3-2010

E-Government, E-Business, and National Economic Performance

Shirish C. Srivastava
HEC School of Management, srivastava@hec.fr

Thompson S.H. Teo
School of Business and School of Computing, National University of Singapore

Follow this and additional works at: https://aisel.aisnet.org/cais

Communications of the Association for Information Systems

E-Government, E-Business, and National Economic Performance

Shirish C. Srivastava

HEC School of Management, Paris

srivastava@hec.fr

Thompson S.H. Teo

School of Business and School of Computing, National University of Singapore

Abstract:

Recent years have witnessed rapid developments in e-government as well as e-business within nations across the world. Although both e-government and e-business contribute toward national economic performance, few studies have analyzed the two jointly in a single research model. Using the Technology-Organization-Environment (TOE) framework and the literature on information and communication technology (ICT) impact; we empirically examine facilitators of e-government and e-business development, the relationship between e-government and e-business, and their collective impact on national economic performance. Our results, which emphasize the differential importance of factors associated with the development of e-government and e-business, can be used by national policy makers for designing effective ICT policies. Specifically, national ICT infrastructure appears to be important for both e-government and e-business. Quality of national human capital emerges as a significant facilitator for e-government but not for e-business, whereas national environment (institutional and macro-economic) appears to be the key enabler for e-business, but not for e-government. Our findings demonstrate the significant and intertwined roles of e-government and e-business in enhancing the national economic performance. With a view to enhancing national economic gains, this research suggests that policy makers should consider measures to enhance development of e-government and e-business collectively rather than in silos.

Keywords: e-government, TOE framework, secondary data, IT impact, national economic performance, e-business

I. INTRODUCTION

Electronic government (e-government) can be broadly defined as the use of online channels for enhancing the access and delivery of any facet of government services and operations to the benefit of citizens, businesses, and other stakeholders. *Electronic business* (e-business), on the other hand, can be defined as the use of the Internet by commercial firms for improving their business operations and customer service. Although e-government and e-business may be similar in terms of underlying technologies, their *raisons d'etre* are very dissimilar. While e-government is meant for providing service to citizens and businesses, e-business exists for conducting commercial activities online.

Despite e-government and e-business serving different purposes, recent literature points to the individual macro-level contributions that e-government [Srivastava and Teo, 2008] and e-business [Dutta and Jain, 2005] make toward enhancing national economic performance. Further, research has also shown that the conditions facilitating the development of e-government and e-business in a nation may be intertwined, e.g., both require the presence of enabling technological infrastructure in the nation [DETE, 2004; Singh et al. 2007]. Studies examining the role of ICT (and its use by government) for national development [Baliamoune-Lutz, 2003; Qureshi, 2005] also indicate "implicit" linkages between e-government and e-business. For example, success of e-business can motivate implementation of e-government, which in turn may facilitate implementation of more e-business. Despite this synergistic relationship, the current literature typically views e-government and e-business as two distinct domains of study. This creates an "academic disconnect" between these two important technological innovations impacting national economic performance. This disconnect limits our understanding about the intertwined role of e-government and e-business for national development [Yoon and Hanna, 2004]. The prime motivation for this research is to integrate these two research streams, viz., e-government and e-business, and examine their convergence at the country level of analysis. This integration will help researchers better understand and describe the theoretical linkages between these two "enacted domains" using the same "objective technology," the Internet. Policy makers and practitioners will benefit from a holistic view on using IT for national development and prosperity. Based on the results, they can design the specific recipe most suited for facilitating their nation's prosperity.

Research on e-business can be broadly classified in three streams: (1) application, implementation, and adoption issues [e.g. Chatterjee et al., 2002; Gefen and Straub, 2000; Pavlou and Fygenson, 2006], (2) technological issues [e.g., Aldridge et al., 1997; Yeung, 1998], and (3) impact on organizational performance [e.g., Subramani, 2004; Subramaniam and Shaw, 2002; Zhu et al., 2003]. Ngai and Wat [2002] in their review paper had pointed out that, despite the importance of public policy and government related issues for e-business, very few research papers have addressed them. Studies examining this subject have primarily addressed broad policy issues related to e-business such as taxation issues [Munro, 1997], legal issues [Aalbers et al., 1998; Cavazos, 1996], and privacy issues [Attaran and Vanlaar, 1999; Awad and Krishnan, 2006]. Topics exploring the relationship between e-government and e-business remain largely unexplored. Further, most research on e-business concentrates on either organizational or individual levels of analyses. There are very few studies that examine e-business issues from a cross country perspective [Mahmood et al., 2004].

Research on e-government can also be divided into three broad areas: (1) evolution and development [e.g., Grölund and Horan, 2004; Layne and Lee, 2001; Srivastava and Teo, 2007b], (2) adoption and implementation [e.g., Olphert and Damodaran, 2007; Otjacques et al., 2007; Teo et al. 2009], and (3) its impact on citizens and businesses by transforming the intermediate governance and control processes [e.g., Moynihan, 2004; Von Haldenwang, 2004; Srivastava and Teo, 2007a]. Further, most studies on e-government are either conceptual or case studies. Quantitative empirical studies on e-government are relatively few and are often limited to analyzing a particular e-government implementation within a country [McHenry and Borisov, 2006a, 2006b; Teo, Devadoss and Pan, 2006]. In their review of IT-impact literature, Melville et al. [2004] also highlighted the paucity of IT impact research at national and cross-country levels and stressed an imperative need for conducting such research.

Past research suggests that governmental activities spur similar activities in the business scenario [Cohen et al., 2002]. For example, the facilitation of a number of online government services for businesses has served to increase the use of ICT and the Internet by businesses in Singapore [Srivastava and Teo, 2004; 2005; Wong, 2003]. Thus, the use of ICT by governments propels its usage in the business scenario [Baliamoune-Lutz, 2003; Qureshi, 2005]. Hence, in addition to increasing governmental efficiency, e-government may serve to increase the business usage of IT and the Internet in a nation in the form of increased e-business activity, thereby facilitating an increase in its

national economic performance [Srivastava and Teo, 2008; WEF, 2005]. To understand these vital issues, we examine the development and impact of e-government and e-business, together, in an integrated model. The specific research questions that we address in this study are:

RQ1: What is the relative importance of the factors facilitating e-government and e-business development in a nation?

RQ2: What is the relationship between e-government and e-business in a nation?

RQ3: What is the relationship of e-government and e-business development in a nation with its economic performance?

Using the Technology-Organization-Environment (TOE) framework [Tornatzky and Fleischer, 1990] as the guiding theoretical lens, we first analyze the contexts facilitating the development of e-government and e-business in a nation. Further, grounding the discussion in IT impact literature, we investigate the impacts of e-government and e-business on national economic performance. There are three key contributions of this study. First, this research examines the impact of e-government and e-business in a nation, thereby addressing the "value" question related to these two Internet enabled interventions. Second, the TOE framework, which has emerged as a useful theoretical lens for understanding technology adoption, has been mostly used in the context of business firms. In contrast, we apply the TOE framework in a cross-country scenario for better appreciating the development and impact of e-government and e-business on national economic performance. Third, through post-hoc analysis, we emphasize the intertwined role of e-government and e-business in a nation and demonstrate the importance of considering them collectively in a single model. Fourth, we test our hypotheses using data from 113 countries, which may help to highlight international differences since different countries are at different stages of e-government and e-business development. In particular, the results highlight the key factors important for e-government and e-business development. These factors serve as important lessons (pertaining to what to focus their resources on) for countries intending to elevate the level of e-government and e-business development.

The rest of the paper is organized as follows. First, using the TOE framework as the guiding theoretical lens, we explicate the contexts necessary for the development of e-government and e-business. Next, using the IT impact literature, we hypothesize the relationship of e-government and e-business with national economic performance. Thereafter, using data from 113 countries (see Appendix 1 for the list of countries), we test the formulated hypotheses. Finally, we end the discussion with a set of implications for research and practice emerging out of this study.

II. THEORY AND HYPOTHESES

Technology-Organization-Environment [TOE] Framework

The Technology-Organization-Environment (TOE) framework developed by Tornatzky and Fleischer [1990] states that the decision to adopt a technological innovation by a firm is based not only on the technology, but also on the related organizational and environmental contexts. Technological context describes the relevant technologies available to the firm. Organizational context depicts some organizational characteristics or resources, such as the quality of human resource, amount of slack resources, etc. The environmental context explains the environmental conditions in which the firm conducts its business. These three contextual factors together influence a firm's innovation adoption decision, which eventually impacts its performance. We extend this theoretical argument to the proliferation of technological innovations at the national level. E-government, which is a technology enabled intervention at the national level, requires a host of enablers for facilitating its adoption and usage [Layne and Lee 2001; Teo et al., 2009]. Taking an institutional perspective of technology implementation in government organizations, Fountain (2001) described the implemented technology as "enacted technology" and distinguished it from "objective technology." Her conceptualization of the enacted technology in the government (e-government), similar to the TOE framework, depended not only on the objective technology, but also on the institutional arrangements surrounding it. These institutional arrangements are similar in spirit to the organizational and environmental factors in the TOE framework.

Past IS studies have used the TOE framework for examining diverse settings, for example, adoption of complex innovations [Kuan and Chau, 2001; Swanson, 1995], electronic data interchange [Iacovou et al., 1995], e-business use and value [Gibbs and Kraemer, 2004; Zhu et al., 2004]. Empirical studies using the TOE framework have found consistent support for the association of contextual factors with technology adoption and performance. Though the TOE framework has been used in multiple research settings, few studies have employed it in cross-country studies. Further, most studies applying the TOE framework have used primary survey data; however, we extend its applicability by using secondary data for our analyses.

Technological Context

E-government development is the extent to which the interactive features of the World Wide Web are used to conduct the business of the government [Kunstelj and Vintar, 2004; UN Report, 2004; West, 2004]. The duties and responsibilities of government are all pervasive and are related to the day-to-day activities of citizens and businesses in a nation. Hence, for fulfilling its duties effectively through the Web (using e-government systems), it is essential that government is connected to its citizens and businesses through the Internet and related ICT infrastructure. This is possible only when a sound ICT infrastructure is in place to support government's interaction with citizens and businesses. Hence, the presence of a well-developed national ICT infrastructure appears to be critical for the development of e-government. In the absence of a sound, reliable, and cheap technological infrastructure, e-government development will remain an unrealized dream [Koh et al., 2005; Singh et al., 2007]. ICT infrastructure is thus imperative for e-government development. This leads to the following hypothesis,

> H1: *The level of ICT infrastructure in a country is positively associated with the level of its e-government development.*

Past research has shown that the presence of a sound technological infrastructure within the firm is essential for the development and usage of e-business by commercial firms [Subramaniam and Shaw, 2002; Dai and Kauffman, 2002]. Extending the argument for the requirement of a sound technological infrastructure within an organization as an essential prerequisite for e-business usage and development [Gibbs and Kraemer, 2004; Zhu et al., 2004], we posit that a well-developed ICT infrastructure at the national level is essential for facilitating the development of e-business in a nation. But it should be noted that in contrast to e-government, e-business often crosses borders, so even countries with poor physical infrastructures (e.g. poor transportation infrastructures) may look toward e-business as a viable competitive strategy.[1] Still a sound ICT infrastructure (Internet) is essential for proliferation of e-business in a nation. The level of e-business development in a nation implies the extent to which firms use the Internet for conducting their business transactions (B2B as well as B2C). At an aggregate level, the presence of an enabling ICT infrastructure within the nation is related to the level of e-business development in a nation. In other words, greater business interaction through the Web requires a well developed ICT infrastructure in that nation. This leads us to our next hypothesis:

> H2: *The level of ICT infrastructure in a country is positively associated with the level of its e-business development.*

Organizational Context

Past studies using the TOE framework have used various organizational factors for describing the organizational context. These factors include both tangible and intangible firm resources such as size, global reach, market resources, financial resources, and human resources [Zhu et al., 2004; Gibbs and Kraemer, 2004]. In their study about organizations, Bogaert, Martens, and Cauwenbergh [1994] highlighted that human resource is perhaps the most important resource for organizational development.

In a similar vein, studies on e-government have highlighted the need for developing certain national resources for facilitating e-government development. Citizens have been identified as an important stakeholder group for e-government implementation and citizens' knowledge has been identified as a vital resource [Flak and Rose, 2005]. In fact, research has found that citizen education and training can be a predictor of e-government use, not just its existence [Thomas and Streib, 2003; Srivastava and Teo, 2009]. For example, an educated populace would demand the ease and convenience of e-government, especially in rural areas with poor infrastructures. Consequently, past studies have highlighted the importance of educated and trained citizens as one of the major enablers for e-government development [Singh et al. 2007; Srivastava and Teo, 2004; Von Haldenwang, 2004]. Thus better quality of human capital in terms of citizens' education and training should facilitate e-government development in the nation. Hence we hypothesize,

> H3: *The quality of citizen human capital (in terms of education and training) in a country is positively associated with the level of its e-government development.*

Following from a similar argument, we posit that educated and trained citizens in a country will be better equipped to use e-business Web sites, thereby propelling the development of e-business. Further, educated and trained citizens in a nation are in a better position not only to use but also to be involved in the implementation of various e-business initiatives by being a part of the implementing organizations. Educated citizens will definitely be in a better position to make use of the B2C channel for business transactions. B2B transactions among firms will also be indirectly

---

[1] We thank the associate editor for highlighting this point.

affected by the presence of a literate national human capital. This will lead to greater utilization of the Internet for business leading to the development of e-business. Thus, we hypothesize,

H4: *The quality of citizen human capital (in terms of education and training) in a country is positively associated with the level of its e-business development.*

Environmental Context

TOE studies have examined the impacts of diverse environmental factors on the adoption of technology [Kuan and Chau, 2001; Swanson, 1995; Zhu et al., 2004]. For example, an organization's industry, its competitors, access to resources, and its dealings with government, are some of the environmental contexts that have been researched [Iacovou et al., 1995; Tornatzky and Fleischer, 1990; Zhu et al., 2002]. For e-government, the environmental context would clearly include the national environment, which encompasses institutional and economic environments [Srivastava and Teo, 2007b]. Past studies on e-government have highlighted the importance of national environmental factors like "public institutions" and "macroeconomic condition". Moon [2002] found that government institutional factors contribute to the adoption of e-government among municipalities. Norris and Moon [2005] established that e-government adoption and sophistication are correlated with the presence of well-developed institutional factors. In a similar vein, McNeal et al. [2003] concluded that legislative professionalism and professional networks are associated with extensive use of e-government. West [2004] stressed the importance of "institutional arrangements" in ensuring e-government development. Similarly, Von Haldenwang [2004] highlighted the importance of a sound institutional base in the country for the development of e-government. Further, he highlighted that e-government development in a nation is a significant correlate of its macro-economic condition. Advanced countries with sound macro-economic indicators are more likely to implement and use e-government [Haldenwang, 2004]. Thus, the institutional and macro-economic environments in a nation have a direct relationship with the level of e-government development.

H5: *The quality of environment (institutional and macro-economic) in a country is positively associated with the level of its e-government development.*

The presence of sound institutional and macro-economic environments also leads to effective processes being implemented by business organizations [WEF, 2005]. We expect that countries with healthier macro-economic environment will have resources and policies for encouraging businesses to adopt e-business, as is seen in the cases of newly industrializing economies like Singapore and Taiwan [Chen, 2003; Wong, 2003]. Although government support plays a lesser role in the case of developed economies, it is important for e-business adoption [Brousseau, 2003; Sadowski et al., 2002]. Some of the biggest barriers for e-business use are the risks associated with the privacy and security concerns of individual users and businesses [Gibbs et al., 2003; Awad and Krishnan, 2006]. The presence of a sound institutional environment can substantially mitigate these risks and instill confidence in citizens and businesses. Institutional arrangements not only serve as a reassurance for their privacy and security concerns, but also provide means for redressal in the event of a breach. Thus, the presence of a sound institutional environment is an important enabler for the growth of e-business in a nation [Gibbs and Kraemer, 2004]. Hence, we hypothesize,

H6: *The quality of environment (institutional and macro-economic) in a country is positively associated with the development of its e-business.*

Past research has shown that governmental activities in the public domain spur similar activities in the business scenario [Cohen et al., 2002]. This argument at the national level follows from the organizational level IS adoption literature which has established the importance of "top management sponsorship" for the adoption of new technology in an organization [e.g. Chatterjee et al., 2002; Teo and Too, 2000; Teo, Tan, and Buk, 1997–98]. Nations like Singapore which have well developed e-government systems have policies for encouraging citizens and businesses for adopting e-business [Ke and Wei, 2004; Srivastava and Teo, 2005; Wong, 2003]. By doing this, governments gain in terms of synergies from the businesses who are better able to interact with the government online. Realizing the benefits, businesses also switch to the e-interaction mode which eventually translates to their extensive e-business use. This leads to our next hypothesis:

H7: *The level of e-government development in a country is positively associated with the level of its e-business development.*

Impact of E-Government and E-Business

Previous research has shown that IT contributes to the improvement of organizational performance [Brynjolfsson and Hitt, 1996; Melville et al., 2004]. The level of technological readiness has also been shown to impact the business value of organizations [Zhu et al., 2004]. To measure the impact of IT, researchers have used multifarious

measures of organizational performance, such as productivity enhancement, inventory reduction, cost reduction, and competitive advantage [Devaraj and Kohli, 2003; Hitt and Brynjolfsson, 1996]. Apart from creating value at the business unit and process level, the extent of use of IT may also impact the performance at the country level of analysis by improving the efficiency and effectiveness of the country [Alpar and Kim, 1990; Dewan and Kraemer, 2000]. Clark et al. [2003] highlighted how the use of basic Internet enabling technology (broadband) at the local government level leads to proliferation of e-government resulting in economic welfare of the population. Clearly, national economic performance of a nation, which indicates its productivity and living standards, is dependent on the technological development in the country [Porter, 2005]. Thus taking a proxy view of IT impact, we posit that e-government development in a nation impacts its national economic performance. This leads to the following hypothesis:

Hypothesis 8: *The level of e–government development in a country is positively associated with the level of its national economic performance.*

Research has shown that e-business and IT improves the performance of firms [Subramaniam and Shaw, 2002; Zhu et al., 2004]. E-business enables a large number of firms to transact with each other efficiently and effectively thereby improving the overall performance of buyers as well as suppliers [Dai and Kauffman, 2002; Subramani, 2004]. An increase in the performance of individual firms will result in an increased aggregated national wealth. Hence, greater usage of e-business will increase the productivity of the nation, leading to an enhanced economic performance [Dutta and Jain, 2005]. This leads to our next hypothesis:

H9: *The level of e-business development in a country is positively associated with the level of its national economic performance.*

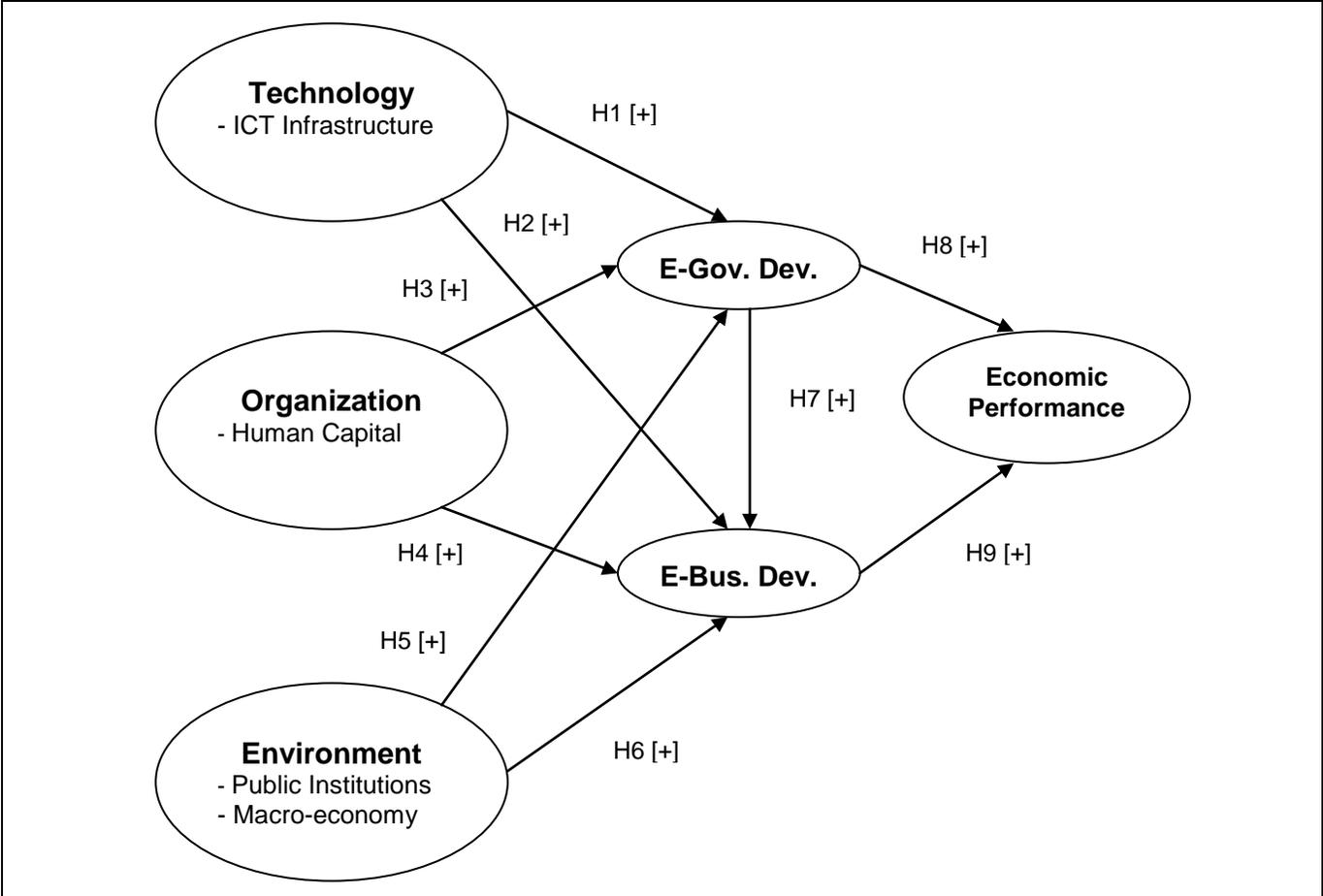The research model for this study is depicted in Figure 1.

Figure 1. Research Model: Integrating E-government and E-business

III. METHOD

Data

In this research, for a meaningful testing of hypotheses, we require data from a large number of countries aggregated at the national level. Collecting large scale primary data from over a hundred countries is constrained by the amount of resources and time available for conducting such a research. Hence, for testing the hypotheses, we explored numerous reliable secondary data sources which have been used in past research. We finally used two major data sources: the United Nations Global E-Government Readiness Report [UN Report, 2004] and the World Economic Forum Global Competitiveness Report [WEF, 2005]. Though WEF has been publishing the Global Competitiveness Report for a number of years now, UN started publishing the United Nations Global E-Government Readiness Report only in 2003. Hence, we used cross-sectional data from two reports: the UN report (released late 2004) and the WEF Global Competitiveness Report (released early 2005), for our analyses. Both the data reports used in this study were released by the agencies within a period of few months; hence, they are contemporary and comparable. The data from the UN E-Government Readiness Report cover 191 countries, and data from the Global Competitiveness Report cover 117 countries. As the variables used in this study were taken from both these reports, it was essential to consider data only for those countries that were available in both reports. After analyzing for the common data points across the two reports, we had data from 113 countries for analyses.

Both, United Nations Global E-government Readiness Report and the World Economic Forum Global Competitiveness Report, are considered to be reliable reports and have been extensively used in academic research. Data from United Nations Global E-Government Readiness Report have been used by studies such as Siau and Long [2006], Srivastava and Teo [2008], and data from World Economic Forum Global Competitiveness Report have been used in studies such as Delios and Beamish [1999], Gaur and Lu [2007].

Constructs, Variables, and Measures

As depicted in our research model (Figure 1), there are six constructs in this study: TOE (technology, organization, environment) factors, e-government development, e-business development, and national economic performance. The technology construct is indicated by ICT infrastructure from the UN E-Government Readiness Report [UN Report, 2004]. The organization construct is indicated by the human capital index from the UN E-Government Readiness Report. The environment construct is composed of two indicators: macro-economy and public institutions index from the Global Competitiveness Report [WEF, 2005].

The intermediate variable of e-government development is assessed by the Web Measure Index in the UN E-Government Readiness Report. Measures for e-business development and national economic performance are taken from the Global Competitiveness Report. While forming the various indices, the reporting agencies carried out suitable statistical procedures for ensuring validity and reliability [UN Report, 2004; WEF, 2005]. For example, in their report, they have highlighted the use of multiple respondent expert surveys in each nation, where the responses from respondents within a nation were examined for internal consistency before being included in the index calculation. A more detailed description of measures employed in this study and their reliability and validity are given in Appendix 2.

IV. DATA ANALYSIS, RESULTS AND DISCUSSION

The descriptive statistics and correlations of the research variables are presented in Table 1.

	Table1: Descriptive Statistics and Correlations							
	Variables	**Mean**	**SD**	**1**	**2**	**3**	**4**	**5**
1	ICT Infrastructure	0.24	0.24					
2	Human Capital	0.82	0.16	0.64**				
3	Environment	4.23	0.89	0.85**	0.54**			
4	E-Government Dev.	0.41	0.26	0.76**	0.61**	0.68**		
5	E-Business Dev.	3.64	1.11	0.85**	0.59**	0.80**	0.84**	
6	Economic Performance	0.29	0.27	0.95**	0.62**	0.87**	0.71**	0.80**

** Correlation is significant at the 0.01 level (2-tailed)

We employed Partial Least Squares (PLS) [Barclay et al., 1995; Chin, 1998; Teo et al., 2009]. PLS imposes minimal demands in terms of sample sizes and measurement scales to validate a model compared to alternative structural equation modeling techniques [Gefen et al., 2000; Mahmood et al., 2004]. Another advantage which PLS offers is that the analysis is distribution free and does not assume true independence of the variables, leading to more reliable results [Gefen et al., 2000; Tobias, 1999]. Further, PLS is robust against other data structural problems, such as skew distributions and omissions of regressors [Cassel et al. 1999]. Moreover, the exploratory theory development stage that e-government research is currently in makes PLS a suitable choice for analyzing data in our study. As regards the measurement model, the issues were mostly related to the content and face validity of the constructs (discussed for each construct in Appendix 2). All constructs are modeled as reflective constructs except "environment," which is modeled as a formative construct. SmartPLS 2.0 was used to analyze the data in this study [Ringle et al., 2005]. Both public institutions [loading = 0.97, β = 0.57, t = 4.22] and macro-economy [loading = 0.96, β = 0.77, t = 3.43] loaded significantly on the "environment construct." The results of PLS analysis for the structural model are depicted in Figure 2.
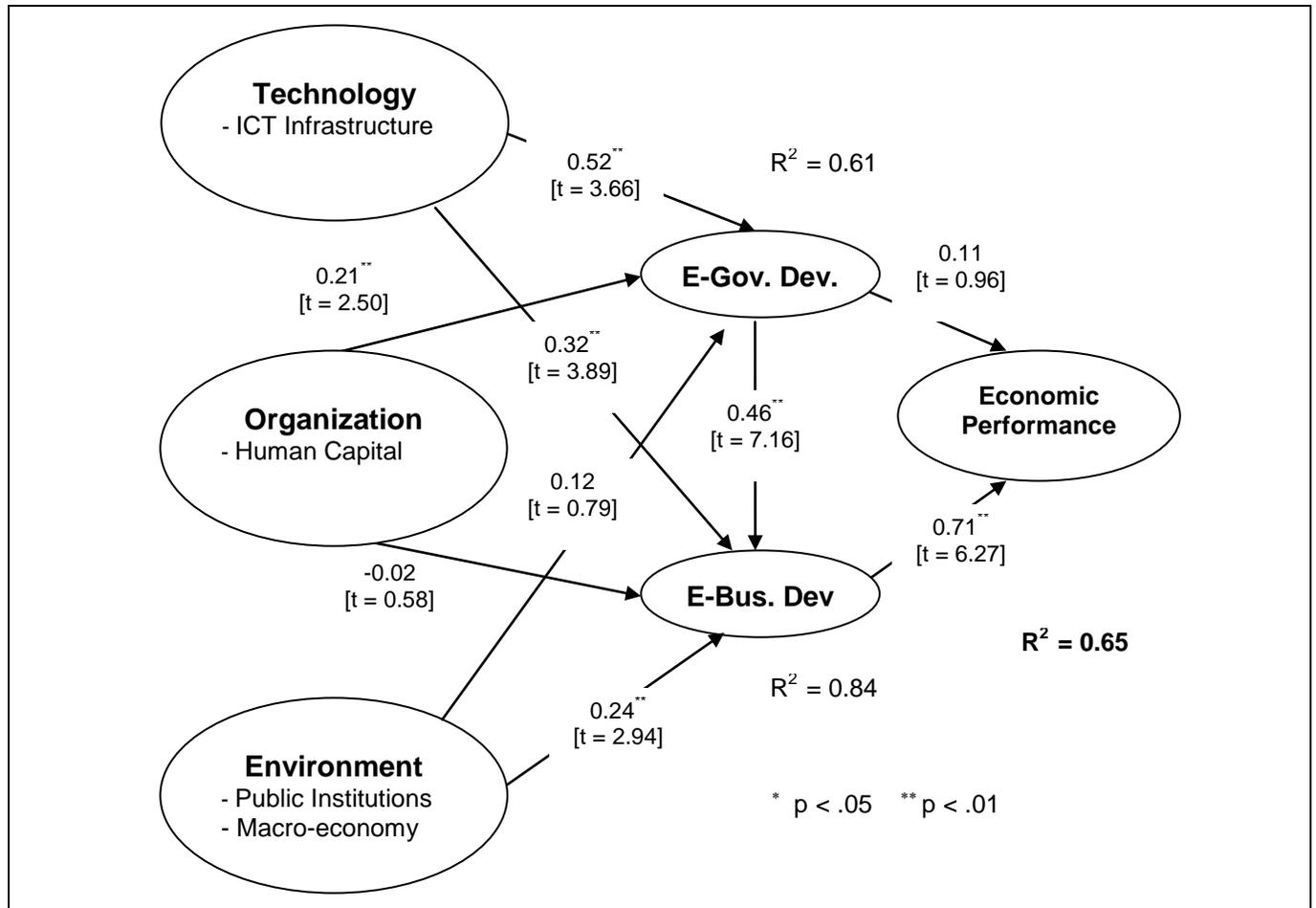

Figure 2. Results of PLS Analysis

H1, which states that there is a positive association between technological development and e-government development in a nation, received strong support (path = 0.52, t = 3.64, p < 0.01). H2 which states that technology is positively associated with the e-business development also received strong support (path = 0.32, t = 3.86, p < 0.01). These results are expected and indicate that technology (ICT infrastructure) is vital for the development of e-government as well as e-business. Specifically, if there is poor infrastructure (e.g., no reliable, cheap, and available Internet access), development of e-government and e-business is greatly inhibited.

H3 which specifies an association between the quality of human capital (in terms of education and training of citizens) and e-government development is also strongly supported (path = 0.21, t = 2.52, p < 0.01). H4, indicating a positive association between the quality of human capital and e-business development is not supported (path = -0.02, t = 0.54, ns). This difference in results between e-government and e-business is interesting. One plausible reason for this difference is the fact that e-government development is more closely related to citizens and, hence, the quality of human capital of the country. On the contrary, the development of e-business is dependent more on

the business infrastructure of the nation. In addition to B2C transactions, the major use of e-business is for B2B transactions, which may not be directly related to the quality of human capital in the nation.

H5 is not supported (path = 0.12, t = 0.79, ns) indicating the minimal role of quality of national institutional and economic environment, for the level of e-government development. H6, which indicates a positive association between the quality of national environment and e-business development, is strongly supported (path = 0.24, t = 2.94, p < 0.01), thereby indicating the important role of national environment (institutional and economic) for e-business development. The result for e-business development is in consonance with the past studies [Gibbs and Kraemer, 2004], whereas the result for e-government development in a cross-country setting is different from the past research which has shown the importance of national environment for e-government development in specific countries [Norris and Moon, 2005; Von Haldenwang, 2004; West, 2004]. The reason for this difference in result in a cross-country setting could be the fact that in many countries, e-government is a top driven initiative and, hence, may not be directly related to the state of public institutions and macro-economy of the nation. Further, a top driven initiative for e-government development may have advantages of being cost efficient and more reliable than the alternative. In contrast, the presence of sound public institutions provides a favorable environment for businesses and a healthy national macro-economy propels the proliferation of businesses in general and e-business in particular. The non-association of national environment (public institutions and macro-economy) with e-government development can also be explained by taking recourse in the concept of "routine rigidity" [Gilbert, 2005]. Policy makers in a country that is already doing well in terms of institutions and macro-economy may resist a change in the systems of government interaction with citizens and businesses and may be indifferent to new forms of government like e-government.

H7, which indicates a positive relationship between e-government development and e-business development, received strong support (path = 0.46, t = 7.16, p < 0.01). This is an important result because it reiterates the synergistic association between e-government and e-business in a nation. This result is in consonance with past research on IS, which has clearly delineated the important role of top management support in organizations for IT development and adoption [Chatterjee et al., 2002; Teo and Too, 2000]. Several case studies on nations having developed e-government systems also validate this result (Wei and Ke, 2004; Teo and Koh, 2009). At the national level, e-government development is a pointer to the government support for e-initiatives, leading to rapid development of e-business [Wong, 2003]. However, it is important to note that since e-business has been around for a longer period than e-government, it is plausible that e-business could also affect e-government development. Consequently, these two constructs are likely to have a synergistic positive association with each other.

H8, which specifies a positive association of e-government development with national economic performance, is not supported [path = 0.11, t = 0.96, ns], whereas H9, which indicates a positive association of e-business development with national economic performance, is strongly supported [path = 0.71, t = 6.27, p<0.01]. The positive association of e-business development with national economic performance is consistent with past studies on IT impact, which indicate that infusion of IT will lead to an increase in performance [Brynjolfsson and Hitt, 2000; Subramaniam and Shaw, 2002; Melville et al., 2004].

The lack of support for H8 is interesting and also surprising as apparently it refutes past IS studies on IT impact. Studies on e-government in the past have shown its positive significant relationship with different performance metrics [Moynihan, 2004; Srivastava and Teo, 2008; West, 2004]. A possible reason for the difference in results for H8 and H9 is that companies tend to have more choices than governments, e.g., companies can move to another country with more favorable conditions to enhance performance while governments can't move to another country and laws may strictly limit their options[2]. Nevertheless, a result indicating non-association of e-government development with national economic performance, no doubt raises an important counter intuitive issue which needs further exploration. Though the proposed model explains a significant amount of variance (65 percent) in the national economic performance, it leaves this anomaly unresolved. For understanding this apparent anomaly, we conducted post-hoc analysis, the details of which are given in the next section.

V. POST-HOC ANALYSIS

Relationship Between E-Government and National Economic Performance

Findings from the previous section in the hypothesized model (Figure 2) show that the relationship between e-government development and national economic performance is not significant. This result is different from the results in past studies that have shown e-government development being significantly related to the economic performance of nations [Srivastava and Teo, 2008]. There can be two plausible reasons for this anomalous result:

---

[2] We thank the associate editor for making this suggestion.

first, there is actually no relationship between e-government development and national economic performance or second, the impact of e-government development on national economic performance is fully mediated through e-business (since our model has two paths from e-government development to national economic performance). Some past studies on IT impact have shown the importance of understanding the process of impact realization through intermediate variables in organizational settings [Barua et al., 1995; Hitt and Brynjolfsson, 1996] and also in the e-government scenario [Srivastava and Teo, 2007a]. To analyze this aspect, we conducted the PLS analysis again without the path from e-business development to national economic performance, the results of which are shown in Figure 3.

We observe that in the revised model, the path from e-government development to national economic performance becomes strongly significant (path = 0.71, t = 11.80, p < 0.01). But the explained variance in national economic performance drops from 0.65 in the hypothesized model (Figure 2) to 0.51. This brings forth a very interesting finding about the relationship between e-government development and national economic performance. In the presence of the path between e-business and national economic performance, the path between e-government development and national economic performance becomes insignificant (Figure 2). This indicates that the relationship between e-government development and national economic performance is *fully mediated* through the development of e-business. This result makes an important contribution in understanding the process of realization of benefits from e-government development. Result points to the overarching importance of e-business development in a nation for realizing the benefits of e-government initiatives in terms of national economic performance.
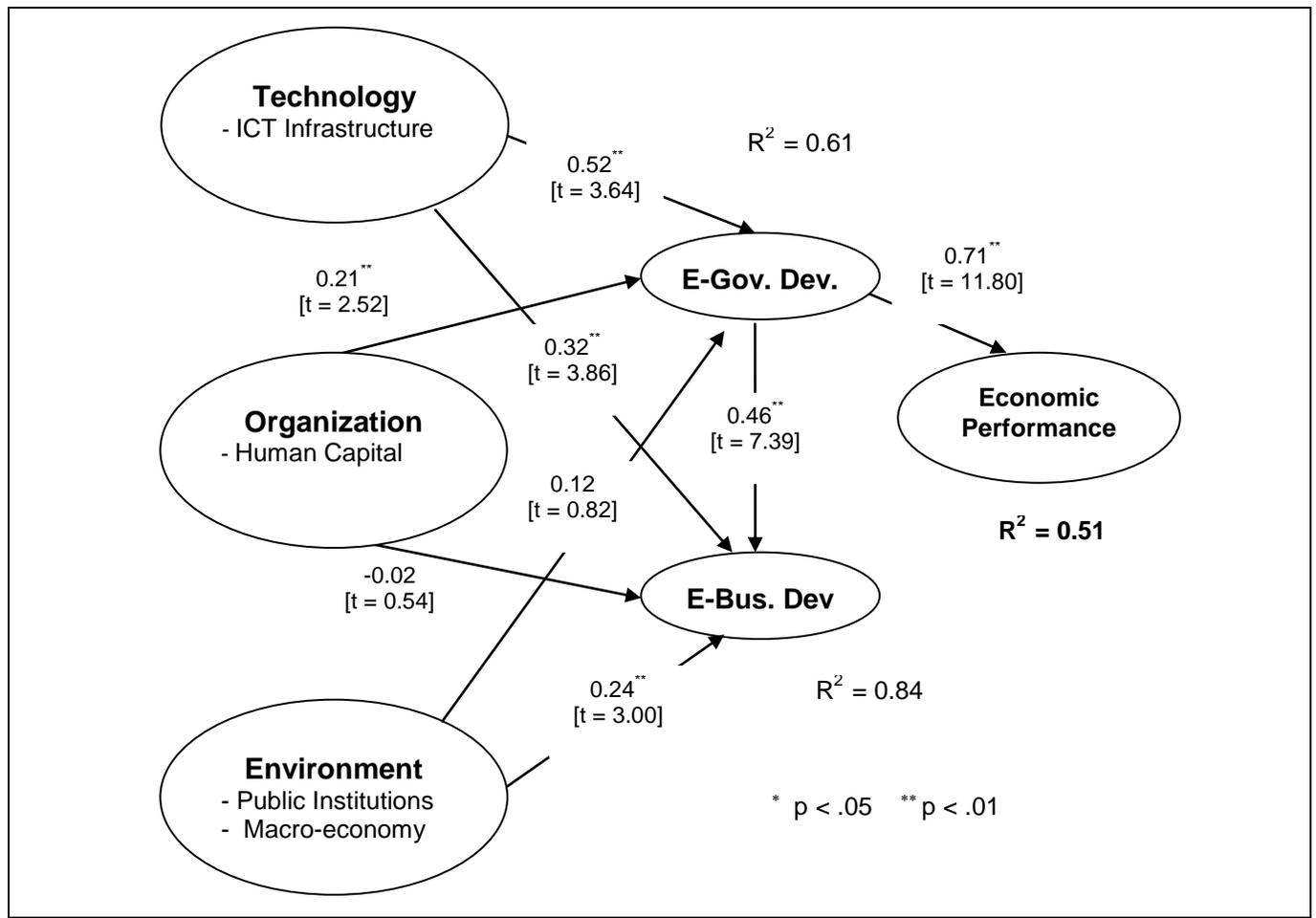

Figure 3. Testing for Mediation: Post Hoc Analysis

We also observe that in the full model (with e-business development) the variance explained in the national economic performance $R^2 = 0.65$, is more than the explained variance ($R^2 = 0.51$) in the presence of e-government alone. For testing if there is a significant difference in the variance explained by the two models (with and without the e-business variable), we adopted a procedure similar to Subramani [2004] and Teo et al. [2009]. For R^2 comparison, we used Cohen's [1988] formula for calculating effect size f^2 as:

$$f^2 = [R^2_{\text{hypothesized}} - R^2_{\text{e-Gov alone}}]/[1 - R^2_{\text{hypothesized}}]$$

The value of f^2 captures whether the impact of a particular independent construct on a dependent construct is substantive. The significance of f^2 is assessed based on a pseudo F test [Chin et al., 1996]. The pseudo F statistic is calculated as $f^* [n - k - 1]$, with 1, $[n - k]$ degrees of freedom where n is the sample size and k is the number of constructs in the model [Subramani, 2004]. The results show that the hypothesized model with e-government and e-business explains a significantly greater variance in national economic performance than e-government alone. Thus, the integrated model with e-government and e-business not only explains a significantly greater variance but also provides an explanation as to how the benefits of e-government are realized in the presence of a well-developed e-business network within the nation. A practical anecdotal illustration of this result is the impact of the Online Business Licensing Service [OBLS], started as an e-government initiative in Singapore to assist businesses in getting and renewing all licenses at one stop shop [Periasamy and Sia, 2007; Teo and Koh, 2009]. This initiative has certainly spurred businesses to interact with government online and also use the online channel for other aspects of their business conduct. Without the presence of a sizeable number of businesses using this online initiative, its full potential would not have been realized. Thus, e-government and e-business are closely intertwined and the full benefit of e-government initiatives contributing to the economic performance of the nation will be realized effectively in the presence of a facilitating e-business infrastructure in the nation.

VI. LIMITATIONS

One key limitation of the study concerns the use of secondary data. We use data and indices as formulated by the reporting agencies, thereby giving us lesser control over the definition of variables. Primary survey data would conceivably have provided better measures, but it is very difficult for a small group of researchers to undertake a large scale cross-country primary data collection. Further, the data used have been compiled by trustworthy organizations, taking into account suitable procedures for ensuring reliability and validity. Hence, using these secondary data sources provides a viable way for examining the research questions.

VII. IMPLICATIONS

Implications for Research

This study offers several implications for research. First, although there are close linkages and dependencies between the development and impact of e-government and e-business, research has mostly analyzed them in silos. We highlight the importance of analyzing "e-government" and "e-business" jointly by integrating them cohesively in a unified theoretical framework. Future research can further study the dependencies and linkages between the two.

Second, the study highlights the relative importance of the different factors facilitating e-government and e-business development in a nation. Results suggest that ICT infrastructure is an important prerequisite for the development of both e-government and e-business. The quality of human capital in terms of education and training of citizens emerges as an important facilitator for e-government development but not for e-business. On the other hand, national environment emerges as a significant determinant for the development of e-business but not for e-government. Future research can investigate the relative conditions under which these factors may assume greater or lesser importance.

Third, the study demonstrates that e-government development in a nation is significantly related to the level of its e-business development. Further, the analyses in this research (including the post-hoc analysis) reveal that both e-government development and e-business development are positively associated with national economic performance. Moreover, the process of accruing benefits from e-government development is fully mediated through the development of e-business. Also the explanatory power of the integrated model increases significantly. This clearly highlights the importance of considering e-government and e-business in a single integrated framework. The result also makes an important contribution to the IT impact literature at country level of analysis and evidently highlights that, similar to organizational studies, it is imperative to consider all the variables (including the intermediate variables) associated with IT impact.

Fourth, although some past studies have conceptualized e-government as an "enacted technology" depending not only on the "objective technology" but also the surrounding "institutional arrangements" (Fountain, 2001); this is one of the few studies that empirically tests the TOE framework for understanding e-government. We do this in a cross-country setting for better understanding the development of e-government and e-business at the national level. TOE, which has served as a useful theoretical framework for understanding the adoption and performance of technological innovations and information systems (IS) in organizations is applied and tested in a global context. Future research can similarly explore and adapt other theoretical frameworks to different levels of analyses.

Fifth, most past e-government research is either conceptual or in the form of case studies. There is a dearth of quantitative empirical studies on e-government [Norris and Moon, 2005]. Moreover, there are relatively few studies on e-government which address issues from a global perspective. The current research, using secondary data for examining the research problem, paves the way for future e-government research contemplating to utilize secondary data sources. Another important avenue for future research relates to examining the conditions under which e-government is a success, whether e-government leads to enhanced economic performance and whether good economic performance is a predictor of e-government development.

Implications for Practice

The research also has several important implications for practitioners, especially governments and policy makers. First, the study identifies important prerequisites for the development of e-government and e-business in a nation. The differential relationships of the quality of human capital and the quality of national environment provide empirical evidence that factors affecting e-government development and e-business development are not the same. Understanding these differences is important for policy makers in formulating strategies for enhancing e-government and/or e-business development. Further, depending on the specific requirements and priorities in a nation, policy makers have an actionable result for differentially allocating resources for e-government and/or e-business development.

Second, the study provides suggests the positive relationship of e-government and e-business with the economic performance of a nation. It also demonstrates the important role of e-government development in a nation for the growth of e-business in that country. The results can be used as a reference by practitioners and policy makers who are looking forward to new ways for establishing the usefulness of IT investments especially in the government scenario.

Third, results exhibit the intertwined and synergistic relationship of e-government and e-business with national economic performance thereby highlighting the importance of considering e-government and e-business collectively for effective implementation and administration of government plans [UN Report, 2004; Von Haldenwang, 2004]. E-government by itself will not result in the desired benefits; rather efforts toward e-government are translated to national economic performance effectively through the development of appropriate e-business. Hence concerted efforts should be made for enhancing both e-government and e-business development.

Fourth, given the finding that e-business development is essential for economic performance, it is important for countries to ensure that the key factors important in facilitating e-business development are present, else companies may choose to reside or host their e-business suites elsewhere. The results may also serve as a guide to countries endeavoring to elevate their e-government development on what to focus their resources on.

VIII. CONCLUSION

This research seeks to understand the development and impact of e-government and e-business using an integrated framework in a cross-country scenario. Results show that development and impact of e-government are closely related and intertwined with each other. Further, the impact of e-government on national economic performance is effectively realized through the development of e-business in that nation. Hence, it is imperative to analyze e-business along with e-government for fully appreciating their relationships with national economic performance. Future research can attempt at understanding the role of firm level variables in addition to country level variables for the development of e-business and their consequent relationship with e-government. Future research can also explore the underlying processes facilitating development and impact of e-government and e-business. This can be done by identifying the relevant intermediate variables (separately for development and impact). For example, the impact of e-government on national economic performance in a nation may be dependent on certain intermediate *efficiency* related variables or the extent of citizen participation in e-government.

REFERENCES

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.

Aalbers, R.J., A.M.,Townsend, and M.E. Whitman (1998) "The Threat of Long-Arm Jurisdiction to Electronic Commerce", *Communications of the ACM* (41)12, pp. 15–20.

Aldridge, A., M. White, and K. Forcht (1997) "Security Considerations of Doing Business Via the Internet: Cautions to Be Considered", *Internet Research* (7)1, pp. 9–15.

Alpar, P., and M. Kim (1990) "A Microeconomic Approach to the Measurement of Information Technology Value", *Journal of Management Information Systems* (7)2, pp. 55–69.

Attaran, M., and I. Vanlaar (1999) "Privacy and Security on the Internet: How to Secure Your Personal Information and Company Data", *Information Management & Computer Security* (7)5, pp. 241–247.

Awad, N.F., and M.S. Krishnan (2006) "The Personalization Privacy Paradox: An Empirical Evaluation of Information Transparency and the Willingness to Be Profiled Online for Personalization", *MIS Quarterly* (30)1, pp. 13–28.

Baliamoune-Lutz, M. (2003) "An Analysis of the Determinants and Effects of ICT Diffusion in Developing Countries", *Information Technology for Development* (10), pp. 151–169.

Banerjee, P., and P.Y.K. Chau (2004) "An Evaluative Framework for Analyzing e-Government Convergence Capability in Developing Countries", *Electronic Government* (1)1, pp. 29–49.

Barclay, D., R. Thompson, and C. Higgins (1995) "The Partial Least Squares (PLS) Approach to Causal Modeling: Personal Computer Adoption and Use, An Illustration", *Technology Studies* (2)2, pp. 285–309.

Barua, A., C.H. Kriebel, and T. Mukhopadhyay (1995) "Information Technologies and Business Value: An Analytic and Empirical Investigation", *Information Systems Research* (6)1, pp. 3–23.

Bogaert, I., R. Martens, and A.V. Cauwenbergh (1994) "Strategy as a Situational Puzzle: The Fit of Components" in Hamel, G. and A. Heene (eds.) *Competence-Based Competition,* The Strategic Management Society, Sussex: John Wiley and Sons, pp. 57–74.

Brousseau, E. (2003). "E-Business in France: Did Early Adoption Prevent its Development?" *The Information Society* (19)1, pp. 45–57.

Brynjolfsson, E., and L. Hitt (1996) "Paradox Lost? Firm-Level Evidence on the Returns to Information Systems Spending", *Management Science* (42)4, pp. 541–558.

Brynjolfsson, E., and L. Hitt (2000) "Beyond Computation: Information Technology, Organizational Transformation and Business Performance", *Journal of Economic Perspectives* (14)4, pp. 23–48.

Cavazos, E.A. (1996) "The Legal Risks of Setting Up Shop in Cyberspace", *Journal of Organizational Computing and Electronic Commerce* (6)1, pp. 51–60.

Chatterjee, D., R. Grewal, and V. Sambamurthy (2002) "Shaping Up for e-Business: Institutional Enablers of the Organizational Assimilation of Web Technologies", *MIS Quarterly* (26)2, pp. 65–89.

Chen, T.J. (2003) "E-Business to Protect the Network Relationships: The Case of Taiwan's PC Industry", *The Information Society* (19)1, pp. 59–67.

Chin, W.W. (1998) "The Partial Least Squares Approach to Structural Equation Modeling" in Marcoulides, G.A. (ed.) *Modern Methods for Business Research*, Mahwah, NJ: Lawrence Erlbaum Associates, pp. 295–336.

Clark, D., et al. (2003) "Local Government Stimulation of Broadband: Effectiveness, e-Government, and Economic Development", *Working Paper Series* rwp03-002, Harvard University, John F. Kennedy School of Government.

Cohen, W.M., R.R., Nelson, and J.P. Walsh (2002) "Links and Impacts: The Influence of Public Research on Industrial R&D", *Management Science* (48)1, pp. 1–23.

Dai, Q., and R.J. Kauffman (2002) "Business Models for Internet-Based B2B e-Business", *International Journal of Electronic Commerce* (6)4, pp. 41–72.

Delios, A., and P.W. Beamish (1999) "Ownership Strategies of Japanese Firms: Transactional, Institutional and Experience Influences", *Strategic Management Journal* (20), pp. 915–933.

DETE (2004) *Optimizing Usage of ICTs by Irish SMEs and Microenterprises*. Department of Enterprise, Trade and Employment, Ireland, http://www.entemp.ie/publications/enterprise/2004/ebusinessstrategy.pdf (current Nov. 11, 2008).

Devaraj, S., and R. Kohli (2003) "Performance Impacts of Information Technology: Is Actual Usage the Missing Link?" *Management Science* (49)3, pp. 273–289.

Dewan, S., and K.L. Kraemer (2000) "Information Technology and Productivity: Evidence from Country-Level Data", *Management Science* (46)4, pp. 548–562.

Dutta, S., and A. Jain (2005) "An Analysis of the Diffusion of Information and Communication Technologies of Nations" in Dutta, S., A. Lopez-Claros, and I. Mia (eds.) *The Global Information Technology Report,* Geneva: World Economic Forum.

Flak, L.S., and J. Rose (2005) "Stakeholder Governance: Adapting Stakeholder Theory to e-Governance", *Communications of the Association for Information Systems* (16), pp. 662–664.

Fountain, J. (2001) *Building the Virtual State: Information Technology and Institutional Change,* Washington, DC: The Brookings Institution,.

Gaur, A.S., and J.W. Lu (2007) "Ownership Strategies and Subsidiary Performance: Impact of Institutions and Experience", *Journal of Management* (33)1, pp. 84–110.

Gefen, D., and D.W. Straub (2000) "The Relative Importance of Perceived Ease of Use in IS Adoption: A Study of e-Business Adoption", *Journal of the Association for Information Systems* (1), pp. 1–28.

Gefen, D., D.W. Straub, and M. Boudreau (2000) "Structural Equation Modeling and Regression: Guidelines for Research Practice", *Communications of the Association for Information Systems* (4)7, pp. 2–76.

Gibbs, J.L., and K.L. Kraemer (2004) "A Cross-Country Investigation of the Determinants of Scope of e-Business Use: An Institutional Approach", *Electronic Markets* (14)2, pp. 124–137.

Gilbert, C.G. (2005) "Unbundling the Structure of Inertia: Resource versus Routine Rigidity", *Academy of Management Journal* (48)5, pp. 741–763.

Grölund, Å., and T.A. Horan (2004) "Introducing e-Gov: History, Definitions and Issues", *Communications of the Association for Information Systems* (15), pp. 713–729.

Hitt, L., and E. Brynjolfsson (1996) "Productivity, Business Profitability, and Consumer Surplus: Three Different Measures of Information Technology Value", *MIS Quarterly* (20)2, pp. 121–142.

Iacovou, C.L., I. Benbasat, and A.S. Dexter (1995) "Electronic Data Interchange and Small Organizations: Adoption and Impact of Technology", *MIS Quarterly* (18)3, pp. 465–485.

Ke, W., and K.K. Wei (2004) "Successful e-Government in Singapore", *Communications of the ACM* (47)6, pp. 95–99.

Koh, C.E., S. Ryan, and V.R. Prybutok (2005) "Creating Value through Managing Knowledge in an e-Government to Constituency (G2C) Environment", *Journal of Computer Information Systems* (Summer), pp. 32–41.

Kuan, K.K.Y., and P.Y.K. Chau (2001) "A Perception Based Model for EDI Adoption in Small Business Using a Technology-Organization-Environment Framework", *Information & Management* (38)8, pp. 507–512.

Kunstelj, M., and M. Vintar (2004) "Evaluating the Progress of e-Government Development: A Critical Analysis", *Information Polity* (9), pp. 131–148.

Layne, K., and J. Lee (2001) "Developing Fully Functional e-Government: A Four Stage Model", *Government Information Quarterly* (18), pp. 122–136.

Mahmood, M.A., K. Bagchi, and T.C. Ford (2004) "On-Line Shopping Behavior: Cross-Country Empirical Research", *International Journal of Electronic Commerce* (9)1, pp. 9–30.

McHenry, W., and A. Borisov (2006) "E-Government and Democracy in Russia", *Communications of the Association for Information Systems* (17), pp. 1064–1123.

McHenry, W., and A. Borisov (2006) "Measuring e-Government: A Case Study Using Russia", *Communications of the Association for Information Systems* (17), pp. 905–940.

McNeal, R.S., et al. (2003) "Innovating in Digital Government in the American States", *Social Science Quarterly* (84)1, pp. 52–70.

Melville, N., K. Kraemer, and V. Gurbaxani (2004) "Review: Information Technology and Organizational Performance: An Integrative Model of IT Business Value", *MIS Quarterly* (28)2, pp. 283–322.

Moon, M.J. (2002) "The Evolution of e-Government Among Municipalities: Rhetoric or Reality?" *Public Administration Review* (62)4, pp. 424–433.

Moynihan, D.P. (2004) "Building Secure Elections: e-Voting, Security, and Systems Theory", *Public Administration Review* (64)5, pp. 515–528.

Munro, N. (1997) "If It Grows, Tax It", *Communications of the ACM* (40)1, pp. 11–13.

Ngai, E.W.T., and F.K.T. Wat (2002) "A Literature Review and Classification of Electronic Commerce Research", *Information & Management* (39), pp. 415–429.

Norris, D.F., and M.J. Moon (2005) "Advancing e-Government at the Grassroots: Tortoise or Hare?" *Public Administration Review* (65)1, pp. 64–75.

Olphert, W., and L. Damodaran (2007) "Citizen Participation and Engagement in the Design of e-Government Services: The Missing Link in Effective ICT Design and Delivery", *Journal of the Association for Information Systems* (8)9, pp. 491–507.

Otjacques, B., P. Hitzelberger, and F. Feltz (2007) "Interoperability of e-Government Information Systems: Issues of Identification and Data Sharing", *Journal of Management Information Systems* (23)4, pp. 29–51.

Pavlou, P.A., and M. Fygenson (2006) "Understanding and Predicting Electronic Commerce Adoption: An Extension of the Theory of Planned Behavior", *MIS Quarterly* (30)1, pp. 115–143.

Periasamy, K.P. and S.-K. Sia (2007) "Challenges in Delivering Cross-Agency Integrated e-Services: The OBLS Project", *Journal of Information Technology* (22)4, pp. 420–431.

Porter, M.E. (2005) "Building the Micro-Economic Foundations of Prosperity: Findings from the Business Competitiveness Index" in *The Global Competitiveness Report 2005–06*, Geneva, Switzerland: World Economic Forum.

Qureshi, S. (2005) "E-Government and IT Policy: Choices for Government Outreach and Policy Making", *Information Technology for Development* (11)2, pp. 101–103.

Ringle, C.M., S. Wende, and S. Will (2005) *SmartPLS 2.0 (M3) Beta,* http://www.smartpls.de., Hamburg.

Sadowski, B.M., C. Maitland, and J. van Dongen (2002) "Strategic Use of the Internet by Small and Medium-Sized Companies: An Exploratory Study", *Information Economics and Policy* (14), pp. 75–93.

Siau, K., and Y. Long (2006) "Using Social Development Lenses to Understand e-Government Development", *Journal of Global Information Management* (14)1, pp. 47–62.

Singh, H., A. Das, and D. Joseph (2007) "Country-Level Determinants of e-Government Maturity", *Communications of the Association for Information Systems* (20), pp. 632–648.

Srivastava, S.C., and T.S.H. Teo (2004) "A Framework for Electronic Government: Evolution, Enablers and Resource Drainers" in *Proceedings Eighth Pacific Asia Conference on Information Systems*, Shanghai, China.

Srivastava, S.C., and T.S.H. Teo (2005) "Electronic Government as a Guided Evolution in Singapore: Vision for the World in the 21st Century" in Weaver, M. (ed.) *Proceedings Academy of Management Meeting Best Papers (AOM 2005),* Honolulu, HI, pp. E1–E6.

Srivastava, S.C., and T.S.H. Teo (2007a) "E-Government Payoffs: Evidence from Cross-Country Data", *Journal of Global Information Management* (15)4, pp. 20–40.

Srivastava, S.C., and T.S.H. Teo (2007b) "What Facilitates e-Government Development? A Cross-Country Analysis", *Electronic Government: An International Journal* (4)4, pp. 365–378.

Srivastava, S.C., and T.S.H. Teo (2008) "The Relationship Between e-Government and Business Competitiveness: The Moderating Influence of Environmental Factors", *Communications of the Association for Information Systems* (23)5, pp. 73–94.

Srivastava, S.C., and T.S.H. Teo (2009) "Citizen Trust Development for e-Government Adoption and Usage: Insights from Young Adults in Singapore", *Communications of the Association for Information Systems* (25)31, pp. 359–378.

Srivastava, S.C., T.S.H. Teo, and S. Chandra (2007) "E-Government and Corruption: A Cross-Country Analysis", *Proceedings of the Twenty-Eighth International Conference on Information Systems*, Montreal, Canada.

Subramani, M. (2004) "How Do Suppliers Benefit from Information Technology Use in Supply Chain Relationships?" *MIS Quarterly* (28)1, pp. 45–73.

Subramaniam, C., and M.J. Shaw (2002) "A Study of the Value and Impact of B2B e-Commerce: The Case of Web-Based Procurement", *International Journal of Electronic Commerce* (6)4, pp. 19–40.

Swanson, E.B. (1995) "Information Systems Management Among Organizations", *Management Science* (40)9, pp. 1069–1092.

Tan, C.W., and S.L. Pan (2003) "Managing e-Transformation in the Public Sector: An e-Government Study of the Inland Revenue Authority of Singapore (IRAS)", *European Journal of Information Systems* (12), pp. 269–281.

Teo, T.S.H., P. Devadoss, and S.L. Pan (2006) "Towards a Holistic Perspective of Customer Relationship Management (CRM) Implementation: A Case Study of the Housing and Development Board", Singapore, *Decision Support Systems*, 42(3), pp. 1613–1627.

Teo, T.S.H., and T.K. Koh (2009) "Lessons from Multi-Agency Information Management Projects: Case of the Online Business Licensing Service (OBLS) Project, Singapore", *International Journal of Information Management*, doi:10.1016/j.ijinfomgt.2009.07.004.

Teo, T.S.H., S.C. Srivastava, and L. Jiang (2009) "Trust and Electronic Government Success: An Empirical Study", *Journal of Management Information Systems* 25(3), pp. 103–137.

Teo, T.S.H., M. Tan, and W.K. Buk (1997–98) "A Contingency Model of Internet Adoption in Singapore", *International Journal of Electronic Commerce* 2(2), pp. 95–118.

Teo, T.S.H., and B.L. Too (2000) "Information Systems Orientation and Business Use of the Internet: An Empirical Study", *International Journal of Electronic Commerce* (4)4, pp. 105–130.

Thomas, J.C., and G. Streib (2003) "The New Face of Government: Citizen-Initiated Contacts in the Era of e-Government", *Journal of Public Administration Research and Theory* (13)1, pp. 831–02.

Tobias, R.D. (1999) *An Introduction to Partial Least Squares Regression,* Cary, NC: SAS Institute,.

Tornatzky, L.G., and M. Fleischer (1990) *The Processes of Technological Innovation*, Lexington, MA: Lexington Books.

UN-Report (2004) "UN Global e-Government Readiness Report: Towards Access for Opportunity", New York: United Nations.

US Government (2002) "E-Government Strategy: Simplified Service Delivery to Citizens", Washington DC: Office of Management and Budget.

Von Haldenwang, C. (2004) "Electronic Government (e-Government) and Development", *The European Journal of Development Research* (16)2, pp. 417–432.

WEF (2005) "Global Competitiveness Report 2005–2006", World Economic Forum, Geneva, Switzerland.

West, D.M. (2004) "E-Government and the Transformation of Service Delivery and Citizen Attitudes", *Public Administration Review* (64)1, pp. 15–27.

Wong, P.K. (2003) "Global and National Factors Affecting e-Business Diffusion in Singapore", *The Information Society* (19)1, pp. 19–32.

Yeung, M.M. (1998) "Digital Watermarking", *Communications of the ACM* (41)7, pp. 31–33.

Yoon, J., and J. Hanna (2004) *Korea's Experience in Promoting E-Business Adoption Among Micro and Small Enterprises*, International Bank for World Bank Reconstruction and Development, World Bank, available at http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2005/01/07/000090341_ 20050107102649/Rendered/INDEX/311190ENGLISH0no1580Ebiz.txt (current Nov. 11, 2008).

Zhu, K., et al. (2004) "Information Technology Payoff in e-Business Environments: An International Perspective on Value Creation of e-Business in the Financial Services Industry", *Journal of Management Information Systems* (21)1, pp. 17–54.

Communications of the Association for Information Systems

APPENDIX1: COUNTRIES ANALYZED

Albania, Algeria, Argentina, Armenia, Australia, Austria, Azerbaijan, Bahrain, Bangladesh, Belgium, Benin, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Cambodia, Cameroon, Canada, Chad, Chile, China, Colombia, Costa Rica, Croatia, Cyprus, Czech Republic, Denmark, Dominican Republic, Ecuador, Egypt, El Salvador, Estonia, Ethiopia, Finland, France, Gambia, Georgia, Germany, Ghana, Greece, Guatemala, Guyana, Honduras, Hungary, Iceland, India, Indonesia, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Korea Republic, Kuwait, Kyrgyzstan, Latvia, Lithuania, Macedonia FYR, Madagascar, Malawi, Malaysia, Mali, Malta, Mauritius, Mexico, Republic of Moldova, Mongolia, Morocco, Mozambique, Namibia, Netherlands, New Zealand, Nicaragua, Nigeria, Norway, Pakistan, Panama, Paraguay, Peru, Philippines, Poland, Portugal, Qatar, Romania, Russian Federation, Serbia and Montenegro, Singapore, Slovakia, Slovenia, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Tajikistan, Tanzania, Thailand, Trinidad and Tobago, Tunisia, Turkey, Uganda, Ukraine, United Arab Emirates, United Kingdom, United States of America, Uruguay, Venezuela, Vietnam, Zimbabwe

Total Number of Countries Analyzed = 113

APPENDIX 2: DESCRIPTION OF MEASURES EMPLOYED

TECHNOLOGY

The technology construct is indicated by the Telecommunication Infrastructure Index from the UN e-government readiness report 2004. The Telecommunication Infrastructure Index is a composite weighted average index of six primary indices based on basic infrastructural indicators, which define a country's ICT infrastructure capacity. These are: PCs/1000 persons; internet users/1000 persons; telephone lines/1000 persons; online population/1000 persons; mobile phones/1000 persons; and Televisions/1000 persons [UN Report, 2004]. Data for UN Member States was taken primarily from the UN International Telecommunication Union (ITU) and UN Statistics Division, supplemented by the World Bank. Data across countries were standardized by constructing six separate indices for the indicators. The indicators constructed reflected the country's relative performance specified by a value between 0 and 1. The indicator value was calculated as: Indicator value = (Actual value – Minimum value) / (Maximum value – Minimum value). Further, the survey deemed a far greater significance for the prevalence of PCs, Internet users, telephone lines and online population to be of far greater significance than mobile phones and TVs at this point in e-government. Hence the Telecommunication Infrastructure Index was calculated based on: Infrastructure Index = 1/5 (PC index) + 1/5 (Internet user index) + 1/5 (Telephone line index) + 1/5 (On-line population index) + 1/10 (Mobile user index) + 1/10 (Television index) [UN Report 2004]. This index has been used in past academic studies like Siau and Long [2006], Srivastava and Teo [2007b].

ORGANIZATION

The organization construct is taken from the UN e-government readiness report 2004 as the Human Capital Index. Data for the Human Capital Index rely on the UNDP "education index" which is a composite of the adult literacy rate and the combined primary, secondary and tertiary gross enrolment ratio with 2/3 weights given to adult literacy and one third to gross enrolment ratio [UN Report, 2004].

The UN Report defines adult literacy as the percentage of people aged fifteen years and above who can, with understanding, both read and write a short simple statement on their everyday life. Combined primary, secondary, and tertiary gross enrolment ratio is indicated by the total number of students enrolled at the primary, secondary, and tertiary level, irrespective of age, as a percentage of the population of school age for that level [UN Report, 2004]. This index has been used in past academic studies like Siau and Long [2006], Srivastava and Teo [2007b].

ENVIRONMENT

The environment construct has two indicators taken from the Global Competitiveness Report 2005. The institutional environment is indicated by the Public Institutions Index[3]. The index is formulated on the two dimensions of public institutions: the execution of contracts and law and the state of corruption in the country. The index is based on a World Economic Forum's Executive Opinion Survey [WEF, 2005]. The macro-economic environment is also taken from the Global Competitiveness Report 2005 and is indicated by the Macro-Economic Environment Index[4], which uses a mix of hard data as well as survey of executives and indicates the state of macro-economic condition of the

---

[3] The public institutions index = ½ contracts and law sub index + ½ corruption sub index.
[4] Macro-economic environment index = ½ macro-economic environment stability sub-index + ¼ country credit rating + ¼ government waste.

country. It consists of three major components: macro-economic stability, institutional investor country credit rating and government waste variable [WEF, 2005]. Since the two indicators capture two different aspects of the environment variable: the public institutions environment and the macro-economic environment, we have modeled them as formative indicators for the environment construct. These indexes have been used in past academic studies like Srivastava and Teo [2007b].

E-GOVERNMENT DEVELOPMENT

The e-government development construct is indicated by the Web Measure Index from the UN E-Government Readiness Report 2004. The Web Measure Index is based upon a five-stage model, ascending in nature, and building upon the previous level of sophistication, of a country's online presence. For countries which have established an online presence, the model defines stages of e-readiness according to a scale of progressively sophisticated citizen services [UN Report, 2004]. Countries are coded in consonance with what they provide online and the stage of e-government evolution they are presently in. The five stages of e-government on which the country Web sites were coded were based on the UN's five stage e-government evolution model[5] in which the stages are: emerging presence, enhanced presence, interactive presence, transactional presence and networked presence. The Web Measure Index is an indicator of the sophistication and development of the e-government Web sites of that particular country and has been used in past studies as a measure of e-government development [Siau and Long, 2006; Srivastava and Teo, 2007a, 2007b, 2008].

E-BUSINESS DEVELOPMENT

The e-business development construct is indicated by the Extent of Business Internet Use taken from the Global Competitiveness Report 2005. E-business development represents the maturity of nations' businesses in using the Internet for conducting their transactions. It indicates whether the Internet use by businesses in the particular country to buy and /or sell products and services is widespread or is low. The extent of business use of the Internet indicates the level of development of e-business in the country. A high level of e-business in a nation indicates that a high volume of business (B2B and B2C) is conducted using the Internet. In our study, we use it as a measure of e-business development.

NATIONAL ECONOMIC PERFORMANCE

Economic performance of a nation depends both on the value of nation's products and services, measured by the prices they can command in open markets, and also on the efficiency with which they are produced [Porter, 2005]. In this study, we use Porter's productivity paradigm for operationalizing national economic performance. The national economic performance of a nation is an indicator of the micro-economic capabilities of its constituents and is measured by the GDP per capita adjusted for purchasing power parity, the values for which are taken from Global Competitiveness Report 2005.

NOTE ON RELIABILITY AND VALIDITY OF DATA USED

The Global Competitiveness Report 2005 and the UN e-Government Readiness Report 2004 have been prepared by two leading agencies (namely World Economic Forum and United Nations) which have a long experience and expertise in collecting and interpreting global data. The data from both reports had two components—hard data and survey data. Some indices like human capital index, ICT infrastructure index, and national economic performance rely completely on hard data compiled by UN; other indices, like macro-economic index, public institutions index, and e-government development, emerge from a mix of survey as well as from hard data. For ensuring reliability and validity of all the constructs, it is important to have an overview of the methods undertaken by the two agencies.

The country-level data was collected by WEF through a number of partner institutes who were given a uniform set of guidelines which were strictly adhered to. Some of these guidelines included taking responses only from CEOs or equivalent rank company officials, facility for the respondents to answer in their preferred language (thirty language versions were presented; the reliability of expression was ensured by the partner institutes), etc. A stratified random sampling procedure was adopted to ensure representation of the spectrum of companies in the country. In all 10,993 respondents participated in the survey which corresponds to an average of ninety-four respondents from each country. A renowned leader in the field of survey, Gallup International was associated at the early stages and all suggestions given by them were adhered to. The data from respondents within the country was checked for internal consistency by analyzing the standard deviation in the responses. Apart from ensuring internal consistency, it was important to tackle the issue of "perception bias" i.e., "a systematic positive or negative bias found among all respondents in a given country; for example, some might believe that people in a certain country are generally more positive about their own economic environment than people in another country, who might be pessimistic" [WEF,

---

[5] The full description of the model is available at http://www.unpan.org/egovernment3.asp.

2005]. To minimize chances of perception bias, two techniques were adopted. First, the questions were framed in a way that asks the respondents to compare their own country to world standards, rather than thinking in absolute national terms. Second, wherever possible, the survey data was compared with hard data on similar issues.

The UN also followed similar procedures for ensuring validity and reliability for their survey. The most important issue in the case of the UN survey was the training of researchers who actually carried out the Web survey. Multiple researchers were used to rate the Web sites according to the stages of e-government Web development. Detailed guidelines were provided for choosing the Web sites and features for classification and analysis. In all, a total of over 50,000 online features and services from 178 countries across six sectors were assessed ensuring a wide coverage with reliable and consistent methods [UN Report, 2004]. We used the data directly from these reports as the data collecting agencies are trustworthy and followed rigorous procedures for ensuring the reliability and validity. Moreover as highlighted earlier, data from these reports has been used by several past studies.

ABOUT THE AUTHORS

Shirish C. Srivastava is an Assistant Professor at HEC School of Management, Paris. He obtained his Ph.D. from the School of Business, National University of Singapore. His research has been published in several international refereed journals such as *MISQ Executive, Journal of Management Information Systems, Journal of Information Technology, Communications of the Association for Information Systems, Journal of Global Information Management, Information Resources Management Journal,* and *Electronic Government: An International Journal,* among others. He has also authored several book chapters and has presented his research in key international refereed conferences like International Conference on Information Systems (ICIS), Academy of Management (AOM), Academy of International Business (AIB), Institute for Operations Research and the Management Sciences (INFORMS), and Americas Conference on Information Systems (AMCIS). He has been thrice nominated for the prestigious Carolyn Dexter Award at the Academy of Management (AOM) Meetings 2005, 2007, and 2008 and was a finalist for the award at AOM 2007. Recently, he was nominated for the academy wide William H. Newman award at the AOM 2009, Chicago and is the winner of the Gerardine DeSanctis Dissertation Award for the best doctoral dissertation paper in organizational communication and information systems. He has also been a winner at the Society for Information Management (SIM) Paper Awards Competition, 2007. His research interests include IT-enabled offshore sourcing, e-government, IS strategy and e-business strategy.

Thompson S.H. Teo holds joint appointment as an Associate Professor in the Department of Decision Sciences at the School of Business, and in the Department of Information Systems at the School of Computing, National University of Singapore. His research interests include the strategic use of IT, e-commerce, adoption and diffusion of IT, strategic IT management and planning, and offshoring. He has published more than 100 papers in international refereed journals. He is Senior Associate Editor for the *European Journal of Information Systems,* Regional Editor [Asia and Pacific] for the *International Journal of Information Management* and is also on several editorial boards such as *Communications of the Association for Information Systems, Internet Research* and *Omega.* He has co-edited four books on IT and e-commerce, and is also a two-time winner of the SIM Paper Awards Competition.