Original Paper

The role of e-government systems in ensuring government effectiveness and control of corruption

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ABSTRACT

E-government systems are a part of the general process of digital transformation in the public sector: countries with efficient e-government manage to reduce the administrative burden on private citizens and businesses and to improve government performance, transparency and accountability. This article brings to light the connection between the development of e-government systems and such factors as the rule of law and control of corruption. The study relies on a path model, which was built and statistically tested by using linear regression analysis to authenticate the veracity of the model's components. The model uses three indicators adopted from the World Bank's Governance Indicator project – the rule of law, control of corruption, and government effectiveness. The data to measure the e-Government Development Index (EGDI) in fifteen countries was provided by the e-Government 2016 Survey conducted by the United Nations. The findings reveal a positive complementary relationship between the rule of law in a country and the development of an e-government system, which enhances the government's effectiveness. The article describes a shift towards a more citizen-centric e-government implementation strategy, which can be recommended in particular to policy-makers in developing economies. The proposed model can be recommended as a measurement tool to assess effective governance in any given country.

Роль систем электронного правительства в обеспечении эффективности государственного управления и контроля коррупции

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АННОТАЦИЯ

Системы электронного правительства являются частью общего процесса цифровой трансформации в государственном секторе: странам с эффективным электронным правительством удается снизить административную нагрузку на частные лица и предприятия, а также повысить эффективность, прозрачность и подотчетность правительства. Эта статья раскрывает связь между развитием систем электронного правительства и такими факторами, как верховенство закона и борьба с коррупцией. Исследование опирается на модель роста, которая была построена и статистически протестирована с использованием линейного регрессионного анализа для проверки достоверности элементов модели. В модели используются три показателя, рассчитываемые Всемирным банком: верховенство закона, борьба с коррупцией и эффективность правительства. Данные для измерения индекса развития электронного правительства (EGDI) в пятнадцати странах были предоставлены в рамках Обзора электронного правительства 2016 года, проведенного ООН. Полученные данные свидетельствуют о позитивной взаимодополняющей взаимосвязи между верховенством закона в стране и развитием системы электронного правительства, которая повышает эффективность правительства. В статье описывается сдвиг в сторону более ориентированной на граждан стратегии внедрения электронного правительства, которая может быть рекомендована, в частности, лицам, определяющим политику в развивающихся странах. Предложенная модель может быть рекомендована в качестве инструмента оценки эффективности государственного управления в любой стране.

Introduction

Just as technological innovation is aimed at optimizing the business process or the work of enterprises and at giving them a competitive advantage, e-government is aimed at improving the efficiency, effectiveness and transparency of governance and public service delivery [1]. The aim of innovation in the public sector, that is, electronic government (or e-government), is to provide quality public service delivery, reduce stress and bureaucracy in accessing public services, build trust in government and government accountability to its citizens and users [2]. Apart from improving citizens' access to public services and being a transformative tool [3], e-government also makes it possible to promote business to business (B2B) networking, acting as a link between businesses and enabling resource flow and efficient communication [4].

In recent years, e-government research and implementation has transitioned into the phase of citizen-centric or citizen-centered e-government, which seeks to put citizens at the core of these public service innovations [5; 6]. For a long period, most governments have focused on infrastructure provision rather than on satisfying the citizens/users (the main reason why these implementations exist) [7; 8]. That being said, if citizen-centric e-government is fully embraced and implemented effectively, it will enhance user satisfaction and increase government effectiveness.

For e-government to successfully fulfil its purpose in any given environment, the following factors are necessary: citizen satisfaction, security, privacy and trust, support from the government, ICT skills, facilities offered, efficiency, innovative thinking, strategic ICT thinking within government, rule of law, availability of ICT infrastructure and ICT amenities [9; 10].

This study investigates e-government and its influence on government effectiveness by building a model which takes into account certain factors and tests them.

This paper is organized as follows. The next section provides a review of the research literature on this problem. After that, in the methodology section, we are going to describe our research model and postulate the hypotheses we are going to test. Then, we are going to discuss the findings, and the final section concludes and discusses the policy implications of the results.

Literature Review

This study is centered on effective governance, which is achievable when e-government is citizen-centric. A citizen-centric e-government system encourages users to interact more freely and effectively with their governments and thus leads to enhancement of the quality of public services [5]. A citizen-centric e-government involves participation of users/citizens [6] before, during and after the delivery of e-government services. Governments must fully transform from agency-centric to citizen-centric in order for e-government capabilities to be fully realized [11].

Eger & Maggipinto pointed out that e-government does not encompass technology alone but also includes rules and procedures. Thus, their study concludes that "e-government operates under the Rule of Law, protecting general principles such as equality, administrative transparency, rights protection for all citizens" [12, p. 23]. This assertion indicates the significant role played by the rule of law in any successful e-government endeavor. The rule of law is a powerful anti-corruption predictor and e-government has the potential of curbing corruption [13].

When the rule of law is upheld and followed, it leads to development and prosperity. The rule of law contributes to the protection of such core values as human freedom, which, in its turn, fosters an environment for economic development [14]. Socio-economic development policies are at the heart of e-government initiatives [15]. Thus, e-government development and economic development are interdependent. This means that in an environment where the rule of law is supported by institutions, e-government systems can flourish. E-government cannot be successful in chaotic systems (primarily where the rule of law is violated), which can be illustrated by an example of corruption in developing economies, which leads to the failure of e-government projects [16].

Previous studies failed to examine the effect of e-government on government effectiveness. For example, Ifinedo [17] theorized models yet did not provide sufficient evidence to demonstrate the positive influence of the rule of law on e-government growth in transition economies of Central and Eastern Europe. Krishnan & Teo [18] focused on e-government maturity, using the growth model to determine the value of good governance on e-government maturity. Another study [19] focuses on government efficiency and e-government growth.

Our study focuses on another aspect – on the impact of e-government development on effective governance. We are going to address the following research questions:

1. Does the rule of law influence the development of e-government and corruption control?

2. Does e-government development influence corruption control?

3. Does e-government development enhance government effectiveness?

The next section outlines the research model and posits the hypotheses.

Research Model and Hypotheses

To answer the research questions and test the hypotheses, we need to develop a viable methodological framework [20]. Model validation and model development are necessary for research because they enhance our knowledge base and also provide the empirical basis for the construction of a comprehensive theory for further studies [21].

The research model for this study consists of the following components: the rule of law, corruption control, e-government development, and government effectiveness.

Rule of law

According to the World Justice Project, the rule of law is defined by these four universal principles: accountability, just laws, open government, and accessible and impartial distribution of justice[1]. In other words, the strong adherence to formal procedures and requirements is crucial [22]. The factors considered in the Rule of Law Index include: (1) constraints on government powers, (2) absence of corruption, (3) open government, (4) fundamental rights, (5) order and security, (6) regulatory enforcement, (7) civil justice, (8) criminal justice and (9) informal justice. Thus, the rule of law index is considered in this study as a representation of the rule of law in any given country.

Corruption control

Mungiu-Pippidi and Dadašov [23] describe corrupt activities as a result of individual behavior by self-seeking agents (bureaucrats), who abuse their position for personal gains and thereby betray top-level policy-makers' interests. Furthermore, the researchers highlighted the fact that corruption is a function of monopoly power over

a good or service, the discretion to decide who receives it, and the degree of accountability of public authorities [23]. Our study uses the World Bank Group's World Governance Indicator – control of corruption, which captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as exploitation of the state by elites and private interests[2].

As such, anti-corruption policies are used by policy-makers to ensure effective governance. Corruption control is an important component to be included into our model.

E-government development

Research on e-government has investigated monitoring and evaluation of public sector e-services and infrastructure maturity over different periods. Benchmarking of e-government maturity performed by the United Nations[3] is a comprehensive assessment of the distribution of e-government in various governments across all nations. The 2016 UN report highlighted the following key points as factors which determine the development of e-government: the existence of Whole-of-Government Approaches (WGAs), e-participation, open government data or electronic and mobile services. Hence, e-government development requires strong political commitment, government-wide vision, collaborative leadership, as well as appropriate legislation and holistic institutional frameworks[4]. E-government development influences national progress [24].

This study associates e-government development with the UNDESA's e-Government Development Index (EGDI).

Government effectiveness

Government effectiveness encompasses the ability of the government to provide quality public services and its ability to formulate credible and quality policies [25]. Government effectiveness has a positive impact on innovation and so-

cio-economic activities of companies and enterprises, creating perfect conditions for economic prosperity [26].
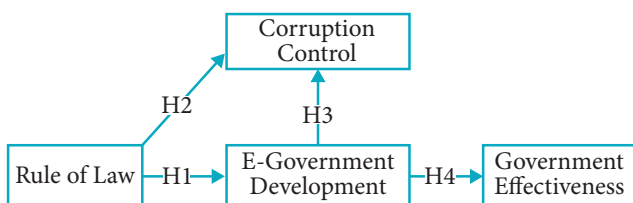

Figure 1. Proposed research model

Figure 1 illustrates the proposed research model. The rule of law influences e-government development and the control of corruption. E-government development has a significant impact on the control of corruption and, most importantly, on government effectiveness.

The next section expounds on the methodology of the study.

Methodology

For the purpose of this study, we used three (3) governance indicators for 2016 from the World Bank's Governance Indicator project – the rule of law, control of corruption, and government effectiveness[5]. The e-Government Development Index (EGDI), the indicator which measures e-government performance country-wise, was derived

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[5] World Bank (2016). *The Worldwide Governance Indicators (WGI) project*. Retrieved from: http://info.worldbank.org/governance/WGI/ (Accessed 10 August 2018)

from the UN's e-Government 2016 Survey [25]. The reason for selecting 2016 was due to the fact that these are the most recent data available for the EGDI indicator on the current state of e-government in all countries.

In selecting the countries for our comparative analysis, we chose three countries from each continent. One country was selected for each of the EGDI ranges: 0–0.39 (low), 0.4–0.59 (medium), and 0.60–1 (high). The countries and their respective indicators are shown in Table 1.

For the purpose of this study and due to the numerical nature of variables, a linear regression analysis was performed on the presented data set in the R programming language. The study explored the relationship between the dependent and independent variables for each scenario (hypothesis) of the model (see Figure 1).

The regression analysis was chosen for this study because it allows us to identify mathematical relationships between dependent and independent variables as well as describe the impact that an independent variable has on a dependent variable [28]. Thus, a simple linear regression analysis was used to verify the association between each interconnected component of the proposed model.

The results were expressed as the quality of the adjusted model called R-squared (R^2). R^2 ranges from 0 to 1 and describes the amount of variation in the response that is explained by the least squares line [29].

Table 1

Countries and selected indicators for 2016

Region	Country	E-government development index	Government effectiveness	Rule of law	Control of corruption
Africa	Mauritius	0.6231	1.0	0.8	0.3
	Ghana	0.4182	–0.2	0	–0.2
	Guinea	0.1226	–1.0	–1.3	–0.9
Americas	USA	0.8420	1.5	1.7	1.3
	Cuba	0.3522	–0.1	–0.4	0.1
	Bolivia	0.4821	–0.6	–1.2	–0.7
Asia	Republic of Korea	0.8915	1.1	1.1	0.4
	Jordan	0.5123	0.1	0.3	0.3
	Pakistan	0.2583	–0.6	–0.8	–0.9
Europe	Finland	0.8817	1.8	2.0	2.3
	Belarus	0.6625	–0.5	–0.8	–0.3
	Albania	0.5331	0	–0.3	–0.4
Oceania	Australia	0.9143	1.6	1.8	1.8
	Papua New Guinea	0.1882	–0.7	–0.8	–0.9
	Samoa	0.4019	0.5	0.8	0.3

Source: World Bank (2016). *The Worldwide Governance Indicators (WGI) project*. Retrieved from: http://info.worldbank.org/governance/WGI/ (Accessed 10 August 2018); United Nations (2016). *United Nations e-government survey 2016: e-government in support of sustainable development*. New York. Retrieved from: http://workspace.unpan.org/sites/Internet/Documents/UN-PAN97453.pdf (Accessed 10 August 2018).

Research Findings

This section presents the results of the analysis performed on the given data (see Table 2) by using the selected linear regression test. In the sub-sections below we describe the results of the relationship test.

Rule of Law and E-Government Development (RoL → EGDI)

First, we tested the following hypothesis:

H1: The presence and effectiveness of the rule of law has a positive and significant effect on e-government development in any country.

Table 2

Regression coefficients on e-government development (EGDI)

Independent Variable	$β$	t	$Pr(>|t|)$	Result
RL.EST	0.05306	3.607	0.00319**	Supported (H1)
	Significance codes: * $p < 0.05$, ** $p < 0.01$; *** $p < 0.001$ Adjusted R-squared: 0.4618			

Rule of Law and Corruption Control (RoL → CoC)

The second hypothesis to be tested was as follows:

H2: The presence and effectiveness of the rule of law has a positive and significant effect on control of corruption in any country.

Table 3

Regression coefficients on corruption control (CC.EST)

Independent Variable	$β$	t	$Pr(>|t|)$	Result
RL.EST	0.1546	3.188	0.00781**	Supported (H2)
	Significance codes: * $p < 0.05$, ** $p < 0.01$; *** $p < 0.001$ Adjusted R-squared: 0.7948			

E-Government Development and Corruption Control (EGDI → CoC)

The third hypothesis looked the following way:

H3: E-Government development (effectiveness and quality of service delivery) has a positive and significant effect on the level of corruption control in any country.

Table 4

Regression coefficients on corruption control (CC.EST)

Independent Variable	$β$	t	$Pr(>|t|)$	Result
EGDI	1.6445	2.544	0.02575*	Supported (H3)
	Significance codes: * $p < 0.05$, ** $p < 0.01$; *** $p < 0.001$ Adjusted R-squared: 0.7948			

As it can be seen from Table 4, the results prove the hypothesis that e-government development has a positive and significant effect on corruption control in any country.

E-Government Development → Government Effectiveness (EGDI → GE)

H4: E-Government development (effectiveness and quality of service delivery) has a positive and significant effect on government effectiveness in any country.

Table 5

Regression coefficients on government effectiveness (GE)

Independent Variable	$β$	t	$Pr(>|t|)$	Result
EGDI		3.795	0.00223**	Supported (H4)
	Significance codes: * $p < 0.05$, ** $p < 0.01$; *** $p < 0.001$ Adjusted R-squared: 0.4891			

As Table 5 illustrates, the results of our analysis prove the hypothesis that e-government development has a positively significant influence on government effectiveness. Our results thus agree with those of the studies referenced in the preceding sections, which assert that e-government contributes to people's trust in the government and the government's accountability (characteristics of an effective government).
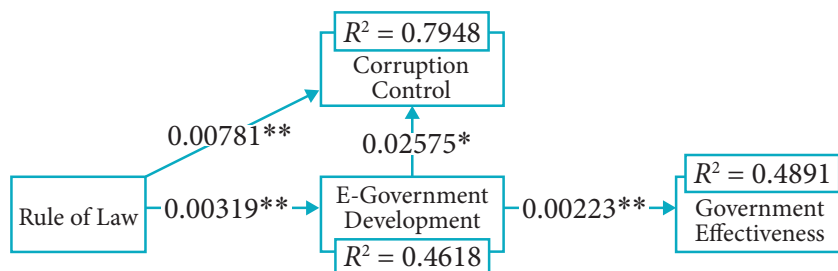

Figure 2. Path diagram of the conceptual model of government effectiveness based on the development of e-government

Our observations agree with the study of Kim [13], who concludes that the rule of law is a fundamental precondition of government effectiveness and an important tool in fighting corruption (see Figure 2).

From the theoretical standpoint, our conceptual model affirms the fact that adherence to the rule of law influences corruption control and e-government development; e-government development, in its turn, influences corruption control and government effectiveness.

Discussion

This study presents e-government as a key factor that shapes government effectiveness. The model we built and the analysis of the available data indicate that the rule of law is significant in controlling corruption and creating room for e-government development. E-government development also significantly influences the control of corruption and enhances government effectiveness.

The results obtained are in line with the study of Diez et al. [29], who found that states which adhere to the rule of law have an enabling environment for e-government to flourish because it encourages e-participation. Following this line of reasoning, it can be concluded that the development of e-government creates transparency in governance and enhances trust among citizenry and, therefore, helps fight corruption [30; 31]. Moreover, our results agree with those of Smith [32], who pointed out that e-government helps the state address vital questions and needs of citizens.

This study's findings contribute to the theoretical discussion of e-government development by highlighting its role in ensuring effective governance. The model is highly recommended as a measurement tool to assess effective governance in any given country. The constituents of the model have proven to be important indicators, thus their combination may be useful for policy-and decision-makers.

Conclusion

The above-described study involved the analysis of selected development indicators (factors) – the rule of law, corruption control, e-government development, and government effectiveness – and the role they play collectively in ensuring government effectiveness (with e-government as the core component). We found that the rule of law together with promotion of e-government systems enhances the efficiency of public services. Thus, creation of a citizen-centric e-government environment becomes one of the crucial tasks for modern states in the digital era.

Just as every research has certain hindering factors, this study is no exception. To begin with, for our model, we used a limited number of factors, so further research is needed to expand the model and test other contributing factors. Moreover, 52 it would be productive to use cross-sectional panel data for different time periods.

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