather, citizens will have to personally approach their financial institutions to authorize tax balance payments to the CRA (see Figure 4)

E-government services should be designed in an adaptive fashion to facilitate easy addition and removal of public e-services.

A common predicament facing governmental institutions is the frequent policy and legislation modifications that impact the transactional procedures and/or requirements of public administration. Yet, the mass migration of public services onto the virtual medium has altered the nature by which such legislative amendments are made known to citizens. In traditional government bureaucracies, citizens are often notified of changes to transactional procedures and/or requirements as and when they are mandated to perform the governmental transaction [Tan and Pan 2003]. For e-governments however, the notification takes the form of ubiquitous diffusion via a centralized informational portal such that the responsibility for staying abreast of legislative revisions is divided between the government and citizens: the public agencies ensure the timeliness of announcements whereas citizens are presumed to be proactive in continuously updating themselves on relevant transactional information [Ho 2002]. Nonetheless, to



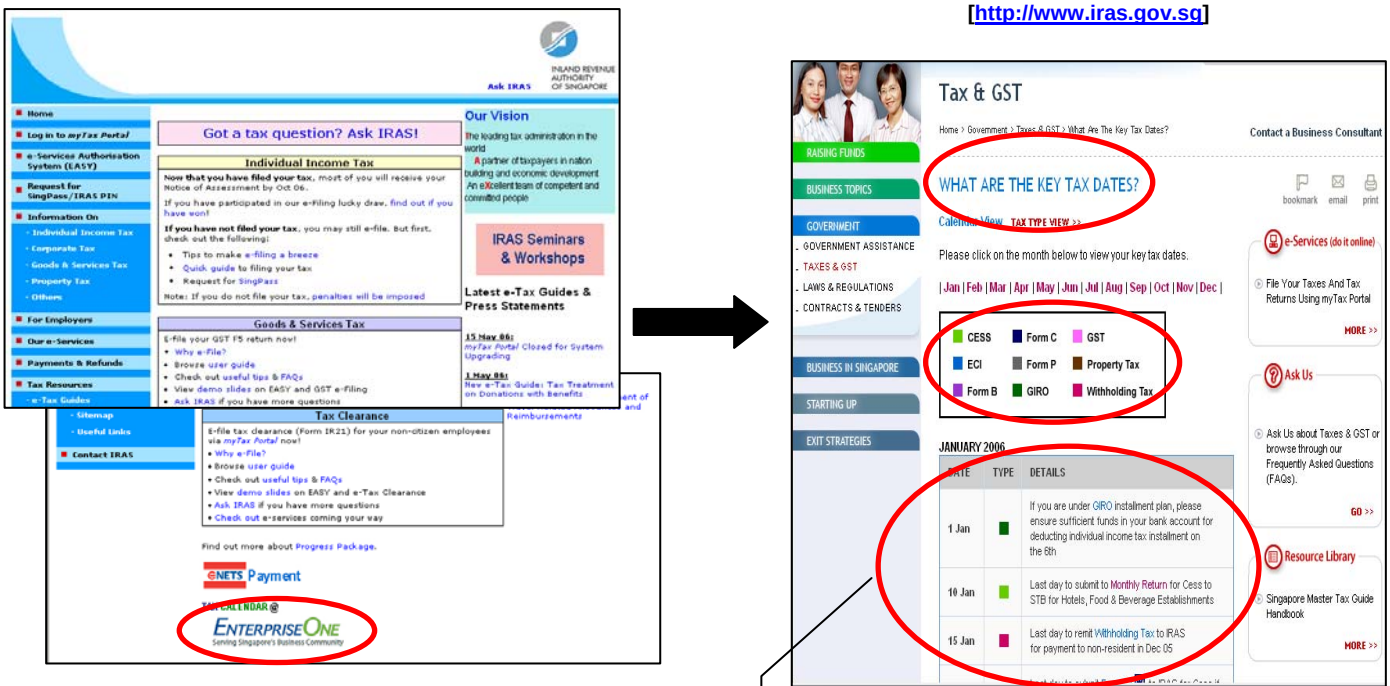
Navigability



Low Navigability due to the burden that the user has to go through just to check out important deadlines to common individual tax administrations which are displayed within among clusters of text

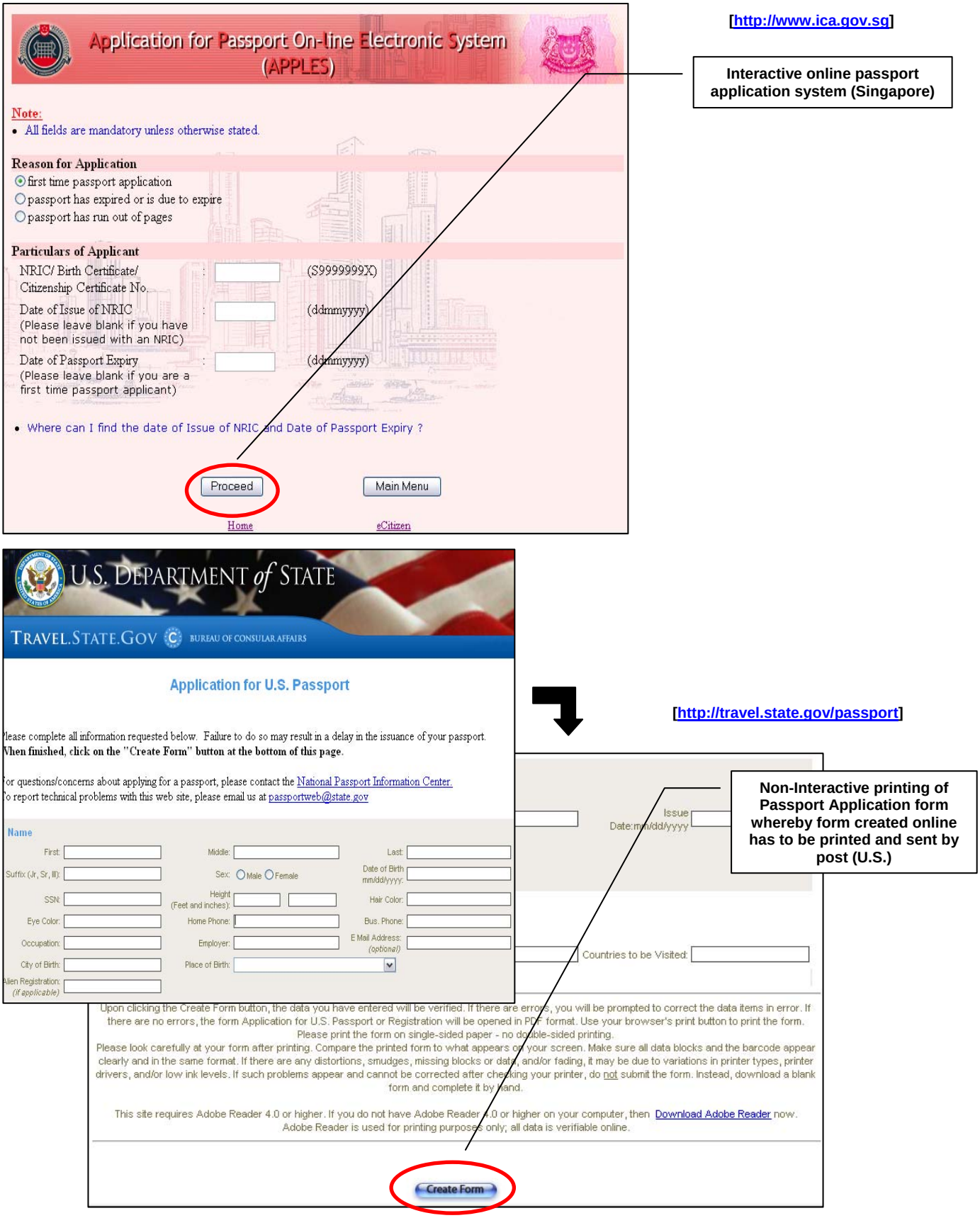
[http://www.irs.gov]

[http://www.iras.gov.sg]



High Navigability as user can easily check out important deadlines for common individual tax administrations which are displayed in a table format

Figure 2. Comparison of the Navigability Interface Design Principle – Thoughtless vs. Citizen-Centric Organization of Service Content

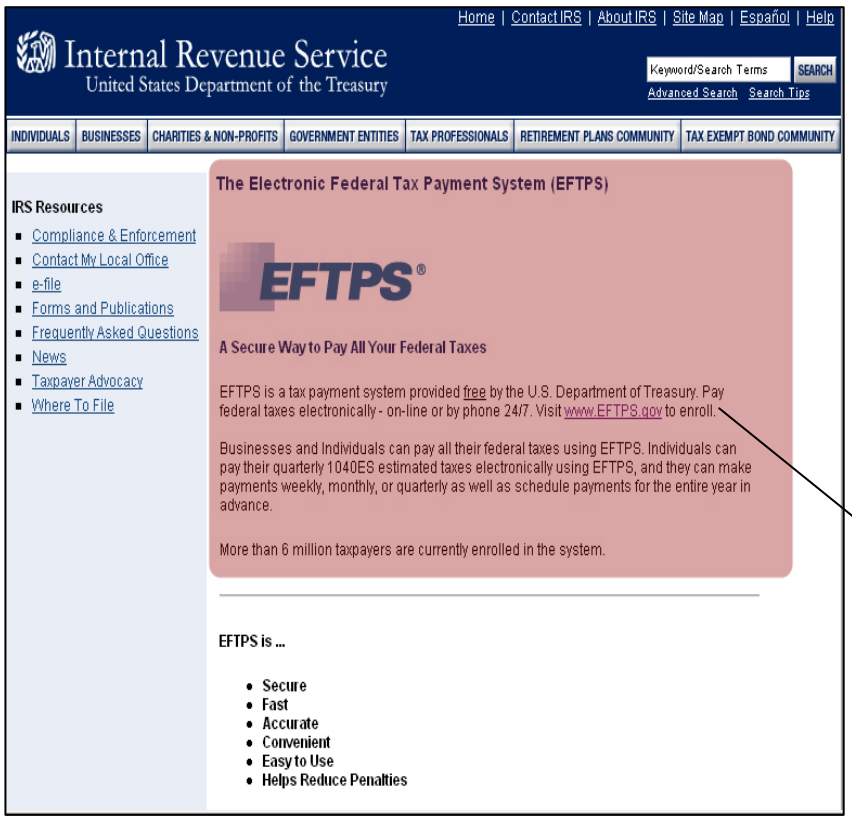


Interactivity

Figure 3. Comparison of the Interactivity Interface Design Principle – Online vs. Postal Submission of Passport Application

Non-Interoperable payment of tax through the authorization of third party financial institution (Canada)

[http://www.cra-arc.gc.ca/eservices/payments/tpsp-e.html]



Interoperable payment system provided by the Department of Treasury for purpose of tax payment to the Internal Revenue Service (U.S.)

[http://www.irs.gov/efile/article/0,,id=98005,00.html]

Interoperability

Figure 4. Comparison of Interoperability Design Principle – Non-Interoperable vs. Interoperable Electronic Payment System for Tax Balances

guarantee real-time synchronicity between public administrative regulations and e-government service offerings, the rapid adaptability of the Internet is pivotal in delivering dynamic Web pages, which are highly amendable to service content modifications. For instance, the Web site of the Inland Revenue Authority (see Figure 5) has set aside a personalized domain ("My Tax Portal") for each taxpayer such that new tax-related e-government services relevant to specific groups of users can be easily appended without overhauling the entire Web site. In comparison, the Web site of the Canada Revenue Agency (see Figure 5) presents a rather static façade and does not accommodate much latitude for change to the personalized domain ("My Account") with respect to the addition of new tax-related services.

E-government services must be secure to prevent unsanctioned intrusions of disclosed transactional information by unauthorized personnel.

Security has received widespread attention in e-commerce literature under the broad banner of information privacy [Wang 2002]. As opposed to privacy, which focuses on legislative and procedural measures in preventing secondary access of disclosed transactional information, security pertains more to protective mechanisms to safeguard such information from unsanctioned or illegal intrusions [Wang 2002]. But there is a key distinction in the disclosure of transactional information between e-commerce and e-government. In most cases, e-commerce users can always avoid disclosing any sensitive personal information by opting to purchase the product anonymously in a "brick-and-mortar" store. This position, however, does not hold in the context of governmental transactions because the transmission of confidential data is often mandated by the procedural requirements of the transaction, with the only option available to citizens being whether this disclosure occurs off- or online. Therefore, for the Internet to thrive over its physical counterpart as a delivery medium for public services, it must ensure that the tradeoff between its inherent precautionary measures against digital information leakages versus the overall risks to be borne by citizens from an online disclosure is tipped in its favor [Bélanger and Carter 2005; Lee et al. 2005; Phang et al. 2005; Treiblmaier et al. 2004; Wimmer et al. 2001; Yao and Houston 2002]. For instance, the Singapore official Web site employs third-party certification authority as a neutral stamp of approval and validation of its online security features. Conversely, although the United States official Web site attempts to build up public confidence in its e-government service offerings by articulating clear descriptions of its information disclosure policy and the kinds of security mechanisms being enforced in the domain, it clearly lacks the impartiality of a third-party guarantor as exemplified by Singapore (see Figure 6).

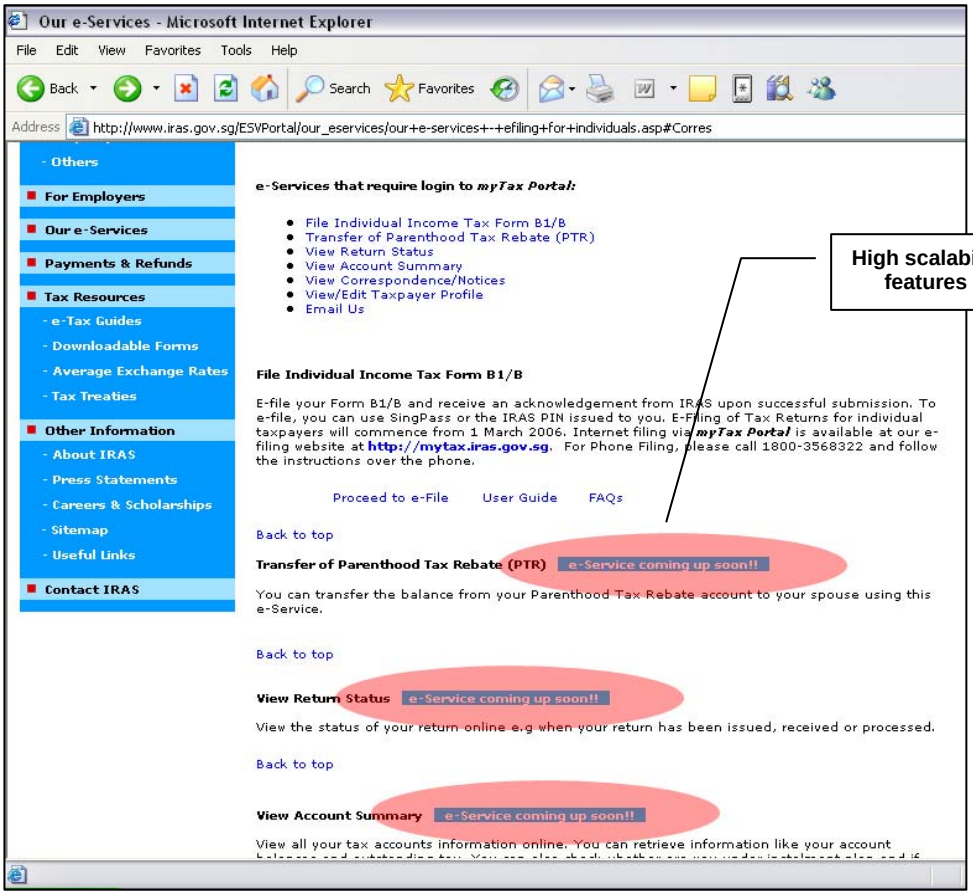
VI. DISCUSSION

E-government is a growing socio-technological phenomenon in response to escalating public pressure for the reformation of bureaucratic public administrative procedures [Tan and Pan 2003]. Yet despite a matching proliferation of e-government scholarship, fundamental functionality and interface design issues relating to the service quality of e-government Web sites remain elusive and problematic both theoretically and pragmatically [Ancarani 2005; Gant and Grant 2001; Hazlett and Hill 2003; United Nations 2004]. As has been emphasized by a number of scholars [Ancarani 2005; Hazlett and Hill 2003; Teicher et al. 2002], e-government exists as a new route to public sector rejuvenation, with web design being a determining factor in shaping citizens' perceptions of service quality, thereby influencing their adoption intentions [Buckley 2003]. Responding to such an appeal for an in-depth appreciation of service quality in the context of public e-services, this paper delineates between transactional content and delivery interface in designing e-government Web sites. We begin by reviewing contemporary literature that advocates the essentiality for incorporating the notion of service quality into the interface design of e-government Web sites. Additionally, we bring to light practitioner studies which document an obvious service quality gap cutting across the Web sites of various governments and governmental hierarchies. Following this, we supply theoretical arguments and empirical evidence substantiating the delineation between IT-mediated service content and delivery in augmenting our understanding of e-government Web site design. Departing from conventional e-government development process frameworks, we then unveil the EGSLC as a model—grounded in Ives and Learmonth's [1984] CSLC framework—that illuminates *detailed* functional specifications affecting citizens' perceptions of service content quality for an e-government Web site. We also induct a host of six interface design principles for ITMCSD that explain and predict citizens' perceptions of service delivery quality towards an e-government Web site. Together with pragmatic examples elicited from e-government Web sites in reality, we illustrate the viability of our proposed EGSLC and interface design principles both theoretically and practically.

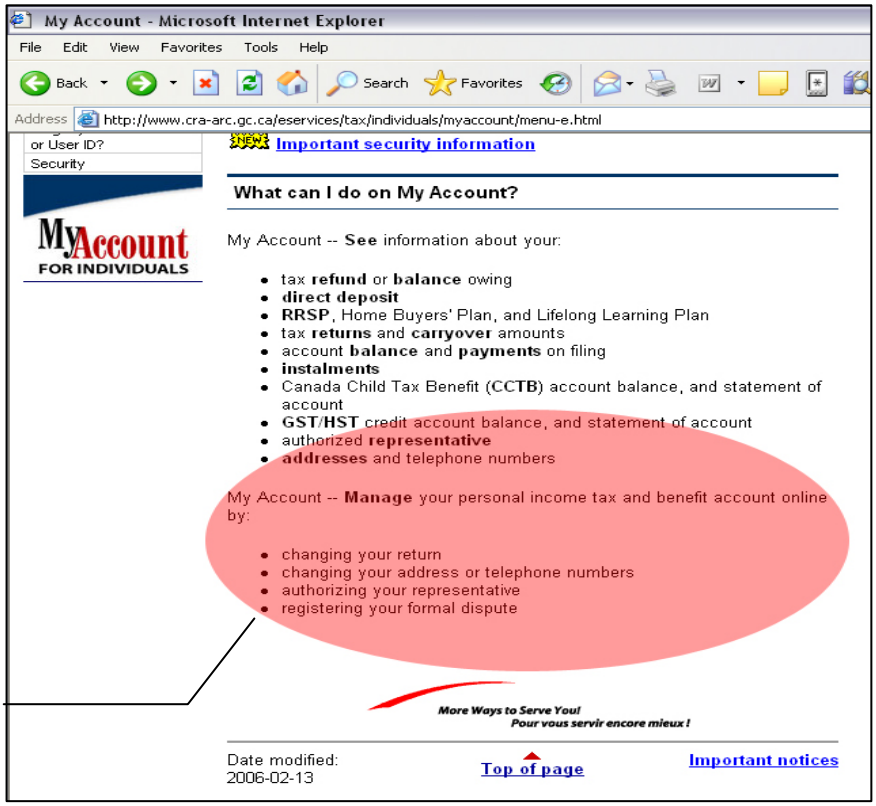
Theoretical Contribution

Conceptually, although the delineation of service quality into content and delivery may not be totally unfamiliar to researchers [see Ancarani 2005; Grönroos 1990; Grönroos et al 2000], this study is the foremost of its kind to explore this distinction in e-government. Our proposed EGSLC symbolizes an initial effort aimed at appreciating and scrutinizing the service domains, associated with e-government transactional content, as they are split into their finer-grained constituents, i.e., the EGSLC reveals a dual-level abstraction model for appreciating citizens' service expectations of online government transactions. The EGSLC shares characteristics of existing e-government

[https://mytax.iras.gov.sg/ESVWeb/default.aspx]



High scalability of personalized tax portal with new features constantly being added (Singapore)

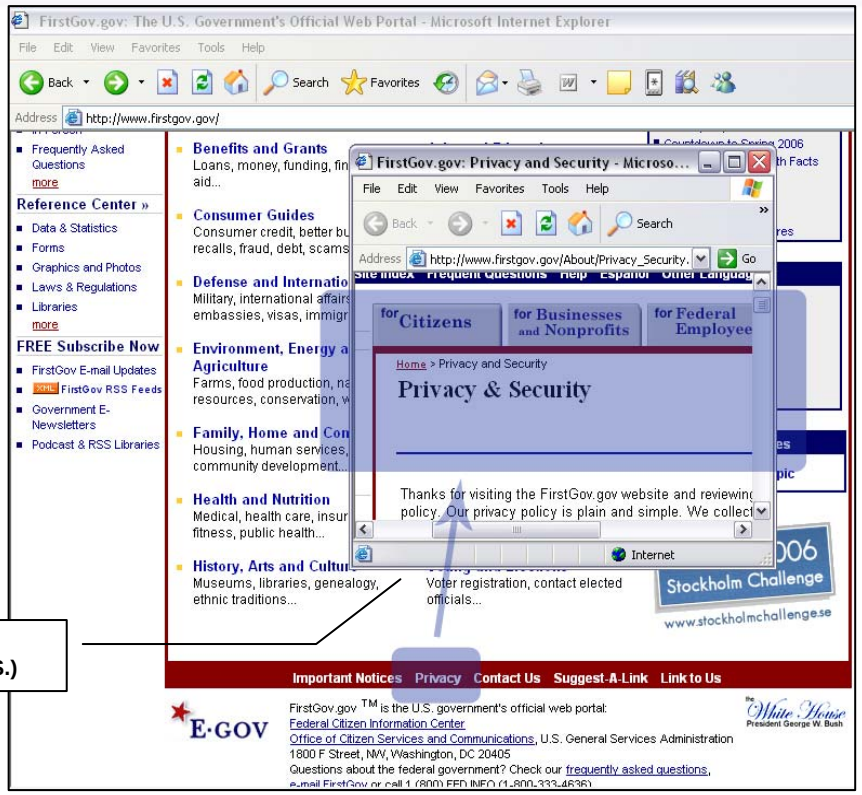


Low scalability of personalized tax portal with static features (Canada)

Adaptability

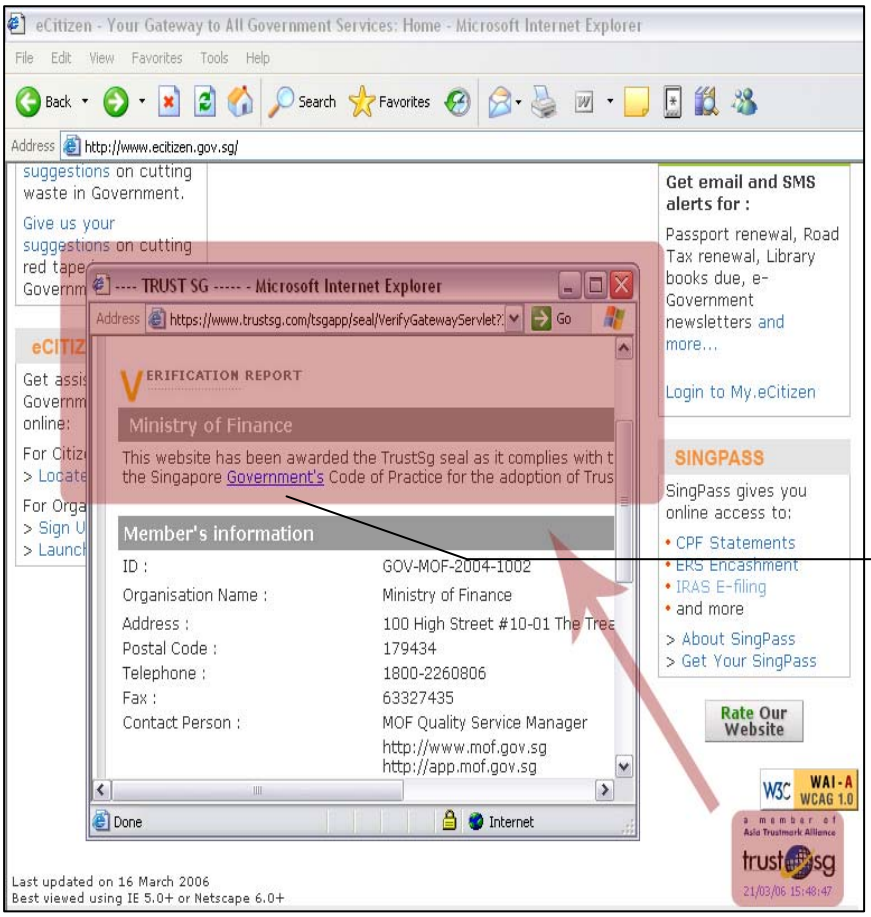
[http://www.cra-arc.gc.ca/eservices/tax/individuals/myaccount/menu-e.html]

Figure 5. Comparison of the Adaptability Interface Design Principle – Dynamic vs. Static Web Page Design



Security through enacting and explicating a comprehensive privacy and security policy (U.S.)

[https://www.firstgov.gov]



Security through the use of third party certification authority (Singapore)

[https://www.ecitizen.gov.sg]

Security

Figure 6. Comparison of Security Design Principle – Third-Party Validation vs. Mere Explication of Security Mechanisms

process models with its higher-order stages of requirements, acquisition and ownership. Concurrently, it broadens the theoretical implications of previous work by reducing each of these stages into sub-dimensional representations of citizens' service anticipations, thereby making it feasible to uncover the set of functional specifications unique to e-government.

In addition, our identification of ITMCSD design principles endeavors to pave the way for future inquiries to delve into an area of research in e-government that has normally been dealt with only superficially. While e-government scholars have often quoted constructs such as accessibility [Dippo 2003; Jaeger 2003], interoperability [Poon 2002] and security [Wang 2002] as determinants of citizens' receptivity toward e-government services, the nebulous and secondary nature of the treatment of these concepts in extant literature has rendered it sufficiently difficult to comprehend how they play a role in affecting citizens' adoption behavior. In fact, the conventional intertwining of service content and delivery has culminated in misconceptions that these two are inseparable from each other [Ancarani 2005]. By distinguishing content from delivery, interface design principles are finally allowed to emerge as distinctive but indispensable dimensions, which equally impact citizens' perceptions of e-government service quality.

Pragmatic Implications

Though the comparison depicted in Table 1 may be inconclusive, the application of the EGSLC framework to the assessment of e-government Web sites offers insights into the design of IT-mediated service functionalities. Evidently, while certain functional specifications are implemented uniformly, others allow for more maneuverability and creativity. For instance, e-government Web sites can readily include service functionalities, which invite greater engagement with citizens and are in agreement with the eventual goal of transferring ownership of e-government transactions from public agencies to citizenries. This transference of ownership in transactional responsibilities also serves the secondary purpose of improving the socio-political climate of government-citizen interactions. Active communication between governments and citizens through personalizable e-government services allows public agencies to observe evolving social needs among citizens, and to subsequently reflect these observations as proactive governmental responses through upgraded functionalities, which must then be constantly benchmarked against the EGSLC. The utility and relevance of the EGSLC in improving citizens' service satisfaction can thus be seen as a guiding beacon for cultivating active participation in shaping future e-government praxis. Moreover, the explication of functional specifications corresponding to citizens' transactional expectations within the EGSLC serves to ensure optimal adoption of e-government service offerings. The EGSLC thus functions as an analytical toolkit for practitioners to isolate service inadequacies in their current e-government Web sites in order to further explore options for overcoming these functional deficiencies.

By holding service content to be constant across comparable e-government Web sites, we show that efficiency in service delivery is primarily dictated by underlying media characteristics such that it is important to pay attention to the optimization of the delivery medium. As illustrated by the comparisons in Figures 1-6, there exists a tendency among public institutions to overemphasize service functionalities over service delivery when designing e-government Web sites. As a consequence, some public agencies neglect the supplementary role of the communication medium by which e-government services are delivered, thereby leading to sub-optimal web interface solutions. As is best reflected in the examples solicited from matured e-governments, service delivery can still exert a significant impact on the quality of these public e-services even when the content is being held constant. As such, one can never overemphasize the essentiality of taking into account the delivery medium by which public services are being delivered in order to achieve synergy in designing e-government Web sites. Finally, in considering the specific role of delivery media for e-government Web sites, we must first identify critical elements of the medium that will influence the materialization of service functionalities in practice. Incidentally, the nebulous and secondary treatment of media characteristics in extant e-government literature lends weight to the pertinence and timeliness of our recommended ITMCSD design principles. Based on our initial screening of existing e-government Web sites, we are optimistic that these interface design principles of ITMCSD are generic enough to be feasible in guiding the design of public e-services, which blend both IT-mediate service content and delivery.

Conclusion

In summary, as demonstrated in our comparison, the EGSLC offers governments a reasonably meticulous benchmarking mechanism for comparing e-government Web sites both within and across countries in terms of the pragmatism and technological maturity of existing service functionalities. Furthermore, by systematically drawing upon relevant service delivery concepts advocated by other e-government researchers, we put forward a collection of ITMCSD design principles that should prove to be useful to practitioners in the calibration of Web-based transactional channels as viable substitutes for physical media. The core message of the paper is this: it is not only the type of service functionalities that attracts citizens to utilize e-government Web sites, it is also how well these functionalities are delivered. Thus, it is important for practitioners not to ignore either service content or delivery in the design of public e-services, as the whole is always greater than the sum of its parts.

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Editor's Note: The following reference list contains hyperlinks to World Wide Web pages. Readers who have the ability to access the Web directly from their word processor or are reading the paper on the Web, can gain direct access to these linked references. Readers are warned, however, that:

1. These links existed as of the date of publication but are not guaranteed to be working thereafter.
2. The contents of Web pages may change over time. Where version information is provided in the References, different versions may not contain the information or the conclusions referenced.
3. The author(s) of the Web pages, not AIS, is (are) responsible for the accuracy of their content.
4. The author(s) of this article, not AIS, is (are) responsible for the accuracy of the URL and version information.

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