TELECOMMUNICATION INFRASTRUCTURE, GOVERNANCE, AND E-GOVERNMENT DEVELOPMENT: A GLOBAL PERSPECTIVE

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ABSTRACT

Drawing from the resource complementarity perspective of the resource-based view of a firm; this study examines the complementary role of governance dimensions namely, voice and accountability, political stability, government effectiveness, regulatory quality, rule of law, and control of corruption on the relationship between telecommunication infrastructure in a country and its e-government development. Based on publicly available archival data from 178 countries, our results provided support for the hypothesized model. Specifically, while political stability, government effectiveness, and rule of law moderated the relationship of telecommunication infrastructure with e-government development in the positive direction; voice and accountability, and control of corruption moderated the relationship negatively. Further, the relationship between telecommunication infrastructure and e-government development was not contingent on regulatory quality. Our findings contribute to the theoretical discourse on e-government development by understanding the complementary role of governance, and provide indications to practice on managing e-government development by enhancing governance, thereby leveraging the effect of telecommunication infrastructure on e-government development.

KEYWORDS

Telecommunication infrastructure, governance, e-government maturity, archival data

EXECUTIVE SUMMARY

While a great deal of research has been conducted in recent years on the impact of telecommunication infrastructure and governance in a country on its e-government development, the complementary role of governance (in terms of voice and accountability, political stability, government effectiveness, regulatory quality, rule of law, and control of corruption) on the relationship between telecommunication infrastructure and e-government development remains at best anecdotal and
conjectural. The present study posits that when combined, telecommunication infrastructure in a country along with its governance complement each other to add towards its e-government development. The key question of this study is: “How does a nation’s governance interact with telecommunication infrastructure in enhancing its e-government development?” Motivated by the fact that a majority of extant studies on e-government are “micro” in orientation focusing on “particular region or country,” and predicated by the lack of cumulative theoretical development in e-government research, this study, by drawing from the resource complementarity perspective of the resource-based view of a firm, offers a global (or macro) perspective of 178 countries.

Results of the present study indicate that while political stability, government effectiveness and rule of law moderated the relationship of telecommunication infrastructure with e-government development in the positive direction, voice and accountability, and control of corruption moderated the relationship negatively. Further, the relationship was not contingent on regulatory quality. This study (1) concludes that the impact of telecommunication infrastructure on e-government development are justifiably induced by governance; and (2) recommends the practitioners, policy makers, and public administrators to pay increased attention in managing governance alongside the investments in telecommunication infrastructure.

1. INTRODUCTION

E-Government can be broadly defined as the use of information and communication technologies (ICTs) and the Internet to enhance the access to and delivery of all facets of government services and operations for the benefit of citizens, businesses, employees, and other stakeholders (Srivastava and Teo, 2007). E-government development in a country represents the level of functional sophistication of its e-government websites (UN-Report, 2010). Extant studies indicate that the proposed gains of e-government (e.g., revenue growth and cost reductions) continue to be an “elusive dream” for many governments worldwide despite the massive amount of resources invested in the development process. To illustrate, a study by Heeks (2008), in the context of developing countries, indicated that 35% of e-government initiatives were “total failures” with the initiative being never implemented or immediately abandoned after implementation. Further, the study reported that 50% of e-government initiatives were “partial failures” due to undesirable outcomes. These statistics indicate that despite the multiplicity of motivations and service targets underlying public institutions, successful development of e-government is a challenging task faced by government agencies in most countries.

Motivated by this challenge, several studies (e.g., Siau and Long, 2009) have examined the country-level facilitators of e-government development. Within them, most studies (e.g., Srivastava and Teo, 2010) emphasize sound and reliable telecommunication infrastructure (or information/ICT infrastructure) as a critical determinant of e-government development, which in organizational sense is envisioned as encompassing “all computerized networks, applications and services that citizens can
use to access, create, disseminate and utilize digital information” (Selwyn and Brown 2000, p. 662). While the presence of sound and reliable telecommunication infrastructure in a country is an “enabling environment” for its e-government development (UN-Report, 2008), it may have greater impact in the presence of certain other “enabling factors” (Srivastava and Teo, 2008). Given the fact that “good governance, defined as the collection of processes and institutions that create conditions for ordered rule and collective action (Jessop, 1998), has the potential to contribute to the transformation of the public sector, resulting in greater cost savings, enhanced efficiency and reduced administrative burden” (UN-Report 2008, p. 8), we posit that the effect of telecommunication infrastructure on e-government development would be further strengthened by the complementary role of governance. In sum, the specific research question that we address in this study is “How does a nation’s governance interact with telecommunication infrastructure in enhancing its e-government development?”

The rest of the paper is organized as follows. First, by using the resource complementarity perspective of the resource-based view (RBV) of a firm as the guiding theoretical lens, we explicate the significance of governance as national complementary asset on the relationship between telecommunication infrastructure and e-government development. Thereafter, using secondary data from 178 countries (see Appendix for list of countries), we test the hypothesized model. Subsequently, we discuss the findings and their contributions to the knowledge base in e-government research. Lastly, we highlight the major limitations of our study and offer future research directions.

2. THEORY AND HYPOTHESES

The resource based view of a firm is an influential framework within the field of strategic management, which position firms as specific collection of resources (i.e., tangible and intangible assets and competencies owned or controlled by the firm) that can be deployed to achieve competitive advantage over their competitors (Barney, 1991). Teece (1986) introduced the concept of complementary assets (or resource complementarities), which are resources that allow firms to capture the profits associated with a strategy, technology, or innovation. He suggested that for commercializing the design for a new product in a profitable way, a firm needs access to complementary manufacturing and distribution facilities on favourable terms. Even if other firms can imitate the new product, they will not be able to gain competitive advantage from this imitation if they do not have access to the necessary complementary assets. That is, firm resources are considered complementary when the presence of one resource enhances the value or effect of another resource. This conceptualization of RBV is called as resource copresence view (or interaction perspective). While the concept of resource complementarities were originally proposed to study a firm-level phenomenon (Teece, 1986), several researchers has extended its core arguments to different levels (e.g., country-level) and established its usefulness in different empirical settings (e.g., Srivastava and Teo, 2008). Consistent with them, in this study, we consider six dimensions of governance namely, (1) voice and
accountability; (2) political stability; (3) government effectiveness; (4) regulatory quality; (5) rule of law; and (6) control of corruption, as the national complementary assets that will affect the relationship between telecommunication infrastructure and e-government development (UN-Report, 2008).

The impact of telecommunication infrastructures on the development of e-government in a country can be explained by drawing arguments from neoclassical and new growth theories (Siau and Long, 2009). According to these theories, technological progress and creativity is a critical determinant of growth and development (Lucas, 1988). Extending this argument in the context of e-government development, it is logical to presume that telecommunication infrastructure in a country can contribute towards the development of e-government systems as e-government development needs to utilize the ICTs for delivery of public services (Siau and Long, 2009). This has been supported by several empirical studies such as Srivastava and Teo (2010) and Singh et al. (2007). Having highlighted the impact of telecommunication infrastructure in a country on its e-government development, we now focus our efforts on explaining the criticality of governance in the context of e-government development.

As noted by Meso et al. (2009), the concept of governance is gaining increasing focus as a national-level construct owing to the rapidly growing domain of e-government within ICT research. That is, governance has the potential to influence the kind of information systems (IS) that are getting developed. Madon et al. (2007) established that effective implementation of government-based IS for the provision of services is impacted by the macro-level policy making organs; thereby shaping the type of system that eventually gets implemented. Governance revolves around governmental collective action “to advance the public good by engaging the creative efforts of all segments of society, thereby influencing the strategic actions of the stakeholders” (UN-Report 2008, p. xvi), and includes (1) the process by which governments are selected, monitored and replaced; (2) the capacity of the government to effectively formulate and implement sound policies; and (3) the respect of citizens and the state for the institutions that govern economic and social interactions among them (Kaufmann et al., 1999). Thus, governance is responsible for (1) creating an arena that facilitates the participants in all aspects of the economy to easily evolve, learn and adapt (Meso et al., 2006); and (2) assuring political stability, economic stability, equitable distribution of power and national resources, and an environment conducive to the development of e-government. Kaufmann et al. (1999) proposed six aggregated indices for measuring governance (or good governance) in a country (see Table 1 for description). In this study, we posit that the effect of telecommunication infrastructure on e-government development would be further strengthened by the complementary role of governance (in terms of aforementioned dimensions).
TABLE 1. GOVERNANCE DIMENSIONS AND DESCRIPTION

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Description</th>
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<tbody>
<tr>
<td>Voice and Accountability</td>
<td>Captures the extent to which a country’s citizens are able to participate in selecting their government, as well as freedom of expression and association, and a free media.</td>
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<tr>
<td>Political Stability</td>
<td>Measures the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including domestic violence and terrorism.</td>
</tr>
<tr>
<td>Government Effectiveness</td>
<td>Captures the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.</td>
</tr>
<tr>
<td>Regulatory Quality</td>
<td>Captures the ability of the government to formulate and implement sound policies and regulations that permit and promote development.</td>
</tr>
<tr>
<td>Rule of Law</td>
<td>Captures the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.</td>
</tr>
<tr>
<td>Control of corruption</td>
<td>Captures the extent to which public power is exercised for private gain, as well as &quot;capture&quot; of the state by elites and private interests.</td>
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</table>

An application of the concept of governance as the national complementary asset can explain why only some countries are able to attain high levels of e-government development from telecommunication infrastructure investments. Complementary assets can be defined as assets that are required to attain high levels of e-government development from telecommunication infrastructure. If the investment of telecommunication infrastructure requires good governance, only countries that possess them will be able to attain high levels of e-government development from investing in such infrastructures. That is, governance will moderate the relationship between telecommunication infrastructure and e-government development.

2.1. MODERATING INFLUENCE OF VOICE AND ACCOUNTABILITY

Government in a country will be accountable to the needs and demands of its citizens only when they are clearly articulated (i.e., when their “voice” is effective). In the context of public sector reform, “effective” voice and accountability mechanisms in a country have a potential to transform governmental actions and decisions by (1) demanding appropriate channels for deliberative, participatory decision-making in public policy; and (2) addressing the demand-side aspects of public service delivery, monitoring and accountability. That is, when voice and accountability is effective in a country, the level of sophistication of online public services will progress beyond basic information publishing to transactional and connected service. Further, when combined, a well-developed telecommunication infrastructure along with voice and accountability will complement each other to add towards e-government development in a country. Thus,
we hypothesize: “Voice and accountability positively moderates the relationship between telecommunication infrastructure and e-government development (H1).”

2.2. MODERATING INFLUENCE OF POLITICAL STABILITY

Cukierman et al. (1992) argue that governments in politically unstable and polarized countries are more likely to adopt inefficient or suboptimal policies, which adversely affect long-run economic growth. Such a situation is not only limited to economic development but also can affect social development and ICT-led developments. For instance, Kasigwa et al. (2006, p. 78) indicated that “technological infrastructure and political stability are crucial factors for ICT-led development.” Also, as ICT-led developments such as e-government are a major transformational exercise in change management, strong political leadership and stable political conditions are required for e-government applications (Sudan, 2005). Further, when combined, a well-developed telecommunication infrastructure along with political stability will complement each other to add towards e-government development in a country. Therefore, we posit: “Political stability positively moderates the relationship between telecommunication infrastructure and e-government development (H2).”

2.3. MODERATING INFLUENCE OF GOVERNMENT EFFECTIVENESS

It is a widely acknowledged thought that government in a country can accomplish its economic and social objectives only when it is “effective” in producing and implementing good policies and systems (Kaufmann et al., 1999), and delivering public services online to achieve such objectives. That is, governments will be instrumental in developing e-government initiatives and delivering online public services only when its national institutions are effective and when the quality of public administration is effectual (Kaufmann et al., 1999). Further, when combined, a well-developed telecommunication infrastructure along with government effectiveness will complement each other to add towards e-government development in a country. Thus, we posit: “Government effectiveness positively moderates the relationship between telecommunication infrastructure and e-government development (H3).”

2.4. MODERATING INFLUENCE OF REGULATORY QUALITY

A recent large scale study conducted by the World Economic Forum, indicated that the regulatory environment in a country is a critical determinant that facilitates its ICT-led innovations and investments (Dutta and Mia, 2010). Similarly, Schware (2005) stressed the need for effective (or high quality) regulatory frameworks for the adoption and use of e-applications. Further, he indicated that regulatory reforms establish a positive enabling environment for ICT-led developments in a country. Hence, when the quality of regulatory framework is high, it is more likely that e-government services would progress beyond basic information publishing. Further, when combined, a well-developed telecommunication infrastructure along with regulatory quality will complement each other to add towards e-government development in a country.
Therefore, we posit: “Regulatory quality positively moderates the relationship between telecommunication infrastructure and e-government development (H4).”

2.5. MODERATING INFLUENCE OF RULE OF LAW

Schware (2005) stressed the need for harmonizing the legal frameworks across countries for ensuring the cross-border interoperability of the Internet-based applications. Further, Neto et al. (2005) highlighted that ICT activity (in a country) depends significantly on appropriate legal frameworks (particularly, respect for the “rule of law”). Guermazi and Satola (2005, p. 23) established that “it is critical for countries to adopt enabling legal environments that support e-development.” As legal frameworks and laws provide a range of civil and criminal penalties and enforcement procedures, they are essential to advance the e-government development agenda of a country. Further, when combined, a well-developed telecommunication infrastructure along with rule of law will complement each other to add towards e-government development in a country. Thus, we posit: “Rule of law positively moderates the relationship between telecommunication infrastructure and e-government development (H5).”

2.6. MODERATING INFLUENCE OF CONTROL OF CORRUPTION

Corruption is believed to play a substantial role in explicating growth and development of nations including the implementation and maturity of national e-strategy (Yoon and Chae, 2003). Extant studies have shown that the existence of corruption in a country will hinder the growth of e-government (and other ICT-led developments) and will affect its level of sophistication (or maturity). For instance, Yoon and Chae (2009, p. 34) indicated that “corruption actually lowers the effectiveness of national e-strategy and its implementation.” Kim et al. (2009) suggested that countries should embed effective strategies for fighting corruption in the design of the e-government system and stressed the need for stronger leadership in implementing such systems. In sum, when the level of control of corruption in a country is higher, the level of its e-government development will be higher. Further, when combined, a well-developed telecommunication infrastructure in a country along with control of corruption will complement each other to add towards its e-government development. Therefore, we posit: “Control of corruption positively moderates the relationship between telecommunication infrastructure and e-government development (H6).”

3. RESEARCH DESIGN

To test the hypotheses, we gathered archival data (for each of the main constructs) as it offers several advantages namely, easy reproducibility, ability to generalize the results arising from larger datasets, and robust to the threat of common method bias. Hypotheses were tested via a cross-sectional analysis of 178 countries (see Appendix for list of countries). Due to the varying speed in which telecommunication infrastructure and governance affects e-government development in a country, we lagged the
independent and moderating variables by two years prior to the base-year. Table 2 shows the operationalization of constructs and data sources.

**TABLE 2. CONSTRUCT OPERATIONALIZATION AND DATA SOURCES**

<table>
<thead>
<tr>
<th>Construct</th>
<th>Operationalization</th>
<th>Data Sources</th>
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<tbody>
<tr>
<td><strong>Telecommunication infrastructure</strong></td>
<td>The independent construct, telecommunication infrastructure was measured using the telecommunications infrastructure index. It is a composite of five primary indicators (i.e., PCs/100 persons, Internet users/100 persons, Telephone lines/100 persons, Mobile phones/100 persons, and Broadband/100 persons), computed by assigning 20 percent weight for each variable. The values for this index were obtained from the UN E-Government Survey Report (UN-Report, 2008), and ranged between 0 and 1 (with the higher values corresponding to the higher levels of telecommunication infrastructure).</td>
<td>The values were obtained from the UN E-Government Survey Report (UN-Report, 2008).</td>
</tr>
<tr>
<td><strong>Governance</strong></td>
<td>The moderating construct, governance was operationalized using six aggregated measures of governance (i.e., voice and accountability, political stability, government effectiveness, regulatory quality, rule of law, and control of corruption) as originally presented in Kaufmann et al. (1999). The values were obtained from the Worldwide Governance Indicators Database (for year 2008), and ranged between -2.5 and 2.5 (with the higher values corresponding to the better governance).</td>
<td>The values were obtained from the Worldwide Governance Indicators Database (for year 2008).</td>
</tr>
<tr>
<td><strong>E-government development</strong></td>
<td>The dependent construct, e-government development was measured using the online service index (or web measure index), the values for which were obtained from the UN E-government Survey Report (UN-Report, 2010). This index is an indicator of the sophistication and development of e-government websites of countries, and is based upon the UN's four stage model of online service development (i.e., emerging presence, enhanced presence, transactional presence, and connected presence). The values for this index ranged between 0 and 1, with the higher values corresponding to the higher level of e-government development.</td>
<td>The values were obtained from the UN E-government Survey Report (UN-Report, 2010).</td>
</tr>
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</table>

We controlled for economic condition of a country, human capital and regional differences as they might affect e-government development. First, economic condition was measured in terms of GDP per capita (adjusted for purchasing power parity, PPP), the values (for year 2008) for which were obtained from the International Monetary Fund’s (IMF) World Economic Outlook Database. Second, human capital was measured using the human capital index (previously called as the education index) with a value running between 0 and 1 (with the higher values corresponding to the higher levels of human capital). This index, taken from the UN E-government Survey Report (UN-Report, 2008) is a composite of the adult literacy rate and the combined primary, secondary and tertiary gross enrolment ratio, with two thirds of the weight given to adult literacy and one third to the gross enrolment ratio. Third, regional difference was operationalized as the country-level difference across various regions of the world. Based on UN’s regional groupings, we coded countries into five groups (i.e., Americas (e.g., United States); Europe (e.g., Denmark); Africa (e.g., Congo); Asia (e.g., India); and Oceania (e.g., Australia)).
4. ANALYSIS, RESULTS, AND DISCUSSION

Correlation analysis indicated that the concern for multicollinearity in our model would be minimal as most correlations among variables were below the threshold value of 0.8 (Gujarati and Porter, 2009). Although the correlations between (1) government effectiveness and regulatory quality \((r=0.84)\); and (2) regulatory quality and rule of law \((r=0.82)\), indicate a potential for multicollinearity, our use of robust method of moderated multiple regression to test the hypotheses generally mitigates any undue influences (Hair et al., 2006). Nevertheless, we followed up with the diagnostic statistical collinearity tests that measure variance inflation factor (VIF). The results of these tests revealed that our VIFs ranged from 1.42 to 3.01 (all tolerance levels above 0.33). According to Fox (1991), a VIF of above 4.0, or a tolerance level below 0.25, may indicate the potential for multicollinearity; thus, the concern in our model appeared to be minimal.

We used moderated multiple regression for testing the research hypotheses. We adopted the method recommended by Aiken and West (1991) for examining interactions in regression methods where we first “centered” or “linearly-rescaled” each of the two variables by subtracting the mean from each country’s score for each variable to reduce the effect of multicollinearity between the interacting term and the main effect. All interaction terms were assessed simultaneously so that their effects could be seen in the context of the overall model (i.e., in the presence of other interaction effects) (Kankanhalli et al., 2005). A summary of our results are presented in Table 3.

TABLE 3. REGRESSION RESULTS

<table>
<thead>
<tr>
<th>Variables and Statistics</th>
<th>(\beta^a)</th>
<th>Hypothesis Test</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1: Controls</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Econ Cond(^b)</td>
<td>0.48***</td>
<td></td>
</tr>
<tr>
<td>Hum Cap</td>
<td>0.22</td>
<td></td>
</tr>
<tr>
<td>Reg Diff</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>(R^2)</td>
<td>0.44</td>
<td></td>
</tr>
<tr>
<td>Adjusted (R^2)</td>
<td>0.43</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>46.88***</td>
<td></td>
</tr>
<tr>
<td><strong>Step 2: Main Effects</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tele Infra</td>
<td>0.49***</td>
<td></td>
</tr>
<tr>
<td>Voice and Acct</td>
<td>-0.16</td>
<td></td>
</tr>
<tr>
<td>Pol Stabe</td>
<td>0.23*</td>
<td></td>
</tr>
<tr>
<td>Govt Effect</td>
<td>0.32**</td>
<td></td>
</tr>
<tr>
<td>Reg Qual</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>Rule Law</td>
<td>0.43**</td>
<td></td>
</tr>
<tr>
<td>Corrupt Ctrl</td>
<td>-0.28*</td>
<td></td>
</tr>
<tr>
<td>(R^2)</td>
<td>0.67</td>
<td></td>
</tr>
<tr>
<td>Adjusted (R^2)</td>
<td>0.65</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>33.70***</td>
<td></td>
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</table>
As shown in the above table (step 2), telecommunication infrastructure had a strong positive association with e-government development. This result suggests that when a country’s investment in telecommunication infrastructure increases, it should be able to enhance the maturity of online public services. Further, as shown in the above table (step 2), of the six governance dimensions, only political stability, government effectiveness and rule of law were significantly associated with e-government development in the positive direction. These results suggest that (1) rule of law lies at the crux of ICT-led developmental efforts; (2) a country’s e-government development will reach the stage of maturity only when its national institutions are effective; and (3) for the public sector of a country to transform from a bureaucratic organization to an anticipative and responsive government, its political conditions must be stable.

Turning to the interaction effects (see Table 3, step 3), of six interaction terms, five were significant. Among them, while political stability, government effectiveness and rule of law moderated the relationship of telecommunication infrastructure with e-government development in the positive direction (see Figures 1b, 1c and 1d), voice and accountability, and control of corruption moderated the relationship negatively (see Figures 1a and 1e). These results suggest that rule of law, government effectiveness, and political stability will unambiguously spur innovations leading to higher levels of e-government development.

Figure 1a (1b) shows the cross-over interaction of voice and accountability (political stability) on the relationship between telecommunication infrastructure and e-government development. As shown in the figure, while there was a significant positive relationship between telecommunication infrastructure and e-government development at low (high) levels of voice and accountability (political stability), there was an insignificant positive relationship at high (low) levels of voice and accountability (political...
stability). This interaction contradicts (is in line with) H1 (H2), which suggested that a high voice and accountability (political stability) would be associated with the steeper positive slope. Hence, H1 (H2) is not supported (supported). One possible reason pertaining to the negative effect of voice and accountability could be due to its dual effect. Previous literature suggest that voice and accountability in terms of greater participation, often involving multiple and competing voices, can endanger freedom and rights, impede governability and jeopardize pluralism (Malik and Wagle, 2002). In addition, there is a risk that increased participation may reduce the quality of dialogue, thereby undermining the governance process and delaying the e-government development to reach its maturity level.

Figure 1c (1e) shows the ordinal interaction of government effectiveness (control of corruption) on the relationship of telecommunication infrastructure with e-government development. As shown in the figure, while telecommunication infrastructure strongly predicted e-government development in the positive direction at high (low) levels of government effectiveness (control of corruption), the association was weakly positive at its low (high) levels. This interaction is in line (contradicts) with H3 (H6), which suggested that high government effectiveness (control of corruption) would be associated with the steeper positive slope. Therefore, H3 (H6) is supported (not supported). While the finding pertaining to control of corruption is counterintuitive, previous research has found that corruption could be beneficial. For instance, Egger and Winner (2005) established that for a sample of 73 countries and time period 1995-1999, there is a clear positive relation between corruption and foreign direct investment. This might be due to the fact that corruption can have more than one dimension (e.g., good vs. bad), and a deeper look at our measures on control of corruption reveals that there is no such distinction made by Kauffman et al. (1999) while computing the control of corruption index. Hence, our finding interpreted in light of this reality entail that corruption may act as a lubricant or facilitator for enhancing e-government development process.

FIGURE 1. INTERACTION PLOTS

1a. Influence of Voice and Accountability
1b. Influence of Political Stability
1c. Influence of Government Effectiveness
1d. Influence of Rule of Law
1a. Influence of Control of Corruption

Figure 1d shows the disordinal interaction of rule of law on the relationship between telecommunication infrastructure and e-government development. This plot indicates that the positive relationship of the interaction of telecommunication infrastructure and rule of law on e-government development was exhibited only at high levels of rule of law. In other words, telecommunication infrastructure was more strongly related to e-government development of nations with high levels of rule of law. Hence, H5 is supported.

Finally, the relationship of telecommunication infrastructure with e-government development was not contingent on regulatory quality. This could be due to the fact that the effect of regulatory quality on telecommunication infrastructure and e-government development relationship may have been masked by stronger predictors with which it was correlated. Further, among the three control variables, while economic condition and human capital were significantly associated with e-government development in the positive direction, regional difference had no significant influence.

5. CONCLUSION

Our study makes several important implications. Firstly, our study contributes to the knowledge base of RBV by extending the firm-level argumentation of resource complementarities to the macro-level (i.e., country-level) and by establish its usefulness in the empirical context of e-government development. Secondly, our study also
contributes to the knowledge base of e-government by evaluating the boundary conditions (in terms of the complementary roles of governance dimensions) of the relationship between telecommunication infrastructure and e-government development. Thirdly, our study contribute to the practice (1) by helping practitioners, policy makers, and public administrators to understand why differing levels of e-government development continues to prevail despite the investments in telecommunication infrastructure; and (2) showing them the directions to increase the levels of e-government development by effectively managing the governance dimensions alongside the telecommunication infrastructure investments.

As with any study, a few limitations are worth mentioning at this point. First, we used archival data obtained from different sources (as indicated above). While primary data might have given us a better control over the definition of variables, it is less feasible for a small group of researchers to undertake a large scale cross-country data collection given the limited amount of resources and time. Second, we analyzed data only from the countries commonly available in all the primary sources. For instance, we could not include countries like Cuba, Hong Kong and Taiwan as these countries were not commonly available in all the data sources.

Future research may focus on several directions. First, given the unexpected finding concerning the contingent role of voice and accountability, and control of corruption, future research may consider identifying ways to realize the benefits from them. Second, researchers may consider extending our cross-sectional study to a longitudinal (panel) study (as more data becomes available), which would help to examine the issues of temporal precedence (leads/lags between independent, moderating and dependent variables), as well as the evolution of e-government development as a function of the levels and trends in the independent and moderating variables.

In conclusion, our results indicate that governance contributes towards shaping the influence of telecommunication infrastructure on a nation’s e-government development. In this regard, ICT policies for e-government development need to address and include actions that enhance governance, thereby leveraging the effect of telecommunication infrastructure on e-government development.

REFERENCES


**APPENDIX: COUNTRIES ANALYZED**

<p>| Afghanistan | Albania | Algeria | Angola | Antigua and Barbuda | Argentina | Armenia | Australia | Austria | Azerbaijan | Bahamas | Bahrain | Bangladesh | Barbados | Belarus | Belgium | Belize | Benin | Bhutan | Bolivia | Bosnia and Herzegovina | Botswana | Brazil | Brunei Darussalam | Bulgaria | Burkina Faso | Burundi | Cambodia | Cameroon | Canada | Cape Verde | Central African Republic | Chad | Chile | China | Colombia | Comoros | Congo (Democratic Republic) | Congo, Côte d'Ivoire | Croatia | Cyprus | Czech Republic | Denmark | Djibouti | Dominica | Dominican Republic | Ecuador | Egypt | El Salvador | Equatorial Guinea | Eritrea | Estonia | Ethiopia | Fiji | Finland | France | Gabon | Gambia | Georgia | Germany | Ghana | Greece | Grenada | Guatemala | Guinea | Guinea-Bissau | Guyana | Haiti | Honduras | Hungary | Iceland | India | Indonesia | Iran | Iraq | Ireland | Israel | Italy | Jamaica | Japan | Jordan | Kazakhstan | Kenya | Kuwait | Kyrgyzstan | Laos | Latvia |</p>
<table>
<thead>
<tr>
<th>Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lebanon, Lesotho, Liberia, Libyan Arab Jamahiriya, Lithuania, Luxembourg, Macedonia, Madagascar, Malawi, Malaysia, Maldives, Mali, Malta, Mauritania, Mauritius, Mexico, Moldova, Mongolia, Montenegro, Morocco, Mozambique, Myanmar, Namibia, Nepal, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, Norway, Oman, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Qatar, Romania, Russian Federation, Rwanda, Samoa, Sao Tome and Principe, Saudi Arabia, Senegal, Serbia, Seychelles, Sierra Leone, Singapore, Slovakia, Slovenia, Solomon Islands, South Africa, South Korea, Spain, Sri Lanka, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Sudan, Suriname, Swaziland, Sweden, Switzerland, Syria, Tajikistan, Tanzania, Thailand, Timor-Leste, Togo, Tonga, Trinidad and Tobago, Tunisia, Turkey, Turkmenistan, Uganda, Ukraine, United Arab Emirates, UK US, Uruguay, Uzbekistan, Vanuatu, Venezuela, Viet Nam, Yemen, Zambia, Zimbabwe (N=178).</td>
</tr>
</tbody>
</table>