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DETERMINANTS AND IMPACT OF E-GOVERNMENT AND E-BUSINESS DEVELOPMENT: A GLOBAL PERSPECTIVE

Global Information Technology Management

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Abstract

Most past studies have analyzed the development and impact of e-Government and e-Business in a nation separately from each other. In contrast to these studies, we analyze the development and impact of e-Government and e-Business together from a global perspective. Using secondary data from 113 countries and the Technology-Organization-Environment (TOE) and IT impact literature as the guiding theoretical lenses, we examine the facilitators of e-Government and e-Business development, the relationship between e-Government and e-Business, and their impact on national business competitiveness. Our research highlights the importance of national ICT infrastructure for the development of both e-Government and e-Business. The quality of national human capital emerges as an important factor for the development of e-Government but not for e-Business, whereas national environment (institutional and macro-economic) appears to be an important facilitator for e-Business but not for e-Government. Our analysis reveals the significant role played by e-Business in enhancing the business competitiveness of nations. Further, analysis brings forth the important role of e-Business for realizing the benefits of e-Government in improving national business competitiveness. Through this research, we highlight the importance of considering e-Government and e-Business together rather than analyzing them in silos. We make some important contributions and offer implications for researchers, practitioners, and policy makers.

Keywords: e-Government, TOE framework, secondary data, IT impact, business competitiveness, e-commerce, e-business

Introduction

The development of electronic government (e-Government) and electronic business (e-Business) is being increasingly realized as a recipe for success by most countries around the globe. Although there are perceptible linkages between the two, the current literature typically views e-Government and e-Business as two distinct domains of study. It is important to realize that in addition to the various individual and organizational factors, the development of e-Business (or use of e-Commerce) in a nation may be dependent on the development of e-Government. Past research suggests that governmental activities in the public domain spur similar activities in the business scenario (Cohen et al., 2002). Hence, apart from 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-commerce activity, leading to an increase in its business competitiveness (WEF, 2005).

The research in each of these two important areas (e-Business and e-Government) has been mostly growing separately, in an unconnected way. Past studies on e-Business can be broadly classified into three broad streams: application, implementation, and adoption issues (Bons et al., 1998; Chatterjee et al., 2002; Pavlou & Fygenson,

2006), technological issues (Aldridge et al., 1997; Yeung, 1998), and impact on organizational performance (Zhu et al., 2003; Subramani, 2004; Subramaniam & Shaw, 2002). Ngai & Wat, (2002) in their review paper on e-commerce had pointed out that, despite the importance of public policy and government related issues for e-commerce, very few research papers have addressed them. Moreover, most of the studies dealing with e-Business and e-Government-related issues have addressed taxation issues (Munro, 1997), legal issues (Aalbers et al., 1998; Cavazos, 1996), or privacy issues (Attaran & Vanlaar, 1999; Benassi, 1999; Awad & Krishnan, 2006). To our knowledge, none of these studies has touched on the relationship of e-Government to e-Business and their impacts. Further, most research on e-Business concentrates on either organizational or individual levels of analyses for various B2B or B2C activities. There are very few studies that view e-commerce issues from a cross-country perspective (e.g., Mahmood et al., 2004). In their review of IT impact literature, Melville et al. (2004) have highlighted the paucity of IT impact research at national and cross-country levels, and have stressed on an imperative need for conducting such research.

In a similar vein, research on e-Government can be divided into three broad areas: evolution and development (Wimmer, 2002; Layne & Lee, 2001; Warkentin et al., 2002; Von Haldenwang, 2004; Kunstelj & Vintar, 2004; Srivastava & Teo, 2005), adoption and implementation (Moynihan 2004; Koh, et al., 2005; Li 2003; Heeks, 2002; Poon & Huang, 2002), and its impact on citizens and businesses (West, 2004; Moynihan, 2004; Von Haldenwang, 2004; Banerjee & Chau, 2004). Further, most studies on e-Government are either conceptual or case studies. Quantitative empirical studies on e-Government are relatively few, and most of them are limited to analyzing a particular e-Government implementation within a country (Norris & Moon, 2005; Kaylor et al., 2001; Moon, 2002; West, 2004; McNeal et al., 2003; Ho, 2002). To our knowledge, there is no large-scale, quantitative, empirical study involving more than a hundred countries that aims to understand the development and impact of e-Government and e-Business.

In this study, we attempt to address these research gaps for understanding the development and impact of e-Government and e-Business in an integrated way. Using the Technology-Organization-Environment (TOE) framework (Tornatzky & Fleischer, 1990) as the guiding theoretical lens, we analyze the contexts facilitating the development of e-Government and e-Business in a nation. Further, using the IT impact literature as the theoretical basis, we analyze the impact of e-Government and e-Business on national business competitiveness. 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 to this, in our study, we apply the TOE framework in a cross-country scenario for understanding the development and impact of e-Government and e-Business on national business competitiveness. In doing so, we extend the applicability of the TOE framework to analyze cross-country secondary data.

The major contribution of this study lies in understanding the interdependent relationships between the development and impact of e-Government and e-Business in a nation. While most past studies have explored the characteristics and impact of e-Government and e-Business separately, we attempt to understand the interdependent relationships between them. The result from our study, which shows that the impact of e-Government development on the business competitiveness of a nation is fully mediated through e-Business development, reiterates the paramount importance of information and communication technologies (ICT) initiatives by businesses for achieving the full impact of e-Government on national business competitiveness.

The rest of the paper is organized as follows. First, using the TOE framework as the guiding theory, we explicate the contexts necessary for the development of e-Government and e-Business. Next, using the IT impact literature, we explicate our research model, which integrates impact of e-Government and e-Business with their development at the country level of analysis. Next, using data from 113 countries (see Appendix 1 for the list of countries), we test the hypotheses formulated in our research model. Finally, we end the discussion with a set of conclusions and contributions of this study.

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 is also

dependent on the organizational and environmental contexts. Technological context describes the relevant technologies available to the firm. Organizational context describes some of the organizational characteristics and resources, such as the quality of its human resources, amount of slack resources, etc. The environmental context consists of the environmental characteristics in which the firm conducts its business. These three contextual factors influence a firm's decision to adopt an innovation, which eventually impacts the firm's performance. We extend this theoretical argument to the proliferation of technological innovations at a national level. E-government development is enabled by technological facilitation (Layne & Lee, 2001) and requires a host of enablers that help its adoption and usage (Srivastava & Teo, 2004).

Past IS studies have used the TOE framework in different settings, for example, adoption of complex innovations (Swanson, 1995; Kuan & Chau, 2001), electronic data interchange (Iacovou et al., 1995), e-Business use and value (Gibbs & Kraemer, 2004; Zhu et al., 2004), etc. Empirical studies using the TOE framework have found consistent support for the association of all or some of the contextual factors with technology adoption and consequently with performance. Most studies using the TOE framework have focused on technology adoption and use. Though the TOE framework has been used in various contexts, to our knowledge it has not been used to analyse e-Government development. Moreover, most studies applying the TOE framework have used primary survey data. In contrast to this, we use secondary data for our analyses. The use of secondary data enables us to examine the development and impact of e-Government and e-Business on a global scale, whereas the primary data collection is less feasible as it would entail enormous resources to collect data for 113 countries.

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 (West, 2004; UN Report, 2004; Kunstelj & Vintar, 2004). The duties and responsibilities of government are all pervasive and are related to the day-to-day lives of all 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 citizens and businesses through the Internet and ICT infrastructure. This is possible only when there is a good ICT infrastructure to support government's interaction with citizens and businesses through the Web. 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 technological infrastructure, e-Government development will remain only an unrealized dream (Srivastava & Teo, 2004; Von Haldenwang, 2004; Koh et al., 2005). ICT infrastructure is thus imperative for e-Government development. This leads to the following hypothesis:

Hypothesis 1: The level of ICT infrastructure in a country is positively associated with the development of its e-Government.

The presence of a sound technological infrastructure is essential for the development and usage of e-commerce by business organizations (Subramaniam & Shaw, 2002; Dai & Kauffman, 2002). Extending the argument for the requirement of a sound technological infrastructure within an organization as an essential prerequisite for e-Business development and usage (Gibbs & 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. The level of e-Business in a nation implies the extent to which firms in the nation use the Internet for conducting their business transactions (B2B as well as B2C). At an aggregate level, the greater usage of e-Business by a nation necessitates the presence of an enabling ICT infrastructure within the nation. Hence, the basic condition for fulfilling greater business interaction through the Web requires a well-developed ICT infrastructure in that nation. This leads us to our next hypothesis:

Hypothesis 2: The level of ICT infrastructure in a country is positively associated with the development of its e-Business.

Organizational Context

Past studies using the TOE framework have used various organizational factors for the organizational context. These factors included resources (tangible and intangible) that the firm has, e.g. firm size, global reach, market resources, financial resources, human resources, etc. (Zhu et al., 2004; Gibbs & Kraemer, 2004). Studies on e-Government have stressed the need for national resources to facilitate e-Government development. Among these resources, citizens' knowledge appears to be a vital resource. Bogaert, Martens, and Cauwenbergh (1994) have highlighted that in addition to physical resources, human resources are imperative for organizational development. A sound national human capital has been identified as a major enabler for e-Government as well (Srivastava & Teo, 2004; Von Haldenwang, 2004). This leads us to our next hypothesis:

Hypothesis 3: The quality of human capital in a country is positively associated with the development of its e-Government.

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 have a greater usage of B2C channel for business transactions. B2B transactions among firms will also be indirectly 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:

Hypothesis 4: The quality of human capital in a country is positively associated with the development of its e-Business.

Environmental Context

In TOE studies, the impacts of various environmental factors on the adoption of technology have been examined (Swanson, 1995; Kuan & Chau, 2001; Zhu et al., 2004). Past studies on e-Government have highlighted the importance of environmental factors such as "public institutions" and "national macroeconomic condition". Moon (2002) found that the two institutional factors of size and type of government contribute to the adoption of e-Government among municipalities. Norris and Moon (2005) found that e-Government adoption and sophistication were correlated with certain 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. Von Haldenwang (2004) mentioned the importance of having a sound institutional base for the development of e-Government. In his discussion on e-Government development, he also mentioned that advanced countries with sound macro-economic indicators were more likely to implement and use e-Government. Similarly, West (2004) stressed the importance of "institutional arrangements" in ensuring e-Government development. Thus the institutional and macro-economic environments appear to have a direct influence on e-Government development.

Hypothesis 5: The quality of environment in a country is positively associated with the development of its e-Government.

Better institutional and macro-economic environments lead to effective processes being implemented by business organizations (WEF, 2005). We expect that a country with a better macro-economic environment will have resources and policies for encouraging businesses for adopting e-commerce, as in the case of newly industrializing economies like Singapore and Taiwan (Chen, 2003; Wong, 2003). Though government support plays a lesser role in the case of developed economies, nonetheless it is important for e-commerce adoption and usage by businesses (Brousseau, 2003; Sadowski et al., 2002). One of the biggest barriers for e-commerce adoption and use are the privacy and security concerns of users and businesses (Gibbs et al., 2003; Awad & Krishnan, 2006). These barriers can also be reduced in the presence of a sound institutional environment, where citizens and businesses have confidence that not only their privacy and security are assured but also there are effective institutional measures for redress in the event of a breach. Thus, the presence of a sound institutional environment is a major enabler for e-

Commerce adoption leading to the development of e-Business (Gibbs & Kraemer, 2004). Hence, we hypothesize for the development of e-Business:

Hypothesis 6: The quality of environment in a country is positively associated with the development of its e-Business.

E-government development in a nation exhibits the explicit support of government for the adoption of ICT by its citizens and businesses. Past studies on top management support have shown that technology adoption in organizations is impacted by top management sponsorship (Chatterjee et al. 2002; Teo & Too 2000; Premkumar & King 1992). We also know that governmental activities in the public domain spur similar activities in the business scenario (Cohen et al. 2002). Nations like Singapore which have a high level of government usage of ICT have policies for encouraging citizens and businesses to adopt e-commerce (Srivastava and Teo 2005). Thus, the adoption and usage of Internet as a means for business transactions is dependent on the e-Government development in that nation. This leads to our next hypothesis,

Hypothesis 7: The development of e-Government in a country is positively associated with the development of its e-Business.

Impact of e-Government and e-Business

Previous research has shown that IT may contribute to the improvement of organizational performance (Brynjolfsson and Hitt 1996; Mukhopadhyay et al. 1995; 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, like productivity enhancement, inventory reduction, cost reduction, competitive advantage, etc. (Devaraj and Kohli 2003; Hitt and Brynjolfsson 1996; Melville et al. 2004). 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 (Alpar and Kim 1990; Dewan and Kraemer 2000) by improving the efficiency and effectiveness of the country. 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 (West 2004; UN Report 2004; Kunstelj and Vintar 2004). Business competitiveness 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 (Orlikowski & Iacono, 2001; Melville et al., 2004), we posit that e-Government development in a nation impacts its business competitiveness. This leads to the following hypothesis:

Hypothesis 8: The development of e-Government in a country is positively associated with its business competitiveness.

Research has shown that e-Business and IT improve the performance of firms (Brynjolfsson & Hitt, 1996, 2000; Subramaniam & Shaw, 2002; Melville et al., 2004; Zhu et al., 2004). E-Business enables a large number of firms to transact with each other efficiently and effectively, thus improving the overall performance in which the buyers as well as the suppliers benefit (Dai & Kauffman, 2002; Subramani, 2004). An increase in the performance of individual firms will lead to an increase in the national performance of the business firms in an aggregated way. Greater usage of e-Business and ICT by business firms will help in enhancing the productivity of the nation as a whole, leading to an increase in its business competitiveness (Dutta & Jain, 2005). This leads us to our next hypothesis:

Hypothesis 9: The development of e-Business in a country is positively associated with its business competitiveness.

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

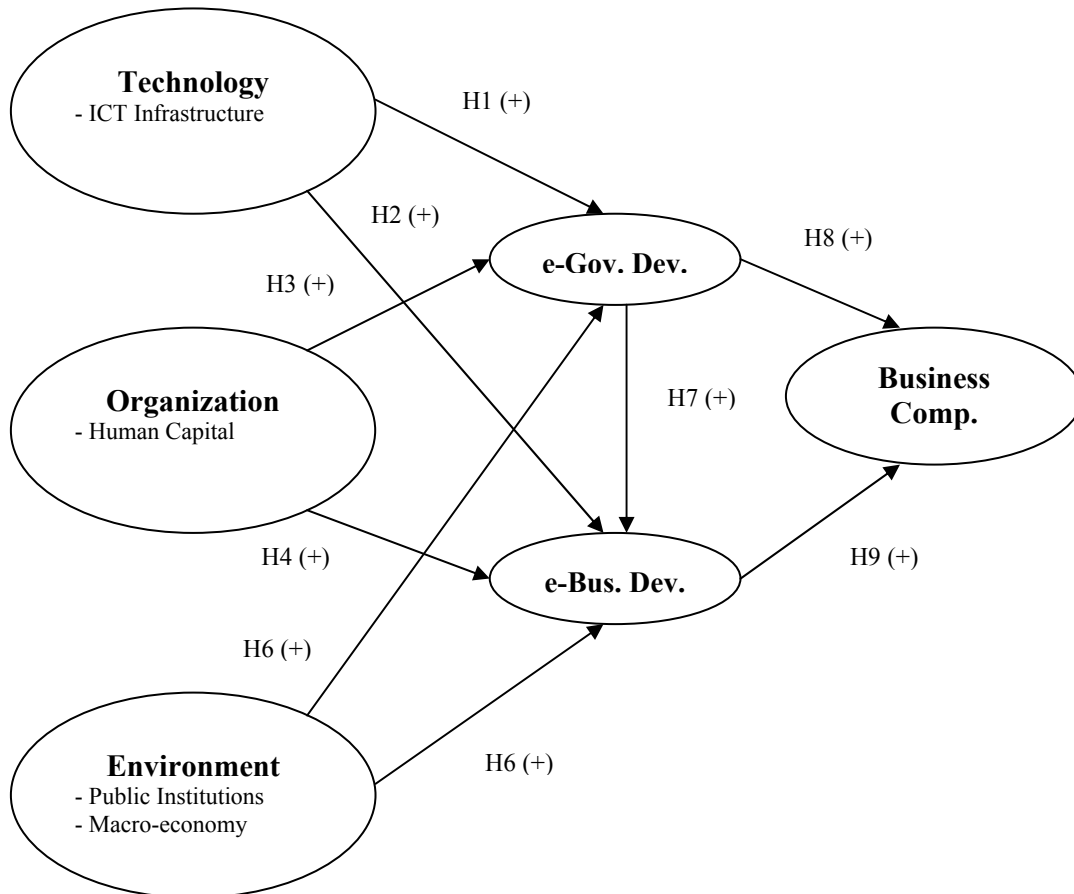


Figure 1. Research Model based on the TOE Framework

Method

Data

For a meaningful testing of hypotheses in this research, we require data from a large number of countries aggregated at the national level. Collecting large-scale, primary data from over 100 countries is constrained by the amount of resources and time available for conducting such a research. Hence, for the purposes of testing our hypotheses, we explored numerous reliable secondary data sources that have been used in past research. Finally, for the purposes of our research, we depended on 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). These were the

two most recent reports available. Though WEF has been publishing a global competitiveness report for a number of years, the 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 from 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, and hence are contemporary and comparable (although the years are different). 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 of these reports, it was essential to consider data for only 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 the United Nations Global e-Government Readiness Reports and the World Economic Forum Global Competitiveness Reports are considered reliable and have been extensively used in past academic research. Data from United Nations Global e-Government Readiness Reports have been used by studies such as Siau and Long (2004, 2006), Srivastava and Teo (2006a, 2006b); data from World Economic Forum Global Competitiveness Report have been used in studies such as Delios and Beamish (1999), Gaur and Lu (2006).

Although secondary data research offers some advantages, such as the ability to analyze large-scale, cross-country data (direct collection of which may be difficult for a small group of researchers), easy reproducibility, etc., it has some limitations. The biggest shortcoming of using secondary data for research is that we have to depend on the information available in the databases, and some constructs may not be direct measures of the intended phenomenon. But considering the fact that secondary data research is an accepted norm in many of the important management disciplines like strategy, finance, international business, etc., and direct collection of large-scale, cross-country data by individual researchers may be unfeasible, we decided to use the above mentioned secondary data sources for our cross-country research.

Constructs, Variables and Measures

As depicted in our research model (Figure 1), there are six constructs in this study: technology, human capital (organization), environment, e-Government development, e-Business development, and national business competitiveness. The technology construct is indicated by ICT infrastructure from the UN e-Government readiness report (UN Report, 2004). The ICT infrastructure has been chosen as it appears to be the most relevant technological resource that may be associated with e-Government and e-Business development in a nation. Organizational context 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 (2004). Measures for e-Business development and business competitiveness 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.

Data Analysis, Results and Discussion

In our study, we employed Partial Least Squares (PLS) (Barclay et al., 1995; Chin, 1998; Wold, 1989). PLS provides the advantage of examining complex theoretical models (having more than one level of theoretical linkages) as is the case in our study (Gefen et al., 2000). In addition to this, PLS imposes minimal demands in terms of sample sizes, measurement scales, and residual distributions to validate a model compared to alternative structural equation modeling techniques (Wold, 1989; Gefen et al., 2000; Mahmood et al., 2004). Another advantage that 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). It also allows for constructs to be modeled as either formative or reflective. Many information systems (IS) studies have found it to be an effective method of analysis (Bock et al., 2005; Subramani, 2003). Moreover, the exploratory theory development stage that e-Government research is currently in makes PLS a suitable choice for analyzing the data in our study.

We tested the proposed hypotheses using PLS. The results of analysis are depicted in Figure 2.

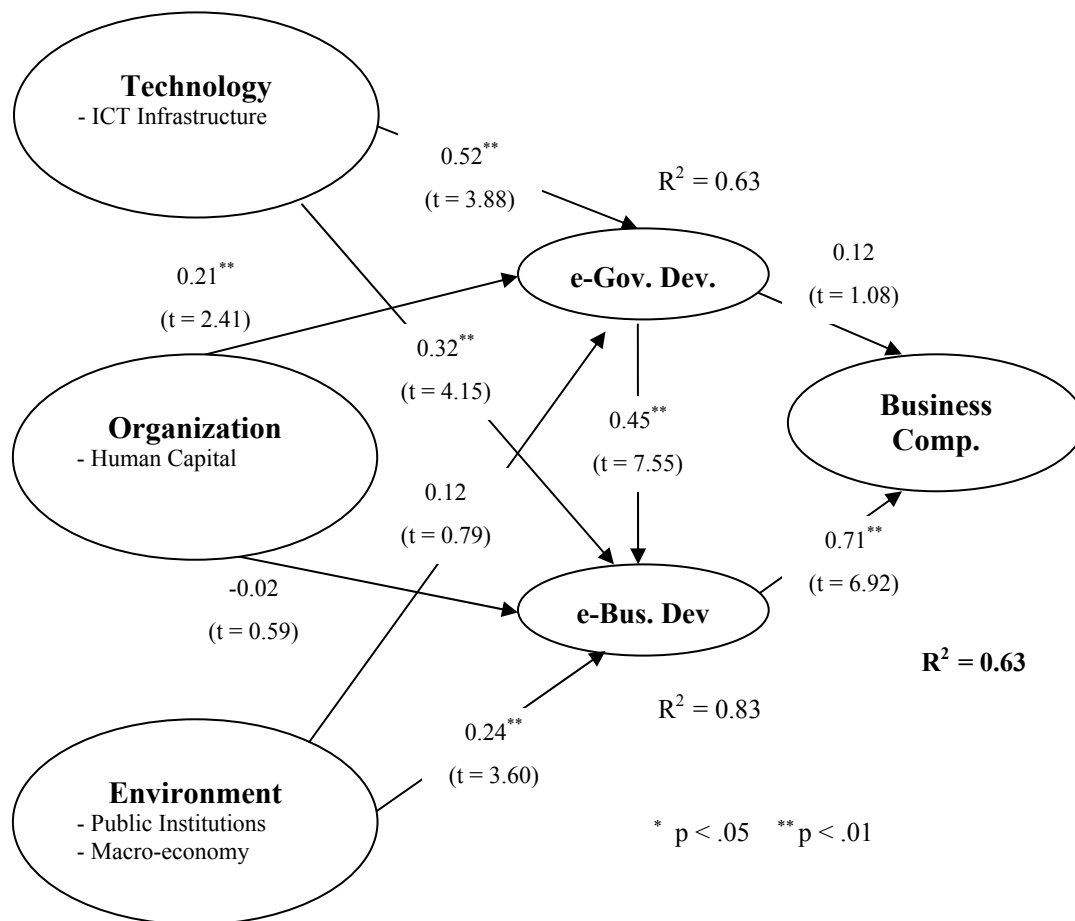


Figure 2. Results of PLS Analysis

From the results, hypotheses 1, 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 = 3.88, p<0.01). Hypothesis 2, which states that technology is positively associated with the e-Business development, also received strong support (path = 0.32, t = 4.15, p<0.01). These results indicate that technology (ICT infrastructure) is vital for the development of e-Government as well as e-Business.

The third hypothesis, which specifies an association between the quality of human capital and e-Government development, is also strongly supported (path = 0.21, t = 2.41, p<0.01). Hypothesis 4, indicating a positive association between the quality of human capital and e-Business development, is not supported (path = -0.02, t = 0.59, ns). This difference between e-Government and e-Business is interesting. One possible 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 other hand, 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 very closely related to the human capital of the nation.

The fifth hypothesis is not supported (path = 0.12, t = 0.79, ns), indicating the minimal role of the quality of national environment in driving e-Government development. The sixth hypothesis, which indicates a positive association

between the quality of the national environment and e-Business development, is strongly supported (path = 0.24, $t = 3.60$, $p < 0.01$), indicating the important role of the national environment for e-Business development. The seventh hypothesis, indicating a positive relationship between e-Government development and e-Business development, received strong support (path = 0.45, $t = 7.55$, $p < 0.01$). This is an important result, because it reiterates the importance of e-Government for the development of e-Business in a nation. This result is in consonance with past research on IS, which have specified the important role of top management support in organizations for IT development and adoption (Chatterjee et al., 2002; Teo & Too, 2000; Premkumar & King, 1992). At the national level, e-Government development is a pointer to the government support for ICT initiatives, leading to a rapid development of e-Business.

The eighth hypothesis, which specifies a positive association of e-Government development with national business competitiveness, is not supported (path = 0.12, $t = 1.08$, ns), whereas the ninth hypothesis, which indicates a positive association of e-Business development with national business competitiveness, is strongly supported (path = 0.71, $t = 6.92$, $p < 0.01$). The positive association of e-Business development with national business competitiveness is consistent with the past studies on IT impact, which indicate that an infusion of IT will lead to an increase in performance (Brynjolfsson & Hitt, 1996, 2000; Subramaniam & Shaw, 2002; Melville et al., 2004). The lack of support for hypothesis 8 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 impacts on different performance metrics (West 2004; Moynihan 2004; Von Haldenwang 2004; Banerjee and Chau 2004). A result indicating non association with national business competitiveness, no doubt raises an important counter intuitive issue which needs further exploration. Though the proposed model explains a significant amount of variance (63.1%) in the national business competitiveness, it leaves this anomaly unresolved. The lack of relationship between e-Government development and national business competitiveness (hypothesis 8) requires deeper understanding and explanation. For understanding this apparent anomaly, we conducted post-hoc analysis, the details of which are given in the next section.

Post hoc Analysis

Exploring the Relationship between E-Government and Business Competitiveness

The findings from the previous section in the hypothesized model (Figure 2) show that the relationship between e-Government development and national business competitiveness is not significant, although the relationship between e-Business development and national business competitiveness is significant. There can be two plausible reasons for this anomalous result: *first*, there is actually no relationship between e-Government development and national business competitiveness or *second*, the impact of e-Government development on national business competitiveness is realized fully through e-Business (since our model has two paths from e-Government development to business competitiveness). Some past studies on IT impact have shown the importance of understanding the process of impact realization through intermediate variables (Barua et al., 1995; Hitt & Brynjolfsson, 1996; Mukhopadhyay et al., 1995; Subramaniam & Shaw, 2002). To analyze this aspect, we did the PLS analysis again without the path from e-Business to business competitiveness, the results of which are shown in Figure 3.

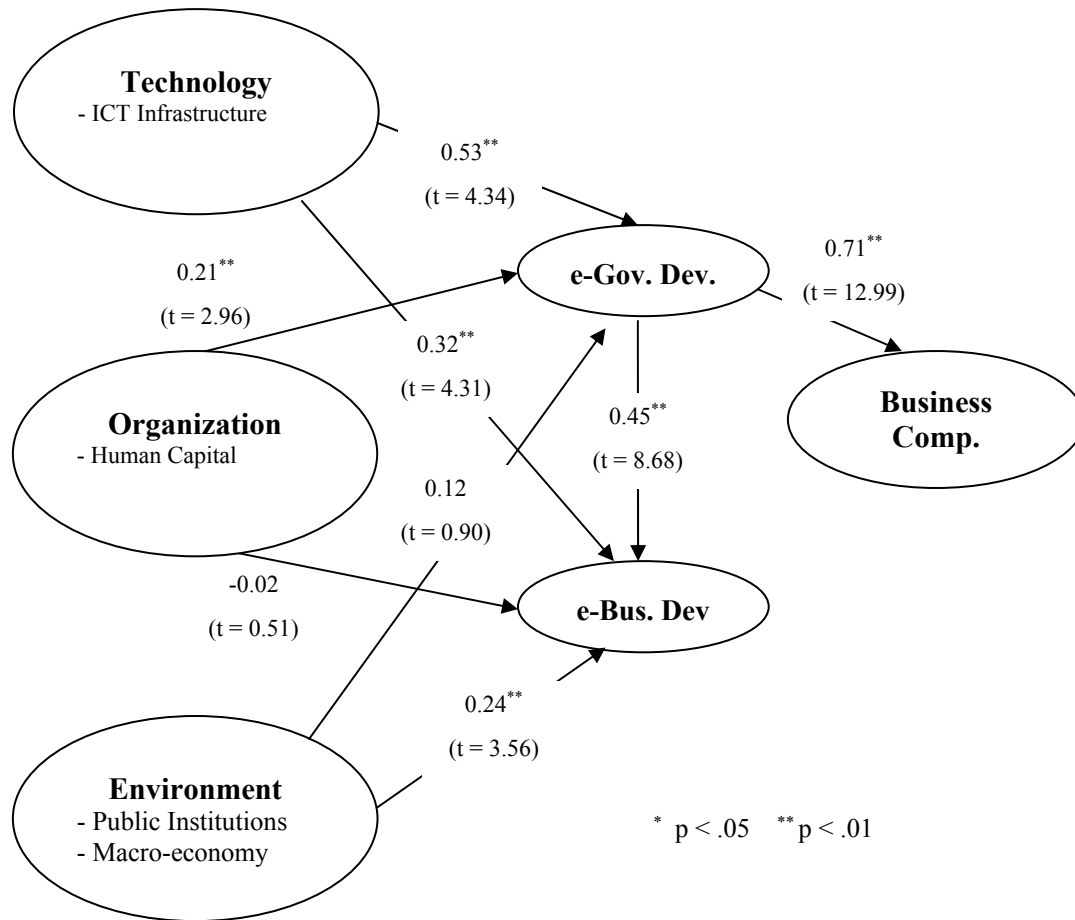


Figure 3. Testing for Mediation: Post Hoc Analysis

From the results in Figure 3, we observe that in the revised model, the path from e-Government development to business competitiveness becomes strongly significant (path = 0.71, t = 12.99, p<0.01). This brings forth a very interesting finding about the relationship between e-Government development and national business competitiveness. In the presence of the path between e-Business and business competitiveness, the path between e-Government development and business competitiveness becomes insignificant (Figure 2). This indicates that the relationship between e-Government development and business competitiveness 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. The result indicates the overarching importance of e-Business development in a nation for realizing the benefits of e-Government initiatives in terms of national business competitiveness.

Contributions and Conclusions

Understanding the facilitators for the development of e-Government and e-Business is vital for the effective implementation and administration of government plans and policies (UN Report, 2004; Von Haldenwang, 2004). E-Government development represents the maturity of the countries' e-Government Web sites in terms of their functionality with reference to the five stages of e-Government evolution: emerging presence, enhanced presence, interactive presence, transactional presence, and networked presence. E-Business development, on the other hand,

represents the maturity of nations' businesses in using the Internet for conducting their transactions. It is equally important for policymakers and businesses to understand the relationship between the two and also their integrated impact on the national business competitiveness. In contrast to most past studies that analyzed various aspects of e-Government and e-Business separately, in this research, we attempt to explore the development and impact of e-Government and e-Business in an integrated fashion. Results show that development and impact of e-Government are related to each other and that the impact of e-Government on national business competitiveness is fully realized through the e-Business development. This result highlights the importance of considering e-Business along with e-Government for fully appreciating their impact on national business competitiveness.

The key limitation of this study is the reliance on secondary data for our analyses. We analyze data only from those countries that were present in our secondary data sources; for example, we could not include countries like Hong Kong and Taiwan in our analyses as data, for these countries were not available in the UN report. Taking into consideration the fact that we have large-scale data from over 100 countries, omitting some of the countries may not make a substantial difference in the results. Despite this potential limitation, our study is one of the first to understand the development and impact of e-Government and e-Business in a cross-country scenario. Moreover, for an analysis such as ours, which aims to analyze data from over 100 countries, we have to depend on established secondary sources of data, as collection of primary data would entail huge amounts of resources.

Through this research, we make some important contributions that have implications for academics as well as practitioners and policymakers. *First*, most studies on e-Government are either conceptual or case studies. There is a dearth of quantitative empirical studies on e-Government (Norris & Moon, 2005). Moreover, there are relatively few studies on e-Government that address issues from a global perspective. Our empirical study, which uses secondary data to analyze e-Government development from a cross-country perspective, fills these gaps in the e-Government literature and makes an important contribution for e-Government research.

Second, there are very few studies analyzing the impact of IT at the country level of analysis (Melville et al., 2003). Moreover, studies analyzing e-commerce in a cross-country scenario are even lesser (Mahmood et al., 2004; Gibbs & Kraemer, 2004). Through this research, by studying the relationship between e-Government and e-Business and their impact on national business competitiveness, we enrich the IT impact and e-commerce literature by analyzing contexts not explicitly explored in the past.

Third, this is the first study that uses the TOE framework in the cross-country perspective for analyzing 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 the organizational context, is applied and tested in a global context.

Fourth, our study suggests that ICT infrastructure is an important prerequisite for the development of both e-Government and e-Business. The quality of human capital emerges as an important facilitator for e-Government development but not for e-Business. National environment is also a significant determinant for the development of e-Business but not for e-Government. These results have important implications for practitioners and policymakers, and give broad guidelines as to what factors are important for developing these two important aspects. The result for e-Business development is in consonance with the past studies (Gibbs & Kraemer, 2004), whereas the results for e-Government development in a cross-country setting is different from the past research that has shown the importance of environment for e-Government development in specific countries (Norris & Moon, 2005; Von Haldenwang, 2004; West, 2004). This anomaly may be due to routine rigidity that is due to well-established and successful public institutions (Gilbert, 2005). Any change in terms of e-Government interaction may not be so easy to implement in such a situation.

Fifth, our analyses (including the post hoc analysis) reveal that both e-Government development and e-Business development are positively associated with national business competitiveness. Further, the results show the process of accruing benefits from e-Government development is through the development of e-Business. The path between e-Government and national business competitiveness is *fully mediated* through the development of e-Business. This is an important contribution to the IT impact literature, as it highlights the importance of considering the entire process of IT impact (including the intermediate processes) even at the national level. Thus, our study extends the IT impact literature highlighting the importance of considering the intermediate variables, which in turn impact the outcome variable not only in the case of the organizational level of analysis but also in a cross-country scenario (Barua et al., 1995; Hitt & Brynjolfsson, 1996; Mukhopadhyay et al., 1995; Subramaniam & Shaw, 2002). Implications for policymakers include the importance of understanding that e-Government by itself will not result in

benefits; rather, efforts toward e-Government are translated to business competitiveness through the development of e-Business. Hence, concerted efforts should be made in both directions.

In this research, we tried to integrate the development and impact of e-Government and e-Business in a nation. Future research can attempt to understand the role of firm-level variables in addition to the country-level variables for the development of e-Business and its consequent relationship with e-Government. Another stream of research can further explore the process of development and impact of e-Government and e-Business in greater depth by identifying the relevant intermediate variables (separately for development and impact). For example, the impact of e-Government on business competitiveness in a nation may be further dependent on certain intermediate *efficiency*-related variables.

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Appendix 1: List of 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, that 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 TVs/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. The data across countries was 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: $\text{Indicator value} = (\text{Actual value} - \text{Minimum value}) / (\text{Maximum value} - \text{Minimum value})$. The survey deemed a far greater significance for the prevalence of PCs, Internet users, telephone lines and on-line population, than mobile phones and TVs. Hence, the Telecommunication Infrastructure Index was calculated based on: $\text{Infrastructure Index} = 1/5 (\text{PC index}) + 1/5 (\text{Internet user index}) + 1/5 (\text{Telephone line index}) + 1/5 (\text{On-line population index}) + 1/10 (\text{Mobile user index}) + 1/10 (\text{TV index})$ (UN Report 2004). This index has been used in past academic studies such as Siau and Long (2004) and Srivastava and Teo (2006b).

Organization (Human Capital)

The construct of human capital is taken from the UN e-Government readiness report (2004) as the Human Capital Index. The data for the Human Capital Index relies 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 two-thirds weight given to adult literacy and one-third to the gross enrolment ratio (UN Report, 2004).

UN Report defines adult literacy as "the percentage of people aged 15 years and above who can, with understanding, both read and write a short simple statement on their everyday life". As per the UN, the combined primary, secondary, and tertiary gross enrollment 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 such as Siau and Long (2004) and Srivastava and Teo (2006b).

Environment

The construct of environment has two indicators taken from the Global Competitiveness Report (2005). The institutional environment is indicated by the Public Institutions Index¹. 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 Index², which uses a mix of hard data as well as survey of executives and indicates the state of macro-economic condition of the 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 indices have been used in past academic studies like Srivastava and Teo (2000a), (2006b).

E-Government Development

The construct of e-Government development is indicated by the Web Measure Index from the UN e-Government readiness report (2004). The Web Measure Index is based on a five-stage model, ascending in nature and building on the previous level of sophistication of a country's online presence. For countries that 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 model³ 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 & Long, 2004, 2006; Srivastava & Teo 2006a, 2006b).

E-Business Development

The construct of e-Business development is indicated by the Extent of Business Internet Use taken from the Global Competitiveness Report 2005. 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 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.

Business Competitiveness

Porter (2005) suggested that "to understand competitiveness the starting point must be the underlying sources of prosperity". The sources of prosperity determine the standard of living, which in turn is related to its productivity. Productivity depends on both: the value of nation's products and services, measured by the prices they can command in open markets, and also the efficiency with which they are produced (Porter, 2005). In this study, we use

¹ The public institutions index = $\frac{1}{2}$ contracts and law sub index + $\frac{1}{2}$ corruption sub index.

² Macro-economic environment index = $\frac{1}{2}$ macro-economic environment stability sub-index + $\frac{1}{4}$ country credit rating + $\frac{1}{4}$ government waste.

³ The full description of the model is available at <http://www.unpan.org/egovernment3.asp>

Porter's productivity paradigm for operationalizing national business competitiveness. The business competitiveness of a nation is an indicator of the micro-economic capabilities of its constituents. Competitiveness is thus related to a nation's standard of living and prosperity (Porter, 2005) and is measured by the GDP per capita adjusted for purchasing power parity, the values for which are taken from Global Competitiveness Report 2005. This has been used as a measure of business competitiveness in past studies like Srivastava and Teo (2006a).

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 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, such as human capital index, ICT infrastructure index, and business competitiveness, rely completely on hard data compiled by the UN; other indices, such as macro-economic index, public institutions index, and e-Government development, emerge from a mix of survey as well as 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 that were given a uniform set of guidelines that 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 (30 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 94 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 were 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, 2005). To minimize chances of perception bias, two techniques were adopted. *Firstly*, 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 were compared with hard data on similar issues.

The UN also followed similar procedures for ensuring validity and reliability for its survey. The most important issue in the case of the UN survey was the training of the 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 wide coverage with reliable and consistent methods (UN Report, 2004). Since the two agencies (namely World Economic Forum and United Nations) followed rigorous procedures, as described above, for ensuring the reliability and validity of the indices, data from these reports were used directly for analyses.

