Impact of National Culture on E-Government Development:
A Longitudinal Study

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ABSTRACT

E-government has become a growth engine for government. Despite splendid progress in information and communication technologies, e-government is developing at a slow pace. This study aims to examine the cultural factors responsible for e-government development. Drawing from customer focus theory and cultural theory, the study explores the relationship between the dimensions of national culture and e-government development. The study uses panel data of e-government development and per capita GDP from 2008 to 2018 of 78 countries to examine the relationship. The result shows that cultural dimensions and per capita GDP are significant predictors of e-government development. Per capita GDP, when examined with cultural dimensions, namely power distance, individualism, uncertainty avoidance, and long-term orientation, shows interactive effects on e-government development. This study contributes to the literature of e-government, the customer focus theory, and cultural theory. The paper also presents the practical implications of findings that are relevant to the policymakers and governments.

KEYWORDS

Culture, E-Government, E-Government Development, Hofstede, Individualism, Longitudinal Study, Long-Term Orientation, Panel Data, Power Distance

INTRODUCTION

E-government has emerged as a powerful medium to connect and deliver services to citizens (Abu-Shanab, 2017; Heeks & Bailur, 2007; Nam, 2019; Sawalha, Al-Jamal, & Abu-Shanab, 2019). Governments are employing several strategies such as the involvement of third-party intermediaries to e-offer their services, reduce the digital divide, and increase the adoption rates of newer technologies (Abunadi & Alqahtan, 2019). Although these strategies could be useful, a citizen-centric approach for designing the services would fetch more appealing outcome which is supported by customer focus theory (Vakeel & Panigrahi, 2018) and cultural theory (Hofstede, 2011).

Customer focus theory (Lohan, Conboy, & Lang, 2011) puts customers at the center stage of the offered services. The theory argues that services which are focused on customers and developed

from their participation are adopted quickly. The adoption is also supported by cultural theory as the development of these services increases rapidly if the designed services are culturally congruent (Bagchi, Hart & Peterson, 2004). Cultural theory (Hofstede, 2011) may explain the intrinsic motivation (see Kumar & Sadarangani, 2018) of people to involve in culturally aligned activities and behavior, including the development of e-government. The United Nations also stressed on adopting citizen-centric and culturally congruent approaches related to e-government for reducing the demand and supply discrepancies in e-services (United Nations, 2016).

E-government development assesses the performance of technology and strategy of a nation that varies across countries (United Nations, 2016; Vakeel & Panigrahi, 2018). The e-government development is associated with several variables, for example, human capital, technological resources, adequacy of infrastructure for service delivery, government willingness to take initiatives, accessible language and content, trust, and culture (Khalil, 2011; Moreno-Enguix, Lorente-Bayona, & Gras-Gil, 2019). Researchers have examined the creation and distribution of culturally related e-government services and culturally congruent policies that are exclusively focused on indigenous people (Bagchi et al., 2004; Erumban & de Jong, 2006; Gong, Li & Stump, 2007; Lallmahomed et al., 2017). However, researchers have paid little attention to provide empirical evidence for establishing relationships between culture and e-government as most of the studies are exploratory or limited to one country context (For example, Lallmahomed et al., 2017; Seng, Jackson, & Philip, 2010; Guijarro, 2007; Twizeyimana & Andersson, 2019). Also, to the best of our knowledge, no work so far has examined the e-government development and culture in a longitudinal design. The longitudinal study may delineate the favorable dimensions which are responsible for growth as effect of a particular factor can be measured across years. Some cultural dimensions may support, whereas others may diminish the e-government development. Therefore, there is a need to understand the impact of culture on e-government encompassing several countries by using longitudinal data. This study is an attempt to fill this gap. This study examines the longitudinal data from 2008 to 2018 to establish the relationship between e-government development and culture. The reason behind countries either leading or lagging in e-government should be discovered and put forward in order to develop firm e-government policies. The study seeks a cultural interpretation and justification of variation in e-government development across countries and attempts to outline the cultural implications for e-government policies.

The contribution of this study is twofold. First, it adds to the body of knowledge of e-government on how culture impacts e-government development. This study supports the development of culturally congruent services along with policies and enhances the theoretical understanding of e-government development. Second, this study contributes to the customer focus theory and cultural theory. The study adopts a citizen-centric view in which citizen acts as a customer when viewed from customer theory perspective and seeks cultural explanations for the development of e-government. This study also outlines the practical implications by analyzing panel data from 2008 to 2018 across 78 countries. This study is first to view e-government development from longitudinal lens to examine the impact of culture. The study outlines as to what extent government and policymakers are required to consider cultural background while designing e-government services.

BACKGROUND

Most researchers define e-government with respect to Information and Communication Technologies (ICT; Wu et al., 2016). For example, Twizeyimana & Andersson (2019) understand e-government as use of all ICTs to improve the operations and structure of government. Although researchers are yet to agree on a common definition of e-government (Sawalha et al., 2019), an inclusive definition of e-government is proposed by Grant & Chau (2005). Scholta et al. (2019) indicated that e-government can be viewed as effort of the government to provide the information and services required by citizens and governments. Whereas Lee et al. (2008) argue that e-government has a critical role in not only providing services to citizens or governments but also renewing the responsibility of governments.

Among the numerous definitions of e-government, the study adopts the definition of e-government given by World Bank for its clear objective and completeness. It defines e-government as government agencies' use of information technologies (for example, Wide Area Networks, the Internet, and mobile computing) that have the ability to transform government relations with citizens (G2C), businesses (G2B), and other arms of government (G2G) (World Bank, 2016).

E-government develops over multiple stages. The different maturity level of e-government gets reflected in the offered services which determine the satisfaction level of citizens (Scholta et al., 2019). United Nation's Department of Economic and Social Affairs (UNDESA) adopted an e-government development framework to measure the performance of the government's initiatives towards e-government across its member's nations. The value, which ranges from 0 to 1, estimated for e-government development for any particular nation is known as e-government development index (United Nations, 2010; 2018).

E-Government Development Index

E-government Development Index (EGDI, hereafter) is an index defined as the aptitude of a government to use Information and Communication Technologies to move its services and activities into the new e-environment (United Nations, 2018; Vakeel & Panigrahi, 2018). EGDI comprises of Online Service Index (OSI, earlier known as web measure index), Telecommunication Infrastructure Index (TII), and Human Capital Index (HCI). The OSI is a quantitative index to estimate the generic aptitude of governments to use e-government as an instrument to inform (Li et al., 2019), communicate, transact, and network (United Nations, 2016). The TII defines ICT infrastructure capacity of a nation (United Nations, 2018). The HCI is the measure of the adult literacy rate, the collective gross enrolment ratio (primary, secondary and tertiary), the expected years of schooling, and the mean years of schooling (United Nations, 2014). To keep pace with the changing environments of technology and governance, the United Nations keeps on altering the mechanism of arriving at the EGDI and its component indexes. For example, the widespread adoption of smartphones has helped people to receive e-services in a faster way (Baishya & Samalia, 2019) which is included as a parameter to measure development in e-government (United Nations, 2010). Table 1 presents the components used in the estimation of EGDI (United Nations, 2008; 2010; 2012; 2014; 2016, 2018).

Development in e-government can be categorized into four phases, which are (1) emerging, (2) enhanced, (3) transactional, and (4) connected (United Nations, 2018). E-government develops from emerging which is the least sophisticated phase to connected phase which is the most sophisticated phase of development (Figure 1). In emerging phase, government is present online by simply offering static information on few web pages without any link to navigate to other web pages. In connected phase, government is present across several medium of ICTs and government is transformed into a web of interconnected and closely knitted entity with integrated infrastructure. Several countries are on different stages of e-government development, which is determined by their culture and manifested by social, political, economic, and technological progress (Scholta et al., 2019). This study focuses on e-government development due to cultural factors.

Customer Focus Theory, Cultural Theory, and E-government

The customer focus theory draws from multiple marketing theories in which customers are put at the center of every action of the organization (Vakeel & Panigrahi, 2018). Customer focus theory focuses on gathering and understanding the requirements of customers, collecting and utilizing their information, assembling their feedback, and improving the relationships (Lohan et al., 2011). In the e-government context, citizens play the role of customers. Governments are tasked to understand the requirements of citizens, develop services, gather feedback, and improve upon the feedback for the betterment of people (Abunadi & Alqahtani, 2019). However, most governments adopt a top-down approach while designing the services and don't encourage participation of people during the design or development phase.

Table 1. Components of e-government development index

Year	Telecommunication Infrastructure Index (TII)	Human Capital Index (HCI)	Online Service Index (OSI)
2008	Internet users (1/5), Fixed-broadband subscriptions (1/5), Personal computer (PC) users (1/5), Fixed-telephone subscriptions (1/5), Mobile-cellular subscriptions (1/5)	Adult literacy (2/3), Gross enrolment ratio (1/3)	Emerging Presence, Enhanced Presence, Interactive Presence, Transactional Presence, Connected Presence
2010	Internet users (1/5), Fixed-broadband subscriptions (1/5), Personal computer (PC) users (1/5), Fixed-telephone subscriptions (1/5), Mobile-cellular subscriptions (1/5)	Adult literacy (2/3), Gross enrolment ratio (1/3)	Emerging Presence, Enhanced Presence, Transactional Presence, Connected Presence
2012	Internet users (1/5), Fixed-broadband subscriptions (1/5), Personal computer (PC) users (1/5), Fixed-telephone subscriptions (1/5), Mobile-cellular subscriptions (1/5)	Adult literacy (2/3), Gross enrolment ratio (1/3)	Emerging Presence, Enhanced Presence, Transactional Presence, Connected Presence
2014, 2016, 2018	Internet users (1/5), Fixed-broadband subscriptions (1/5), Wireless broadband subscriptions (1/5), Fixed-telephone subscriptions (1/5), Mobile-cellular subscriptions (1/5)	Adult literacy (1/3), Gross enrolment ratio (2/9), Expected years of schooling (2/9), Mean years of schooling (2/9)	Emerging Presence, Enhanced Presence, Transactional Presence, Connected Presence
The weight of the parameters is given in brackets.			

Figure 1. Phases in e-government development
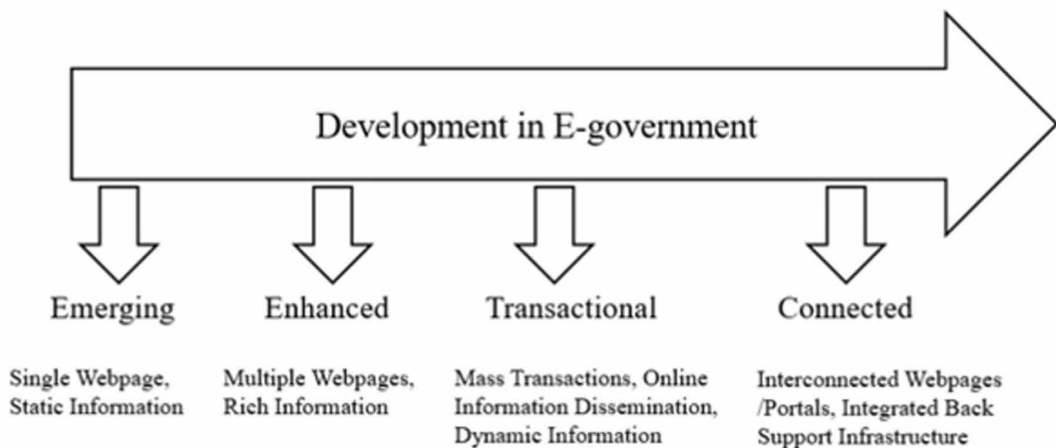
Cultural theory (Hofstede, 2011) explains that high power distance countries usually maintain a hierarchy of relationships and avoid any encounter with authorities, including participation in the design process. These types of services receive poor reception by people and governments put more resources to improve those services, which may lead to corruption (Khan & Krishnan, 2019). Popular e-government services of a country may not work in another country unless they are culturally modified or designed to encourage acceptance by people. Drawing from transaction cost economics theory

(Huo et al., 2018), a collaborative approach between government and people reduces the uncertainty. Also, the participation of people during the development of e-government reduces the ambiguity of ill reception and ensures the development of far better services (Lohan et al., 2011). The participation ensures that people design or choose those services which are culturally congruent. This is supported by cultural theory (Hofstede, 2011), which argues that each nation has a particular set of beliefs. These beliefs shape one's behavior towards an event or action, including the development of e-government. Hofstede (2001) proposed national culture dimensions for each country which design, shape, and groom the behavior of its members.

Hofstede defines culture as "the collective programming of the mind that distinguishes the supporters of one category or group of people from another group" (Hofstede, 2011). The widely held belief, in most of the definitions, is that culture influences and shapes the values among society members. The present study includes the following six dimensions of culture - Power Distance, Individualism, Uncertainty Avoidance, Masculinity, Long-term Orientation, and Indulgence.

There are two-fold reasons for choosing the Hofstede cultural model. First, Hofstede work is most cited work on culture across several domains of literature. To ensure the validity of Hofstede cultural model, Taras, Steel, and Kirkman (2012) conducted a meta-analysis of more than 2000 samples of work from more than 400 journals. The study concluded that Hofstede's cultural dimensions are most comprehensive work and it would remain relevant even after more than 30 years. Second, Hofstede work on culture is available for various countries hence appropriate for establishing statistical relations using panel data. Hofstede assigned a value ranging from 1 to 100 for each of the six cultural dimensions for each country.

National Culture and E-Government Development

Extant literature on e-government has focused more on how technological advancement can be used for development in e-government (for example, Abunadi & Alqahtani, 2019; Moreno-Enguix et al., 2019; Nam, 2019; Sawalha et al., 2019; Twizeyimana & Andersson, 2019), while ignoring the individual participation. Individuals can be encouraged to participate by perception of information possession and by social criteria of collaboration and pro-social conduct (Nica, 2015). Culture fosters the collaboration and pro-social conduct and may influence the perception of people to participate in e-government (Gong et al., 2007). At smaller group level, culture has an impact on the acceptance of e-government (Jackson & Wong, 2014). Although some cultural constraint may diminish the uptake of e-government services in the beginning, these constraints are reduced to minimal in long-run thereby, providing favorable environment for e-government. Once the favourable environment is in place, it influences culture and respond to the world event such as e-government development in its own peculiar fashion (Zhao, 2013). These responses set the cultural identity of a nation which includes history of a nation, dialect, and religious customs among many factors (Bagchi et al., 2004; Gong et al., 2007). These factors profile the culture of a nation that may influence the response to e-government. Majority of previous studies are focused on studying e-government in a specific country such as Europe and Latin America (Seng et al., 2010; Guijarro, 2007), Romania (Hatmanu, Lobont, Albu, & Moldovan, 2014), and Kuwait and Britain (Aladwani, 2013). But very limited works have attempted to go beyond one nation, and understand the impact of culture across several countries (see Hatmanu et al., 2014). This study attempts to fill this research gap.

National culture influences the EGDI as well as its components. For example, to improve the online service index, the government need to develop a portal which is easily accessible by its people. This becomes a challenge in a diverse country such as India where people speak several languages, and their understanding of online portals is limited (Baishya & Samalia, 2019). Such cultural dynamics limit the extent to which online services are offered (Gong et al., 2007). Impact of culture is directly visible in the human capital index. In few collectivistic cultures, people pay more attention to earning livelihood than going to school and improving their human capital. This is very evident among the bottom of the pyramid population (London & Hart, 2010; Prahlad, 2006). The lower attainment of

education level limits the use of technologies such as smartphone or internet, thereby impacting the telecommunication infrastructure index and human capital index (Sawalha et al., 2019). The changes in methodology for estimating the EGDI are highlighted in table 1. The paper argues that these changes are influenced by the national culture of a country.

RESEARCH HYPOTHESIS

Hofstede (2011) suggests researchers to practice national growth variables (for example, GDP per capita) as independent variable to observe the exclusive and profound effect of culture (Bagchi et al., 2004; Gong et al., 2007; Kumar, Giridhar, & Sadarangani, 2019). Following Hofstede's suggestion, the study uses GDP per capita (GDPP) as a control variable.

In high power distance cultures, citizens have high respect for authorities whereas, in low power distance, people seek to equalize the power distribution and ask justification in case of inequalities in power (Hofstede, 2011). People in high power distance societies accept a hierarchical order in which everyone has a place, and they don't seek any justification for it. That's why citizens avoid participation in an open forum debate for social development that involves authorities as a stakeholder, including reception of e-government services. E-government initiatives are perceived as a threat to the established hierarchy (Nkohkwo & Islam, 2013). Therefore, these societies prefer to maintain the status quo and resist e-government initiatives. However, in low power distance societies, people are more favorable to e-government as it does not question the perception of power distribution (Khalil, 2011). Such societies enable citizens to use e-government platform as there is lesser communication barrier based on power issues. Hence, it can be proposed that:

H1: Low power distance positively influences the e-government development.

In an individualistic culture, individuals are considerate about themselves and their immediate families only whereas in collectivistic culture, the individuals' behavior is channeled by group norms. Since citizens of individualistic cultures emphasize personal achievement and productivity (Trompenaars & Hampden-Turner, 1998), they tend to use e-government for effective and fast communication. Bagchi et al. (2004) indicated that individualistic countries tend to perform superior in ICT development and its associated area. It is also evident from the definition of e-government that development of e-government depends heavily on the development of ICT. People of individualistic societies are economically prosperous, have higher purchasing power, and likely to adopt ICTs than individuals from collectivist societies (Bagchi et al., 2004). Therefore, it can be proposed that:

H2: High individualism positively influences the e-government development.

Low uncertainty avoidance cultures have fewer requirements for predictability and rulebook for guidance (Hofstede, 2001; 2011). Higher authorities such as policymakers usually rely on expert opinions given by people having a lower position in the hierarchy, enabling higher participation and thereby acceptance of new initiatives. Low uncertainty avoidance cultures are open to experimentation and adoption of new ICTs (Maitland, & Bauer, 2001). Reduced dependency on rulebook enables people to use different channels of ICT or a combination of channels to complete somewhat similar tasks. Societies with low uncertainty avoidance are likely to be more tolerant of deviant behavior and innovative ideas (Hofstede, 2011). Khalil (2011) argues that ICT flourishes in low uncertainty avoidance cultures as decision makers or governments are ready to take the risk of implementing ICT initiatives. Therefore, it can be proposed that:

H3: Low uncertainty avoidance positively influences the e-government development.

Low masculine or high feminine cultures exhibit modesty, tenderness, and quality of life, whereas high masculine cultures exhibit assertiveness and focus on material success (Hofstede, 2011). Low masculine countries tend to accept ICT development as it improves their quality of life (Bagchi et al., 2004). Although individuals of low masculine cultures clearly draw a boundary between private and workplace sphere, individuals use ICTs to move from one sphere to another (Gong et al., 2007). Sørnes et al., (2004) indicated that one-way ICTs (for example, television) are more prevalent in masculine societies whereas two-way ICTs (for example, e-mail) are more acceptable in feminine cultures. Since development in ICT is directly linked with e-government, it can be proposed that:

H4: Masculinity negatively influences the e-government development.

Long-term orientated cultures believe that today's work will result in a better future, whereas short-term oriented cultures prefer to maintain the old traditions and view societal changes with uncertainty (Hofstede, 2011). ICT has changed the lives of individuals and has altered many time-honored traditions. Long-term oriented cultures adopt futuristic ideas or new initiatives such as ICT from other countries as they believe that these new ideas have the potential to offer a promising future (Khalil, 2011). However, societies with short-term orientation may show an unwillingness to plan to achieve the desired goals. Such cultures find it difficult to adopt the changes brought by ICT adoption since ICT emphasizes long-term planning (Ashkanasy et al., 2004). The increasing number of countries is adopting e-government for a better future (Zhao, 2013). Therefore, it can be proposed that:

H5: Long-term orientation positively influences the e-government development.

High indulgent cultures believe in the free gratification of basic natural and human desire, whereas restraint cultures stand for controlled gratification regulated by strict social norms (Hofstede, 2011). In restraint cultures, usage of ICT is regulated, and fewer people are involved in new initiatives leading to forced acceptance by individuals. In indulgent cultures, individuals consider freedom of speech and communications as an essential part of human desire (Hofstede, 2011), which are mostly accessed through ICTs. ICT enables two-way communications between government and citizens (Bagchi et al., 2004). Indulgent cultures have a comparatively more educated population (Kumar, Giridhar, & Sadarangani, 2019) which foster the adoption and growth of ICTs and ICTs enabled initiatives such as e-government. Therefore, it can be proposed that:

H6: High indulgence in countries positively influences the e-government development.

Controlling the national variable such as per capita GNP or GDP and accessing the effect on culture is a conservative approach, as a strong relationship exists between culture, and social, economic, and political system of a country (Inglehart & Baker, 2000). The empirical cross-sectional study indicates that there is a positive relationship between culture and national economy (Inglehart & Baker, 2000). However, the direction of causality is difficult to determine. To understand the profound effect of culture on technology, previous studies (Bagchi et al., 2004; Gong et al., 2007) suggest controlling the impact of national variable such as GDP. Gross domestic product of a country positively impacts the ICT adoption (Bagchi et al., 2004; Gong et al., 2007). GDP per capita of a country may indicate the investment available for improving the infrastructures for communications and services. Since e-government involves ICT driven activities, it can be proposed that:

H7: High GDP per capita positively influences the e-government development.

Interaction Effects

Husted (2005) and Kumar, Giridhar, & Sadarangani (2019) highlighted the interactive effect of economic development and culture. Hofstede (2001) acknowledges that economic development interacts with the culture at different levels. Economic development has a direct effect on the development of e-government, but an interactive effect of economic development and culture may have a multi-fold effect on e-government development. In this study, first authors have controlled the per capita GDP while analyzing the impact of cultural dimensions on e-government development. Next, to examine the profound impact of per capita GDP on e-government, the authors examined the interaction of per capita GDP and cultural dimensions on e-government. This study also examines the interaction effect of year (time) and per capita GDP on e-government development.

RESEARCH METHOD

The study follows quantitative research methodologies to analyze the panel data. Data for this study is collected from multiple sources. Data for e-government development for 193 countries is collected from the United Nations (United Nations, 2018). United Nations initiated indexing countries on their e-government since 2001 but not at regular interval. To avoid any spurious effects that may be generated due to the non-availability of data at a regular interval, this study performs the analysis of data gathered from the year 2008 to 2018. A decade of e-government development measured across six waves is collected for the year 2008, 2010, 2012, 2014, 2016, and 2018. World Bank (2019) provided data for GDP Per Capita (current US $) for 193 countries for the year 2008, 2010, 2012, 2014, 2016, and 2018. The dataset for Hofstede cultural dimensions is retrieved from the Geert-Hofstede website (Hofstede, 2016). Dataset of 100 countries is available for four cultural dimensions, namely power distance, individualism, masculinity, and uncertainty avoidance. However, data for 84 countries are available for long-term orientation dimension, and dataset of only 78 countries for indulgence dimension. Therefore, the final analysis is performed on strongly balanced dataset of 78 data points across all six years. The list of 78 countries is presented in Appendix A. Hofstede argues that cultural dimensions tend to stay constant over the years and changes very slowly (Hofstede, 2011). Hence, the descriptive statistics of cultural dimensions for a country stay the same across the panel. Table 2 presents the descriptive statistics of all the variables.

The study adopts three steps approach to analyze the panel data. These three analysis approaches are pooled regression, fixed effects model, and random effects model (Baum & Christopher, 2006). Before proceeding to analysis, the authors ensured that data is strongly balanced and comply with the preconditions of panel data analysis as suggested by Bartels (2008) and Drobetz, Grüninger, & Hirschvogl (2010).

RESULTS

In the first stage, pooled regression is performed on panel data (Baum & Christopher, 2006). In model 1, year and GDPP are introduced in pooled regression with EGDI as independent variable. Both year and GDPP are found to be significant (Table 3). This indicates that EGDI varies with year as well as with GDPP, confirming the effect of time and economic growth on dependent variable. In model 2, all six cultural dimensions are introduced to model 1. Results indicate that all cultural dimensions, GDPP, and year are significant. This indicates that culture is significantly related to EGDI. In model 3, interaction terms of per capita GDP and six cultural variables are introduced to model 2. Except for MAS and GDPP#MAS, all variables are significant. This indicates the multilevel impact of GDPP and culture on EGDI. In all the three models, year is always significant confirming that EGDI is dependent on time. This indicates the longitudinal nature of data and panel effect is present. This calls to examine the fixed effects and variable effects models which are applicable to panel data to

Table 2. Descriptive statistics

Year	2008	2010	2012	2014	2016	2018
Per Capita GDP						
N	78	78	78	78	78	78
Min	500	418	565	623	276	426
Max	112851	103267	105447	116613	101449	104103
Mean	21543	20199	21912	22584	20410	21621
Std. dev.	23587	21643	23291	24211	21343	22738
E-Government Development Index						
N	78	78	78	78	78	78
Min	0.154	0.158	0.000	0.180	0.159	0.301
Max	0.915	0.878	0.928	0.946	0.919	0.915
Mean	0.573	0.549	0.615	0.609	0.637	0.687
Std. dev.	0.177	0.166	0.197	0.195	0.189	0.166
Power Distance						
N	78	78	78	78	78	78
Min	18	18	18	18	18	18
Max	100	100	100	100	100	100
Mean	62.83	62.83	62.83	62.83	62.83	62.83
Std. dev.	19.95	19.95	19.95	19.95	19.95	19.95
Individualism						
N	78	78	78	78	78	78
Min	12	12	12	12	12	12
Max	91	91	91	91	91	91
Mean	42.32	42.32	42.32	42.32	42.32	42.32
Std. dev.	22.75	22.75	22.75	22.75	22.75	22.75
Masculinity						
N	78	78	78	78	78	78
Min	5	5	5	5	5	5
Max	100	100	100	100	100	100
Mean	47.94	47.94	47.94	47.94	47.94	47.94
Std. dev.	19.50	19.50	19.50	19.50	19.50	19.50
Uncertainty Avoidance						
N	78	78	78	78	78	78
Min	8	8	8	8	8	8
Max	100	100	100	100	100	100
Mean	65.65	65.65	65.65	65.65	65.65	65.65
Std. dev.	21.10	21.10	21.10	21.10	21.10	21.10
Long-term Orientation						
N	78	78	78	78	78	78
Min	4	4	4	4	4	4
Max	100	100	100	100	100	100
Mean	42.73	42.73	42.73	42.73	42.73	42.73
Std. dev.	23.38	23.38	23.38	23.38	23.38	23.38
Indulgence						
N	78	78	78	78	78	78
Min	0	0	0	0	0	0
Max	100	100	100	100	100	100
Mean	47.54	47.54	47.54	47.54	47.54	47.54
Std. dev.	23.20	23.20	23.20	23.20	23.20	23.20

examine the impact of variables that vary over time. Additionally, the authors performed Breusch-Pagan Lagrange multiplier (LM) test to examine the panel effect in the dataset. LM test result (p=0.000) indicates that there is significant difference across units (Córcoles, Díaz-Mora, Gandoy, 2019). This confirms that panel effect is present in dataset, and pooled regression may not be suitable. Therefore, fixed effects or random effects are to be employed in the further stages of analysis (Jensen, 2007).

In the second stage, fixed effects model is analyzed. Fixed effects model explores the relationship between dependent and independent variable by assuming the correlation between error term and predictor variables (Córcoles et al., 2019). In model 1, year and GDPP are introduced as independent variable and EGDI as dependent variable. Both variables are found to be significant (Table 3). This indicates that EGDI is related to time and economic growth. In model 2, cultural variables are introduced to model 1. The fixed effects model resulted in zero coefficients for all six cultural variables along with omitted standard errors (Table 3). This can be explained as fixed effects remove the impact of time-invariant characteristics to present the profound effect of independent variables on dependent variable (Bartels, 2008). The dataset used in this study consists of cultural dimensions which tend to stay constant over time (Hofstede, 2011). In such conditions, fixed effects model is not suitable as all the cultural variables are removed during the fixed effects analysis (Córcoles et al., 2019). Therefore, authors proceed to next panel data analysis technique using random effects model. Additionally, to decide between fixed and random effects, Hausman test is performed (Bartels, 2006). The test result (p=0.000) suggests using random effects model for the dataset.

In the third stage, the random effects model is analyzed. Unlike in fixed effects model, in random effects, model variation across data is assumed to be random and uncorrelated with independent variables (Gelman & Hill, 2012). Random effects model is best suitable to dataset having differences across dataset that influence dependent variable and suitable to include time invariant variables such as culture (Baum & Christopher, 2006). Inferences from random effects model can be generalized beyond sample i.e., to other countries (Jensen, 2007).

The generalized random effects model is represented as:

$$Y_{it} = \alpha_i + \beta_i X_{it} + \mathcal{E}_i + \mathcal{E}_t + \mu_{it} \tag{1}$$

Where, Y_{it} is the dependent variable; α_i is the intercept; β_i is the coefficient of independent variables; X_{it} represents independent variables; $\mathcal{E}_i$ and $\mathcal{E}_t$ are within-entity error; μ_{it} is between-entity error; i = 1…n; and t = time.

EGDI can be represented as function of dependent variables. For the given panel dataset, the dependent variable in random effects model can be represented as:

$$EGDI_{it} = \alpha_i + \beta_i PD_{it} + \beta_i INDV_{it} + \beta_i MAS_{it} + \beta_i UA_{it} + \beta_i LTO_{it} + \beta_i INDL_{it} + \beta_i GDPP_{it} + \mathcal{E}_i + \mathcal{E}_t + \mu_{it} \tag{2}$$

Where, $EGDI_{it}$ is the estimated dependent variable which can take the values from 0 to 1. $\beta_i X_{it}$, (X = PD, INDV, MAS, UA, LTO, INDL, GDPP) represents a vector that includes the explanatory variables related to culture and per capita GDP. β_i ($\beta_i = \beta1, \beta2, …, \beta_{78}$) is the vector of their associated coefficients. $\mathcal{E}_i$ denotes the error term that controls for the countries' time-invariant fixed effects. $\mathcal{E}_t$ denotes the error term that controls for year-fixed effects. μ_{it} is the independent between entity error term, of mean 0 and constant variance ($\mu \sim N(0, \sigma2)$). Since cultural dimensions tend to stay constant over years, their time-invariant nature can be represented as follows:

$$EGDI_{it} = \alpha_i + \beta_i PD_i + \beta_i INDV_i + \beta_i MAS_i + \beta_i UA_i + \beta_i LTO_i + \beta_i INDL_i + \beta_i GDPP_{it} + \mathcal{E}_i + \mathcal{E}_t + \mu_{it} \tag{3}$$

The results of random effects models are presented in Table 4.

Table 3. Results of pooled regression and fixed effects models

	Pooled Regression			Fixed Effects	
	Model 1	**Model 2**	**Model 3**	**Model 1**	**Model 2**
Year	0.0232***(0.0033)	0.0234***(0.0027)	0.0227***(0.0023)	0.0232***(0.0014)	0.0232***(0.0014)
GDPP	0.005***(0.0002)	0.003***(0.0003)	0.011***(0.0018)	0.0055***(0.0055)	0.0055***(0.0007)
PD		-0.0007*(0.0003)	-0.0018***(0.0004)		0(omitted)
INDV		0.0020***(0.0003)	0.0026***(0.0004)		0(omitted)
MAS		-0.0006*(0.0002)	-0.0003(0.0003)		0(omitted)
UA		0.0013***(0.0002)	0.0024***(0.0003)		0(omitted)
LTO		0.0026***(0.0002)	0.0039***(0.0003)		0(omitted)
INDL		0.0014***(0.0002)	0.0017***(0.0002)		0(omitted)
GDPP # PD			0.007***(0.0016)		
GDPP # INDV			-0.006***(0.0016)		
GDPP # MAS			0.0006(0.0009)		
GDPP # UA			-0.005***(0.0011)		
GDPP # LTO			-0.008***(0.0010)		
GDPP # INDL			-0.0002(0.0018)		
R^2	0.558	0.704	0.794	0.513	0.558
Prob > F	0.000	0.000	0.000	0.000	0.000
Observation	468	468	468	468	468
Number of Countries	78	78	78	78	78

Notes: # Indicates interaction terms. Values in the table represent the coefficients. Standard errors are shown in parenthesis. GDPP = per capita GDP, PD= Power Distance, INDV= Individualism, MAS = Masculinity, UA = Uncertainty Avoidance, LTO = Long-term Avoidance, INDL = Indulgence. *p<0.05; **p<0.01; ***p<0.001

DISCUSSION

The findings indicate that national culture impacts the e-government development. In addition, per capita GDP is a significant predictor of the e-government development. This is evident in the result of model 1 (refer to table 4), which supports hypothesis H7. Results of model 2 (table 4) indicate that GDPP, INDV, , and LTO are significant supporting hypothesis H2, H5, and H7. This indicates that culture is a significant predictor of e-government development. Individualistic countries focus on the growth of individual capabilities, including acquaintance with new initiatives such as e-government, thereby, supports the development of e-government. Countries with long-term orientation tend to adopt newer technologies, including e-government to reap future benefits, thereby, supports the growth of e-government. Contrary to our hypothesis H3, we found a positive effect of high uncertainty avoidance on e-government development. This finding does not reflect the assumptions and findings of researchers who suggest that countries with low uncertainty avoidance tend to embrace technological innovations or e-government than the countries with high uncertainty avoidance (Erumban & de Jong, 2006; Hofstede, 2001). This finding is supported by previous studies (e.g. Zhao, 2013). This may be because of the reason that uncertainty avoidance countries tend to avoid uncertain situations by embracing policies which reduce the uncertainty in society by following rules and regulations. Development of new initiatives such as e-government is strictly based on rulebook and set guidelines which are characteristics of high uncertainty avoidance countries. Results of model 3 indicate that except MAS, GDPP#MAS and GDPP#INDL, all variables are found to be significant predictor of

Table 4. Results of random effects models

	Random Effects				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
GDPP	0.0057***(0.0004)	0.0043***(0.0005)	0.011***(0.0037)	0.011***(0.0034)	0.011***(0.0034)
PD		-0.0002(0.0008)	-0.0020*(0.0009)	-0.0021*(0.0009)	-0.0021*(0.0009)
INDV		0.0016*(0.0007)	0.0030**(0.0009)	0.0033***(0.0009)	0.0035***(0.0009)
MAS		-0.0005(0.0005)	0.00003(0.0007)	-0.0001(0.0006)	-0.0001(0.0006)
UA		0.0014**(0.0005)	0.0023***(0.0006)	0.0023***(0.0006)	0.0023***(0.0006)
LTO		0.0022***(0.0005)	0.0037***(0.0006)	0.0037***(0.0006)	0.0038***(0.0006)
INDL		0.001(0.0005)	0.0016**(0.0005)	0.0016**(0.0005)	0.0017**(0.0005)
GDPP#PD			0.008**(0.0033)	0.008**(0.0031)	0.0085**(0.0031)
GDPP#INDV			-0.008**(0.0031)	-0.009***(0.0028)	-0.0102***(0.0028)
GDPP#MAS			-0.007(0.0019)	-0.0007(0.0017)	-0.0003(0.0017)
GDPP#UA			-0.005*(0.0023)	-0.0057**(0.0021)	-0.0058**(0.0021)
GDPP#LTO			-0.008***(0.0021)	-0.008***(0.0019)	-0.0084***(0.0019)
GDPP#INDL			0.0001(0.0036)	0.001(0.0032)	0.0016(0.0032)
Year2008				-0.11***(0.0074)	-0.131***(0.0099)
Year2010				-0.11***(0.0074)	-0.144***(0.0100)
Year2012				-0.073***(0.0074)	-0.098***(0.0100)
Year2014				-0.08***(0.0074)	-0.105***(0.0100)
Year2016				-0.049***(0.0074)	-0.069***(0.0101)
Year2008#GDPP					0.0011***(0.0003)
Year2010#GDPP					0.0005(0.0003)
Year2012#GDPP					0.0011***(0.0003)
Year2014#GDPP					0.0011***(0.0003)
Year2016#GDPP					0.0009**(0.0003)
R^2	0.558	0.695	0.747	0.797	0.798
Prob > F	0.000	0.000	0.000	0.000	0.000
Observation	468	468	468	468	468
Number of Countries	78	78	78	78	78

Notes: # Indicates interaction term. Values in the table represent the coefficients. Standard errors are shown in parenthesis. GDPP = per capita GDP, PD= Power Distance, INDV= Individualism, MAS = Masculinity, UA = Uncertainty Avoidance, LTO = Long-t erm Avoidance, INDL = Indulgence. *p<0.05; **p<0.01; ***p<0.001

e-government development. This supports that GDPP interacts with cultural variables at multiple levels and supports e-government development. The non-significant relationship of masculinity and e-government development is supported by Kovacic (2005) and Zhao (2013).

Results of model 3 (table 4) indicate four inverse relationships between direct effects (supporting hypothesis H1, H2, H3, H5, H6, and H7) and interaction effects. First, PD shows a direct negative relationship with EGDI, but GDPP#PD shows a positive relationship with EGDI. High power distance countries tend to avoid any discussion with authorities, including the development of e-government, which involves engagement with public authorities. However, interaction term of GDPP and PD suggests that as the economic strength of a country grows, its citizens perceive that their power position is similar to that of public authorities. People don't believe in the power hierarchy anymore, which

supports the engagement of people with authorities in new initiatives and foster the development of e-government. Second, INDV shows a positive relationship with EGDI, but GDPP#INDV shows a negative relationship with EGDI. Individualistic countries focus more on individual capability development, including technological skill development, which supports the e-government development. However, interaction term of GDPP and INDV indicates that as individualistic countries get wealthier, they tend to focus more on the gratification of self than capability building. This marks the reduction in human capital, thereby, impacting e-government development. Lastly, UA and LTO show direct positive associations with EGDI, but GDPP#UA and GDPP#LTO show negative relationships with EGDI. Countries with UA and LTO invest in e-government policies and infrastructure to avoid unstructured situations and realize the future benefits of the policies and infrastructures. This supports the positive association of UA and LTO with EGDI. However, the interaction terms of UA and LTO indicate that as economic strength increases, citizens of countries tend to avoid following the policies and regulations which were designed to avoid uncertain situations and attain long-term benefits. They tend to believe that economic prosperity may offer them to design their environment as per their wish, which avoids the appearance of any uncertain situations. This avoidance includes the failure to comply with e-government policies and results in the reduction of e-government development.

In summary, Individualism, uncertainty avoidance, long-term orientation, and Indulgence have a direct positive effect, and power distance has a direct negative on the EGDI. The negative coefficients of interaction terms represent that positive direct effects are minimized at a higher level of per capita GDP and vice-versa. This indicates that as countries become more prosperous, their growth rate of e-government development diminishes when compared to their early stages of the rate of growth in e-government development. Result of model 3 in table 4 shows a positive relationship between INDL and EGDI. This indicates that countries high on indulgence believe that accessing and availing e-government services are fundamental to human gratification. High indulgent countries believe in the gratification of fundamental and natural human desires related to enjoying life and having fun, including availing to services whenever they want, which is fundamental to e-government development. However, the interaction of GDPP and INDL is not significant, suggesting economic growth in indulgent societies is not related to development in e-government. Results of model 4 (table 4), indicate that along with existing significant relationships, all dummy time variables are significant. This suggests that e-government development is dependent on time. The negative sign of coefficients represents a gradual development in the e-government with time. The coefficients indicate that with time the development in e-government is reaching a plateau where the rate of growth in e-government is diminishing per year. Results of model 5 (table 4), indicate that except for interaction term Year 2010#GDPP, all introduced interaction variables are significant. The positive sign of the interaction terms indicates that time and GDPP are interacting with each other to contribute towards development in e-government.

GDP per capita is the main driver for e-government development majority of the variance in e-government development is explained by GDP per capita. GDP per capita of a country indicates the investment available for improving the infrastructures for information and communication technologies, thereby, supports the development of infrastructure for e-government. Developed countries having a greater GDP per capita have greater resources for new initiatives, for example, e-government. In contrast, developing countries with smaller GDP per capita invest the majority of their resources in fulfilling the basic requirements of their citizens. Further, results show that nations favoring individualism are more inclined to e-government development. Individualism tends to prevail in developed nations while collectivism prevails in developing nations. In addition, the development of e-government is faster in countries with LTO and UA. Countries such as South Korea, Japan, Germany, and China exhibit long-term orientation. Cultures favoring LTO adapts to new situations easily and expect to get a long-term gain. These cultures adopt the e-government as they understand the benefits that the e-government brings to them in the long-term. Countries such as Portugal, Uruguay,

and Malta have high uncertainty avoidance and exhibit higher development in e-government. High PD countries tend to slow the e-government development, and such initiatives are more favored in low power distance countries. Countries such as Denmark, New Zealand, Ireland, and Norway are lowest in power distance and display profound e-government development. Indulgence is found to be significantly related to e-government development. Countries favoring indulgence tend to show free gratification of basic desire and a high level of happiness. These countries are more willing to take up e-government initiatives as they consider e-government a basic desire. E-government development increases their level of satisfaction and happiness. High INDL countries such as UK, Australia, and New Zealand display significant progress in e-government development.

IMPLICATIONS

Theoretical Contributions

There are multiple theoretical implications of the results. The study contributes to consumer focus theory and cultural theory. Although the concept of customer focus has been researched in multiple domains such as marketing (for example, Kumar & Sadarangani, 2019; Kumar, Venkatesan, & Reinartz, 2008) and manufacturing (for example, Sousa, 2003), it has not been sufficiently addressed in information system domain (Lohan et al., 2011). This study fills this gap by adopting a different viewpoint in which citizens are considered customers. By treating citizens as customers, organizations, and institutions, including governments, may develop facilities from citizens' perspective and help them faster gratification of their needs. Information is the most important need for citizens which can be fulfilled through effective use of ICTs and by reducing the digital divide. Customer focus theory suggests not only to understand and work on citizens' requirement, their information, feedback, and relationship but also to focus on their identity, personality, location, and previous experiences (Lohan et al., 2011). Through this study, the authors extend the customer focus theory to the domain of e-government.

Through this study, authors also contribute to cultural theory. The identities, personalities, and previous experiences of people are shaped by the culture of that society. Hofstede (2011) cultural theory has found to be useful in explaining the adoption of ICTs in different countries. This study extends the cultural theory to the e-government domain and explains the development of e-government from a cultural viewpoint. While developing e-government, governments usually adopt a top-down approach. This means if one e-government service is popular in one country; other governments directly copy and implement that service. However, these services may not receive a warm reception by people that are implemented through a top-down approach unless these services are modified to include cultural elements. The success of such projects depends heavily on the cultural component included during the implementation process. Countries have varying cultures which require careful inclusion of cultural elements in the e-government projects.

This study also contributes to the knowledge body of e-government. Almost no study so far has examined the panel data to understand the e-government development across multiple countries. Extant as well as the contemporary studies have focused more on examining the role of technology, economic progress, and development in ICTs (Bagchi et al, 2004; Sawalha et al., 2019) which is supplier side view rather than adopting a buyer or citizen-centric approach and focusing of variables which determines the development of e-government. This study acknowledges that few countries are approaching a growth plateau, whereas some countries are showing a steep growth in e-government development. Through this study, authors delineate the importance of culture on e-government development and how public authorities can use the findings for robust growth in e-government development.

Practical Implications

There are several public policy implications of this study. Public authorities and policymakers who are attempting to build a citizen-oriented environment should seek to clearly identify their customers and their role in the e-government projects. One role could be to act as a participant in e-government projects during the design phase. In e-government, while the choice of the customer may not be within the control of policymakers, they should understand that different customer personalities and abilities may impact the customer focus differently. Segmentation of customers based on personalities, identity, location, or previous experiences (Lohan et al., 2011) will help to build far more efficient e-services. This may allow the authorities and policymakers to understand their citizens and manage their expectations effectively.

By understanding the Hofstede (2001) cultural dimensions, public authorities, and policymakers may design services which are aligned to the culture of that place. This calls for customization in services which are increasingly seen in newer e-government projects. For example, Government of India has launched a mobile application UMANG (Unified Mobile Application for New-Age Governance) which integrates more than 200 applications and around 1200 services from federal, states, and local bodies in more than 13 languages covering several cultural aspects (Dubey, 2019). This application also supports participation from people and welcomes their feedback by using ewom (see, Kumar & Purbey, 2018). The application is culturally designed that encourages citizens to participate in the design process, provide feedback, and use the offered services. Designing a multilingual portal is one such approach for developing culturally aligned service.

As one understands that cultural dimension tends to stay stable over time, one can't manipulate in order to achieve some policy objective. However, policymakers can certainly take account of the favoring cultural dimensions for the country which the authors have identified in this study while designing policies so that program is successfully implemented. For example, e-government educational programs in collectivistic nations must represent e-government as a support to the community. People of collectivistic nations must be shown how e-government helps to alleviate the level of community.

CONCLUSION

The e-government intends to provide values to people by employing several mechanisms, including the development of services and third party involvement. However, an important challenge in delivering the values is to look beyond the normative functioning of e-government to restructure the implicit and explicit value propositions that are being offered to people (Scholta et al., 2019). This can be achieved by understanding the requirements of people as suggested in customer focus theory (Lohan et al., 2011; Vakeel & Panigrahi, 2018). The study also draws from cultural theory (Hofstede, 2011), which argues that individual assesses the offered values which are governed by an individual's beliefs and values shaped by the culture of that context. The culture grooms the individual's interests, positions, personalities, and another social context that is responsible for the development of any new initiatives such as e-government. This study attempts to understand the relationship between culture and e-government development.

This study delineates the impact of cultural dimensions on e-government by analyzing panel data. The dataset has measures of cultural dimensions, per capita GDP, and e-government development from the year 2008 to 2018 for 78 countries. Using a random effects model, the authors found that culture is significantly impacting the e-government development. The cultural dimensions of individualism, long- term orientation, and uncertainty avoidance are directly related to e-government development. Per capita GDP significantly impact the e-government development. The study also indicates the multi-level impact of the interaction of GDP and cultural dimensions. Power distance, individualism, uncertainty avoidance, and long-term orientation exhibit significant multi-level interaction effects on e-government development. The study concludes that national culture greatly influences the

e-government development in a country. Policymakers can understand the nuances inherent in culture and design policies to reach their objective with minimum hindrances. Development of culturally relevant e-government projects with a focus on its customers establishes a close relationship between citizens and government. This study also reinforces the aspect that economic strength of a country measured by GDP or GNP plays an important role in the initiation and development of e-government.

FUTURE RESEARCH

Future study may include broader panel data covering more than a decade long data and including several countries. This study uses per capita GDP as a control variable which may be replaced or extended to some other economic, political, or social variables. Also, inclusion of some country-specific cultural nuances may bring greater insights while explaining the people behavior towards e-government development in a particular cultural setting. Lastly, a qualitative work may offer greater insights on impact of culture on e-government development.

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APPENDIX

The list of 78 countries included in the study

Table 5.

Albania	Estonia	Lithuania	Serbia
Angola	Finland	Luxembourg	Singapore
Argentina	France	Malaysia	Slovakia
Australia	Germany	Malta	Slovenia
Bangladesh	Ghana	Mexico	South Africa
Belgium	Greece	Morocco	Spain
Brazil	Hungary	Mozambique	Sweden
Bulgaria	Iceland	Netherlands	Switzerland
Burkina Faso	India	New Zealand	Tanzania
Canada	Indonesia	Nigeria	Thailand
Cape Verde	Iran	Norway	Trinidad and Tobago
Chile	Iraq	Pakistan	Turkey
China	Ireland	Peru	Ukraine
Colombia	Italy	Philippines	United Kingdom
Croatia	Japan	Poland	United States of America
Czech Republic	Jordan	Portugal	Uruguay
Denmark	Latvia	Republic of Korea	Venezuela
Dominican Republic	Lebanon	Romania	Vietnam
Egypt	Libya	Russian Federation	Zambia
El Salvador		Saudi Arabia	

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