Cultural Influence on e-Government Development

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Abstract: E-government development varies across countries. This study aims to examine the impact of national culture on e-government development across 78 countries. The dimensions of national culture are power distance, individualism, masculinity, long-term orientation, uncertainty avoidance, and indulgence. The paper also examines the role of GDP per capita on e-government development. The result shows that individualism and long-term orientation are positively related to e-government development, whereas power distance is negatively related to e-government development. Also, GDP per capita is found to be significantly impacting e-government development. Multi-level interaction effect of GDP per capita and culture on e-government development is discussed. The paper outlines the implications of results and strategies to design culturally acceptable e-government policies. The paper argues that growth in economic prosperity cannot guarantee e-government development, and national culture must be included in a holistic discussion of the development.

Keywords: E-government, Culture, Cross-cultural study, Culture and e-government development

1. Introduction

E-government has become a dominant medium to connect, control, and provide services to citizens (Abu-Shanab, 2017; Bélanger and Carter, 2012; Bwalya and Healy, 2010; El-Haddadeh, Weerakkody, and Al-Shafi, 2013; Heeks, 2005). E-government, supported by the advancement of Internet-based technologies puts governments under continued pressure to seamlessly e-offer their services to citizens (Weerakkody et al., 2013). To reduce the existing gap of the digital divide and increase the adoption rates of services among citizens, governments are employing several strategies such as involvement of third-party intermediaries (Weerakkody et al., 2013) in facilitating their services electronically. There could be multiple advantages of these strategies, but an approach from the citizens' perspective can bring more insightful information. The United Nations has also stressed the adoption of citizen-centric and culturally congruent approaches for e-government and its development (United Nations, 2016). To measure the progress of e-government across countries, the United Nations have adopted a normalized scale to rate and rank countries on their e-government initiatives named as e-government development (United Nations, 2003). E-government development varies across countries (United Nations, 2016).

E-government development is dependent on several factors such as technology, human resources, infrastructure, political willingness, trust in government, and culture (Khalil, 2011). Among these factors, culture, as acknowledged by researchers, play a crucial role in e-government development, but very less empirical work is performed to understand its impact (Bagchi, Hart, and Peterson, 2004; Dwyer, Mesak, and Hsu, 2005; Erumban and de Jong, 2006; Gong, Li, and Stump, 2007; Karahanna, Evaristo, and Srite, 2006; Lallmahomed, Lallmahomed and Lallmahomed, 2017; Zhang and Maruping, 2008). The development of culturally congruent policies fosters the effective implementation of e-government (Khalil, 2011; Lee et al., 2008). Few researchers have paid attention in understanding relationship between culture and e-government, but these studies (for example, Akman et al., 2005; Seng, Jackson, and Philip, 2010; Guijarro, 2007) are limited to a single country context. The literature lacks studies which include several countries for a comparative analysis that delineate the role culture plays in e-government development. Even the international surveys on e-government do not incorporate social values, social norms, religious beliefs, and socio-political systems, which play an important role in e-government development (Zhao, 2013). These religious beliefs, social norms, and other conventions are reflected in the culture of a country which impacts the development of any new initiatives. Therefore, there is a need to understand the impact of national culture on e-government on a global scale. This study is an attempt to fill this gap. This may shed some light on the reason behind countries either leading or lagging in e-government. The study, therefore, seeks a cultural interpretation and explanation of variation in e-government development.

Economic prosperity also plays a crucial role in e-government development. Economic prosperity measured by GDP, GNP, or GDP per capita indicates the investment available for setting up the infrastructure for e-government. It is very likely that countries with higher GDP have higher development in e-government (United Nations, 2016). However, the authors argue that GDP, when coupled with culture, may have a multilevel impact (Husted, 2005) on e-government development. Researchers have suggested examining the GDP while examining the direct effect of culture (Husted, 2005). Therefore, the study also examines the impact of GDP per capita on e-government development. In addition, to examine the authors' argument of the multilevel interaction effect of GDP per capita and culture on e-government development, the study examines and discusses the interaction effects.

In summary, the study addresses two research questions.

1. How do national cultural dimensions proposed by Hofstede impact the e-government development?
2. What is the role of GDP per capita on e-government development?

The study offers a two-fold contribution to literature. First, this study contributes to the epistemology of e-government and discusses the role of culture on e-government. This study adds to the body of knowledge of e-government on how culture impacts e-government development. This study supports the development of culturally congruent policies and enhances the theoretical understanding of culture and e-government development. Second, the study examines the role of GDP per capita and discusses how it contributes to the development of e-government. For this, the study employs an extensive dataset of 78 countries. The analysis of the large dataset reduces the measurement error (Bagozzi, Yi, and Nassen, 1998) and supports the generalisation of findings. In terms of practical implications, the study investigates to what extent government and policymakers are required to consider cultural background while designing e-government services.

2.   Literature Review

Almost all definitions of e-government are related to Information and Communication Technologies (ICTs). For example, Moon (2002) defines e-government as the use of all ICTs, from fax machines to wireless palm pilots, to facilitate the daily administration of government. Although researchers are yet to agree on a common definition of e-government (Khalil, 2011), an inclusive definition of e-government is proposed by Grant and Chau (2005). They describe e-government as a broad-based transformation initiative, enabled by leveraging the capabilities of information and communication technology to:

1. develop and deliver high quality, seamless, and integrated public services;
2. enable effective constituent relationship management; and
3. support the economic and social development goals of citizens, businesses, and civil society at local, state, national, and international levels

E-government plays a crucial role in providing services to the governments and citizens as well as renewing the responsibility of governments (Khalil, 2011; Lee et al., 2008; Nguyen, 2016). In e-government, the offered services determine the satisfaction level of people and indicate the maturity of e-government. (Lee et al., 2008; Nguyen, 2016). Layne and Lee (2001) described e-government maturity which is extended into four phases: (1) catalog stage, (2) transaction stage (3) vertical integration stage, and (4) horizontal integration stage. The United Nation's Department of Economic and Social Affair adopted an e-government development framework to measure the performance of the government's initiatives towards e-government across its members' 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, 2003; 2010).

2.1 E-government Development Index

The e-government development index (EGDI, hereafter), an index measured from 0 to 1, is 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, 2003). EGDI value represents the average of online service index (OSI), telecommunication infrastructure index (TII), and human capital index (HCI). The mechanisms to calculate EGDI and its components have evolved over the years. Table 1 summarizes the changes in parameters used in the estimation of EGDI (United Nations, 2003; 2004; 2005; 2008; 2010; 2012; 2014; 2016).

2.1.1 Online Service Index (OSI)

The online service index (OSI) is a quantitative index to estimate the generic aptitude of governments to use e-government as an instrument to inform, communicate, transact, and network (United Nations, 2003). The process of calculating OSI includes assessing all the national websites of a country in the native language. This process includes evaluating the e-services, and e-participation portals, along with the web portals of the concerned ministries of environment, health, social services, finance, labour, and education as applicable.

The framework proposed by United Nations (2016) describes e-government development process in four phases which are (a) emerging, (b) enhanced, (c) transactional and (d) connected (figure 1). The emerging phase is the least sophisticated phase, whereas the connected phase is the most sophisticated phase of e-government development. In the emerging phase, the online presence of government is mainly comprised of a webpage with static information without having any link to other websites. The connected phase is the most advanced phase of e-government development, where the government is transformed into a closely knitted and inter-connected entity having an integrated infrastructure.
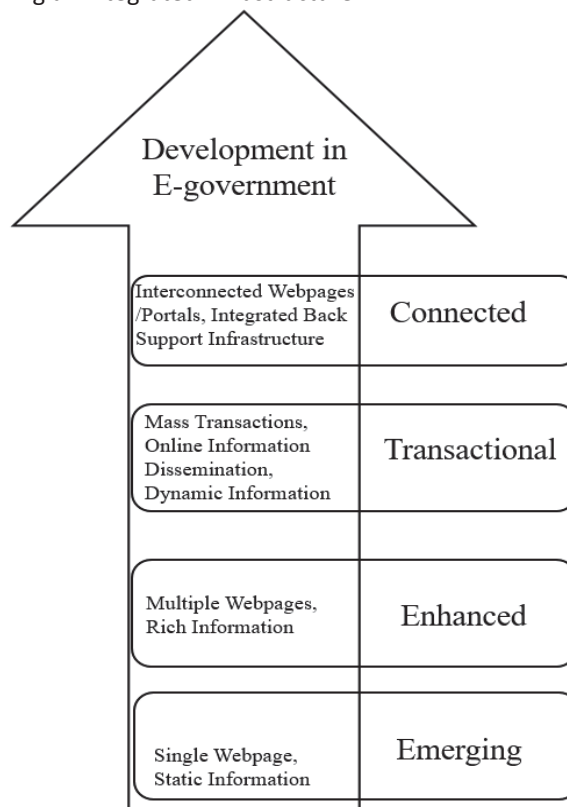

Figure 1: Phases in e-government development

2.1.2 Telecommunication Infrastructure Index (TII)

The TII defines ICT infrastructure capacity of a nation (United Nations, 2014). It is a combined, weighted average index that defines information and communication technology infrastructure capacity of a nation. The exponential increment of cell phone users in the last decade has opened various new opportunities for citizens to avail government services in innovative ways (United Nations, 2014). Considering the growth in the wireless networks, 2014 e-government survey included a new indicator 'wireless broadband subscription' in estimation of TII (Table 1).

2.1.3 Human Capital Index (HCI)

The HCI is a 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). Acknowledging that human capital is fundamentally based on education, the 2014 survey included two new factors in the estimation of HCI: (a) expected years of schooling, and (b) mean years of schooling (Table 1). This addition has been statistically validated by researchers at the United Nations emphasizing that the addition of two new factors has reinforced the HCI (United Nations, 2014).

Table 1: Parameters used for estimation of e-government development index

Year	Telecommunication Infrastructure Index (1/3)	Human Capital Index (1/3)	Online Service Index (1/3)
2001	Internet users (1/5), Online population (1/5), Personal computer (PC) users (1/5), Fixed-telephone subscriptions (1/5), Mobile-cellular subscriptions (1/10), Television sets (1/10)	Adult literacy (2/3), Gross enrolment ratio (1/3)	Emerging Presence, Enhanced Presence, Interactive Presence, Transactional Presence, Seamless or fully Integrated
2003, 2004, 2005	Internet users (1/5), Online population (1/5), Personal computer (PC) users (1/5), Fixed-telephone subscriptions (1/5), Mobile-cellular subscriptions (1/10), Television sets (1/10)	Adult literacy (2/3), Gross enrolment ratio (1/3)	Emerging Presence, Enhanced Presence, Interactive Presence, Transactional Presence, Networked Presence
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	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 parameter is given in brackets.			

Culture of a country may impact the EGDI and its components. This also gets reflected in the parameters used for estimating EGDI and its components. For example, the unprecedented growth in wireless subscription has replaced 'personal computer users' with 'wireless broadband subscription' in the estimation method of TII from the year 2012. We argue that there is a cultural explanation for such growth across all nations.

2.2 National Culture

Culture is defined as the collective programming of the mind that distinguishes the supporters of one category or group of people from another group (Hofstede, 2011). Culture influences and shape the values, beliefs, attitude, and behaviour among society members. Hofstede (2011) conceptualized culture in six dimensions which are as follows.

Power Distance (PD) - Power Distance has been defined as the degree to which the relatively less powerful members of organizations and institutions agree and expect that power is distributed unequally (Bagchi, Hart, and Peterson, 2004; Gong, Li, and Stump, 2007; Hofstede 2011; Zhao, 2013).

Individualism (INDV)- Individualism (vs. Collectivism) is the degree to which people in a society are integrated into groups (Gong, Li, and Stump, 2007; Hofstede, 2011; Kovacic, 2005; Zhao, 2013).

Uncertainty Avoidance (UA) - It is related to society's tolerance for ambiguity. It measures the level of comfort among the members of a society in unstructured situations (Bagchi, Hart, and Peterson, 2004; Hofstede, 2011; Zhao, 2013).

Masculinity (MAS) - It refers to the dissemination of values between the genders. Female's values differ less significantly among societies than the male's values. The assertive pole is termed as 'masculine', and the modest, caring pole is termed as 'feminine' (Bagchi, Hart, and Peterson, 2004; Hofstede, 2011; Zhao, 2013).

Long-Term Orientation (LTO) - It refers to the extent to which a society values its tradition and to what extent individuals are centred on their past and future (Erumban and de Jong, 2006; Hofstede, 2011; Zhao, 2013).

Indulgence (INDL) - This dimension is labelled as the magnitude to which people try to control their desires and impulses, grounded on the way they were raised. A comparatively weaker control is called indulgence and comparatively, stronger control is called restraint (Hofstede, 2011).

There are twofold reasons for selecting the Hofstede cultural model. First, Hofstede's work is most cited across various literature and is still valid today. To check the current validity of Hofstede's work, Taras, Steel, and Kirkman (2012) carried out a meta-analysis of more than 2000 samples for which data was gathered from 451 journals. This project included more than half a million individuals from 49 different countries and regions and concluded that Hofstede's cultural model would remain relevant even after more than 30 years. Second, Hofstede dataset (for all the six dimensions) is available for a large number of countries which supports its use for establishing statistical relations.

E-government can be understood as leveraging the information and communication technologies (ICTs), and sizeable literature is available on ICT and culture. Therefore, it becomes imperative to review the literature of adoption of ICT and national culture. Differences in ICT adoption rates can be explained by cultural differences such as the difference in power distance and uncertainty avoidance (Erumban and De Jong, 2006; Khalil, 2011). Culture is seen as a variable that influences the ICT adoption as well as the rate of ICT adoption (Krumbholz et al., 2000). The justification for divergence among countries in the adoption of ICT for some precise technologies such as the Internet, PC, pager, cell phone, fax machines, and telephone has been validated based on cultural dimensions (Bagchi, Hart, and Peterson, 2004). A study by Erumban and De Jong (2006) concluded that cultural dimensions namely power distance, individualism, and uncertainty avoidance exhibit the notable difference regarding ICT adoption whereas masculinity and long-term orientation dimensions are indifferent to ICT adoption. Low uncertainty avoidance or high uncertainty acceptance aspects of cultures make superior use of any technological innovation, say, the Internet, than as compared to the societies with high levels of uncertainty avoidance (Hofstede, 2001). Likewise, an increase in Internet adoption has been observed with a decrease in power distance (Gong, Li, and Stump, 2007; La Ferle, Edwards, and Mizuno, 2002; Yaveroglu and Donthu, 2002; Yeniyurt and Townsend, 2003). This above-cited evidence regarding the impact of national culture on ICT adoption is positively an instrumental analogy to our study for examining the impact of national culture on e-government development. We understand that e-government is about leveraging the ICT to offer services to citizens, businesses, and governments.

2.3 E-government Development and National Culture

The majority of e-government literature is focused on how technological advancement can be used for development in e-government (for example, Abu-Shanab, 2017; Barzilai-Nahon and Barzilai, 2005; Heeks and Bailur, 2007). Recent studies in e-government have explored the domain of managing e-government through value position (Rose et al., 2015), the domain of health care (Bara-Slupski, 2016), societal challenges such as trust, bribery, and corruption (Mellouli, Bentahar, and Bidan, 2016; Srivastava, Teo, and Devaraj, 2016) and nation-specific studies such as Oman, China, Nigeria, Iran (Al-Jaghoub, Al-Yaseen, and Al-Hourani, 2010; Amagoh, 2016; Fan and Jiang, 2016; Tajgardoon, Manzuri, and Habibi, 2016). Nica (2015) indicates that citizens are impelled by a perception of information possession and by social criteria of collaboration and pro-social conduct. Therefore, a citizen-centric approach leads to a higher engagement of a citizen with the government.

Culture, which influences the collaboration and pro-social conduct, can significantly influence the perception of citizens for e-government services. Jackson and Wong (2014) suggest that culture at the smaller group level can have an influential effect on e-government acceptance. The study found that although some cultural constraints repressed the acceptance of e-government in the initial years, these constraints majorly reduced to a great extent thereby, facilitating a favourable environment for e-government (Jackson and Wong, 2014). Once culture is set in place, it affects nations' response to world events, including the acceptance of new technologies and e-government in its own way. Every nation has a set identity and culture with a specific history, dialect, and religious customs (Bagchi, Hart, and Peterson, 2004; Gong, Li, and Stump, 2007). These experiences shape the culture of a society and impact the adoption of newer initiatives such as e-government. Extant literature indicates that majority of the studies are based on individual countries such as Romania (Hatmanu et al., 2014), Kuwait and Britain (Aladwani, 2013), Europe and Latin America (Akman et al., 2005; Seng, Jackson, and Philip, 2010; Guijarro, 2007). However, limited studies have spanned over several countries to understand the impact of national culture on e-government development. In a study to a specific country, Romania, Hatmanu et al. (2014) identified that power distance, uncertainty avoidance, individualism, and indulgence have a significant impact on e-government development. Multilevel individualism in society does

not influence the development of e-government, unlike power distance and uncertainty avoidance. Therefore, the greater the power distance, the lesser the availability of citizens to e-government, and the more stubborn the attitude to uncertainty avoidance, the lower is development in e-government (Hatmanu et al., 2014).

A study by Kovacic (2005) spans over several countries and provides a theoretical framework to examine the impact of national culture on e-government readiness. It also examines whether the national culture dimensions proposed by Hofstede have a significant impact on e-government readiness. Zhao (2013) addresses the shortcomings of Kovacic (2005) and offered strategies for e-government development. While acknowledging the contribution made by Kovacic (2005) and Zhao (2013), the authors would like to highlight the major differentiation in this study and the other previous studies. There are threefold differences. First, this study uses the United Nation survey report 2016. There are changes in the calculation of individual components (HCI, TII, and OSI) of EGDI since United Nation 2010 survey report, which is used by Zhao (2013). Table 1 shows the changes in parameter over the years. Authors believe that these changes may impact the direction or intensity or both with which they have impacted in the previous two studies. Second, Kovacic (2005) uses only four and Zhao (2013) uses only five dimensions of Hofstede cultural model, whereas this study included the sixth dimension - Indulgence (vs. Restraint) in study. Authors believe that the addition of the sixth dimension may impact the development of e-government, and it may also affect the intensity of the impact of other cultural dimensions. Third, Husted (2005) indicated that the economic development of a country (for example, GDP per capita) interacts with culture and have a multilevel impact on new initiatives. Therefore, the present study also uses GDP per capita as an independent variable. This study examines the effect of interactions of GDP per capita and cultural dimensions on e-government development. This study is first to use the data set of 78 countries for analysis, the largest possible population size, which supports generalizations of results. Authors also suggest the practical implications and strategies for public administrator and managers to develop culturally relevant services to move more toward citizen-centric approach.

3. Research Model and Hypothesis Development

While studying national culture, Hofstede (2011) encourages researchers to implement a national growth indicator (for example, GDP per capita) as an additional independent variable in research models to observe the exclusive and profound effect of culture (Bagchi, Hart, and Peterson, 2004; Gong, Li, and Stump, 2007). Following Hofstede's suggestion, the study uses GDP per capita as an independent variable. To understand the profound effect of culture as well as GDP per capita, the study develops three models. In model 1, the effect of only GDP per capita is observed on e-government development. In model 2, cultural variables are introduced in model 1 to understand the impact of cultural variables on e-government development. In model 3, interaction variables developed by multiplying GDP per capita and six cultural dimensions are introduced in model 2 to examine the multi-level impact of culture and GDP per capita on e-government development. Figure 2 represents the consolidated research model of the study. In figure 2, the straight lines from different independent variables to e-government development represent the direct effect, whereas dotted lines represent the interaction effect of GDP per capita and cultural variables on e-government development.

Countries with high power distance maintain a hierarchy of relationships and limit the access of information to public (Hofstede, 2011). People in high power societies don't seek a justification for hierarchy and accepts the way it is present. This restricts people from participation in activities which involve interaction with authorities or members of hierarchy (Zhao, 2013). This indicates that people from high power distance societies may not use e-government, which reduces the hierarchy and allows the free flow of information. E-government is perceived as a threat to the power hierarchy (Islam, 2004) in high power distance societies. However, in low power distance societies, e-government is well received as it fosters the absence of hierarchy and supports equal power distribution (Khalil, 2011). Low power distance societies allow the free flow of information and may support e-government development. Hence, it can be proposed that:

H1a: Low power distance positively influences the e-government development.
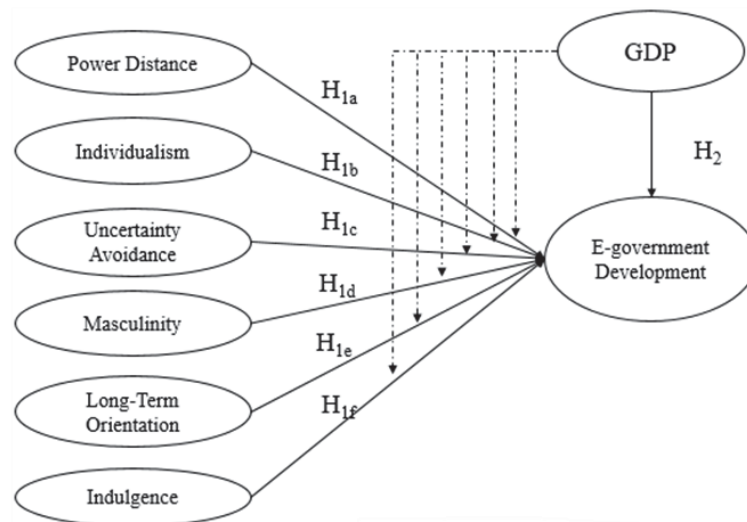
Figure 2: Research Model

The individualism and collectivism are widely studied dimensions in several disciplines. Members of individualistic countries prefer personal achievement and focus on individual productivity (Trompenaars and Hampden-Turner, 1998). Whereas members of collectivistic countries are more concerned about community development, face to face communications, and strong human relationships. This may indicate why collectivistic countries have a lower preference for Internet-based technologies than individualistic countries (Zhao, 2013). Bagchi, Hart, and Peterson (2004) indicated that information and communication technologies such as e-government tend to prevail faster in individualistic countries than collectivistic countries. Therefore, we propose that:

H1b: High individualism positively influences the e-government development.

Hofstede (2011; 2011) posited that countries with low uncertainty avoidance make greater use of technological innovation and Internet-based platforms. Low uncertainty avoidance countries have lesser demand for rulebook guidance, which enables experimentation and uses of e-government services (Maitland and Bauer, 2001). These countries rely on the expert opinions given by citizens enabling citizen participation and acceptance of newer initiatives such as e-government. E-government flourishes in those countries where governments and public authorities are ready to undertake the risk of implementation (Khalil, 2011). Therefore, we propose that:

H1c: Low uncertainty avoidance positively influences the e-government development.

Masculine culture is identified with assertive nature with a focus on material reward and success, whereas feminine culture represents tenderness, modesty, and quality of life (Hofstede, 2011). Countries with feminine culture represent believe that information and communication technologies improve the quality of one's life (Bagchi, Hart, and Peterson, 2004). To further improves their quality of life, feminine cultures support the separation of private and professional life, but they also allow frequent movement from private to professional life through the use of technologies (Gong, Li, and Stump, 2007). Technologies for one way communication such as television or for both way communication such as the Internet are widely adopted by feminine cultures. This indicates that feminine culture may support the development of e-government. Therefore, we propose that:

H1d: Masculinity negatively influences the e-government development.

Countries with long term orientation tend to look into the future to develop and pursue strategic and long-term goals (Hofstede, 2011). These countries invest enough time in planning to develop practices that may be advantageous in the future (Ashkanasy et al., 2004). In contrast, short term orientated countries maintain old tradition and susceptible to change which may bring uncertainty (Zhao, 2013). Newer information and communication technologies may bring uncertainty and not easily adopted by short term oriented countries.

However, long term oriented cultures believe that newer technologies and initiatives such as e-government have the potential to offer benefits in the future (Khalil, 2011). Therefore, we propose that:

H1e: Long-term orientation positively influences the e-government development.

Countries with indulgence support the free gratification of basic human desire (Hofstede, 2011). In contrast, restraint cultures support the measured gratification of fundamental and natural desires which are regulated by strict societal norms. Restraint societies also regulate the use of information and communication technologies whereas indulgent societies consider the access of information and technologies as their fundamental need. Adoption of these technologies is crucial for the development of newer initiatives such as e-government which is supported by indulgent societies. Therefore, we propose that:

H1f: High indulgence in countries positively influences the e-government development.

Economic development is found to have an impact on the culture of a nation. Economic development, which is measured by GNP or GDP, shows a strong relationship with culture (Inglehart and Baker, 2000). Economic development plays an important role in both culture and adoption of technologies. For example, Bagchi, Hart, and Peterson (2004) and Gong, Li, and Stump (2007) found GDP significantly and positively impact the adoption of information and communication technologies. In this study, the authors examine the direct effect of per capita GDP (GDPP) on e-government development. Therefore, we can hypothesize that:

H2: High GDP per capita positively influences the e-government development.

3.1 Interaction Effect

The economic development of a country interacts with culture that has a multilevel impact on adoption or development of information and communication technologies. Husted (2005) acknowledged that culture has interactive effects with economic development. Hofstede (2001) also suggested that the interactive effect of economic prosperity and cultural dimensions can have a multi-level impact on new initiatives such as e-government. Therefore, the study first examines the direct effect of cultural dimensions and per capita GDP on e-government development. Next, the interaction effects of per capita GDP and cultural dimensions are examined with e-government development as dependent variable. Developed and developing countries may exhibit different levels of effect of culture and economic progress, which is also examined in this study.

4. Research Methodology

The study follows quantitative research methodologies. Data for this study is collected from three different sources. UN E-government Survey 2016 provides data for individual components of OSI, TII, and HCI for 193 countries (United Nations, 2016). World Bank (2016) provides data for GDP Per Capita (current US $) for 193 countries. The dataset for Hofstede cultural dimensions is retrieved from the Geert-Hofstede website (Hofstede, 2016). The dataset of 100 countries is available for power distance, individualism, masculinity, and uncertainty avoidance, 84 countries for long-term orientation and 78 countries for indulgence. Therefore, the final analysis is performed on 78 data points. There are two reasons for using secondary data sources. Considering the novelty of this study which encompasses several countries, an extensive dataset of several countries, is required. Collecting the primary data from 78 countries is beyond the scope of this work. Second, the dataset used in this study is already either fully or partially used in the research domain, confirming its applicability in the research field. The dimensions of culture are used by Zhao (2013), data for e-government index is used by Kovacic (2005), and data for GDP per capita is used in several studies, for example, Husted (2005). Therefore, the accessibility of data of 78 countries is feasible only though secondary data sources.

Table 2 presents the minimum, maximum, mean, and standard deviation values of the cultural dimensions and indexes. Appendix A lists the 78 countries for which the analysis is performed.

Table 2: Descriptive statistics of variables

	N	Min	Max	Mean	Std.dev
Power Distance	78	18.00	100.00	62.83	19.95
Individualism	78	12.00	91.00	42.32	22.75
Masculinity	78	5.00	100.00	47.94	19.50
Uncertainty Avoidance	78	8.00	100.00	65.65	21.10
Long-Term Orientation	78	4.00	100.00	42.73	23.38
Indulgence	78	0.00	100.00	47.54	23.20
Online Service Index	78	0.02	1.00	0.57	0.23
Human Capital Index	78	0.16	1.00	0.75	0.17
Telecommunication Infrastructure Index	78	0.05	0.94	0.51	0.24
E-Government Development Index	78	0.18	0.95	0.61	0.19

Figure 2 represents the research model, which consists of cultural dimensions, economic variables, and e-government development. The study uses the correlation and regression as statistical tools to establish the relationship which extends the previous studies (Kovacic, 2005; Zhao 2013). Also, GDP per capita interacts with the culture at different levels and impacts the development of new initiatives. Therefore, this study also examines the interaction effect of GDP per capita and all the six cultural dimensions on e-government development. The dependent variable is e-government development. The independent variables are all six cultural dimensions, GDP per capita, and interaction variables. The interaction variables are obtained by multiplying the cultural dimensions with GDP per capita. These variables are: GDP per capita X Power Distance; GDP per capita X Individualism; GDP per capita X Masculinity; GDP per capita X Uncertainty Avoidance; GDP per capita X Long-Term Orientation; GDP per capita X Indulgence.

5. Results and Findings

Pearson Correlation test was performed to examine the relationship between e-government development and Hofstede national cultural dimensions. Table 3 represents the result of the analysis.

Firstly, EGDI, which is a composite score of OSI, TII, and HCI, is understandably highly positively correlated to its components, i.e., OSI, TII, and HCI with a value of 0.888, 0.950, and 0.912 respectively. Correlation between EGDI and GDP per capita is 0.739 which is higher than correlation coefficient of all cultural dimensions, suggesting that GDP per capita has a greater impact on e-government development than the impact of any other cultural dimensions of a country.

Secondly, the result shows that EGDI, OSI, HCI, TII, and GDP per capita are negatively correlated with power distance, ranging from -0.451 to -0.627 and positively correlated with individualism, ranging from 0.508 to 0.655. Masculinity and uncertainty avoidance are not significantly related to any of the variables. Long-term orientation displayed a significant correlation with EGDI, OSI, HCI, TII, and GDP per capita, ranging from 0.284 to 0.494. It indicates that countries with long-term orientation culture perceive that development in e-government may be helpful in the future. Indulgence is significantly related to GDP per capita (with correlation coefficient 0.314), which indicates that per capita income has an impact on free gratification of fundamental and natural human desires related to enjoying life and having. Based on our statistical analysis using a correlation matrix, we accept hypothesis H1a, H1b, H1e, and H2.

Table 3: Pearson correlation results

		EGDI	OSI	HCI	TII	GDPP	PD	INDV	MAS	UA	LTO
Online Service Index (OSI)	Correlation	0.888**									
	N	100									
Human Capital Index (HCI)	Correlation	0.912**	0.675**								
	N	100	100								
Telecommunication Infrastructure Index (TII)	Correlation	0.950**	0.746**	0.867**							
	N	100	100	100							
GDP per capita (GDPP)	Correlation	0.739**	0.593**	0.625**	0.803**						
	N	100	100	100	100						
Power Distance (PD)	Correlation	-0.537**	-0.451**	-0.481**	-0.543**	-0.627**					
	N	100	100	100	100	100					
Individualism (INDV)	Correlation	0.632**	0.508**	0.599**	0.637**	0.655**	-0.658**				
	N	100	100	100	100	100	100				
Masculinity (MAS)	Correlation	-0.027	0.008	-0.057	-0.032	-0.017	0.093	0.061			
	N	100	100	100	100	100	100	100			
Uncertainty Avoidance (UA)	Correlation	0.167	0.132	0.184	0.149	-0.093	0.169	-0.139	0.039		
	N	100	100	100	100	100	100	100	100		
Long-Term Orientation (LTO)	Correlation	0.473**	0.405**	0.395**	0.494**	0.284**	-0.112	0.269*	0.065	0.096	
	N	84	84	84	84	84	84	84	84	84	
Indulgence (INDL)	Correlation	0.161	0.151	0.159	0.135	0.314**	-0.264*	0.121	-0.042	-0.193	-0.431**
	N	78	78	78	78	78	78	78	78	78	78
** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).											

Thirdly, the correlation result shows that among cultural dimensions, power distance is highly negatively correlated with individualism (-0.658). Hofstede acknowledges this negative correlation and argues that if economic development is held constant, the relationship may disappear (Husted, 2005). Also, a significant negative correlation is found between indulgence and power distance (-0.264), and between indulgence and long-term orientation (-0.431). Hofstede (2011) acknowledges a weak negative relation between indulgence and long-term orientation. A significant positive correlation is also found between individualism and long-term orientation (0.269). However, this significant correlation among explanatory variables may give rise to the multicollinearity problem while performing regression analysis.

To examine the interaction effect, we performed the regression with EGDI, GDP per capita, six cultural dimensions, and interaction terms. Interaction terms are created by multiplying GDP per capita with all cultural dimensions. Correlation results reported a high level of multicollinearity. VIF value is found to be in the range of 50, which is much greater than the commonly suggested cut-off of 10 (Hair et al., 1992). The paper adopts the recommendation by Aiken, West, and Reno (1991) to resolve multicollinearity issue by transforming data using the centering or de-meaning procedure. After transformation, VIF is calculated to check the extent of multicollinearity and VIF values were found to be much below the cut-off value of 10. The problem of multicollinearity does not appear to be severe after transformation.

The study uses hierarchical regression, which enables the entry of the independent variable first (GDP per capita), then the cultural dimensions and lastly interaction terms. Table 4 represents the result of hierarchical regression. The hierarchical regression is performed by creating three models. The dependent variable for all three models is EGDI. The independent variable for model 1 is GDP per capita, for model 2 it is all six cultural dimensions, and for model 3 it is all the interaction variables created by multiplying GDP per capita and cultural dimensions.

Model 1 examines only the influence of GDP per capita on the EGDI dependent variable. Adjusted R-square is 0.52 suggests that 52% change in EGDI is explained by GDP per capita.

In Model 2, in addition to GDP per capita, all six cultural dimensions were added. GDP per capita remains significant. Model 2 confirms that individualism, uncertainty avoidance, long-term orientation, and indulgence are significant and related to e-government development in the expected direction. LTO has the highest beta coefficient, followed by INDV, which is consistent with the result of correlation analysis. Power distance and masculinity are not significant. The standardize beta coefficients of both items, PD and MAS, are less compared to other variables and close to zero, this result is not of much significance.

The introduction of these cultural dimensions in the model significantly improves the explanatory power as evident by the increase in R-square value, which is significant. Based on the regression result, we have enough evidence to accept hypothesis H1b, H1d, H1e, H1f, and H2.

Table 4: Result of Hierarchical Regression

	Model 1		Model 2		Model 3	
GDP per capita	0.718	**	0.748	**	0.776	**
Power Distance			-0.060		-0.009	
Individualism			0.319	**	0.288	**
Masculinity			-0.088		-0.078	
Uncertainty Avoidance			0.194	**	0.179	**
Long-Term Orientation			0.350	**	0.283	**
Indulgence			0.183	*	0.191	*
GDP per capita X Power Distance					0.119	
GDP per capita X Individualism					-0.310	*
GDP per capita X Masculinity					0.068	
GDP per capita X Uncertainty Avoidance					-0.124	
GDP per capita X Long-Term Orientation					-0.250	**
GDP per capita X Indulgence					-0.031	
Adjusted R^2	0.520		0.700		0.820	
Change in R^2			0.190	**	0.110	**
** Correlation is significant at the 0.01 level (2-tailed).* Correlation is significant at the 0.05 level (2-tailed). The standard beta coefficient is reported in the table.						

In model 3, interaction variables are introduced to already existing variables. From the regression result (Table 4), interaction term GDP per capita X Individualism and GDP per capita X Long-Term Orientation are found to be significant and show a negative impact on the dependent variable. Regression result indicates that individualism and long-term orientation have a positive direct impact on e-government development, whereas the interaction term for both is negative. In table 5, we summarize the hypotheses and the results:

Table 5: Summary of hypothesis

Paths in the Model	Correlation (1)		Regression (2)		Result
	Coefficient	p-value	Coefficient	p-value	
H1a: PD-EGDI	-0.537	0.000	-0.060	0.346	Supported (1)
H1b: INDV-EGDI	0.632	0.000	0.319	0.000	Supported (1and2)
H1c: MAS-EGDI	-0.027	0.473	-0.088	0.411	Not supported
H1d: UA-EGDI	0.167	0.341	0.194	0.000	Supported (2)
H1e: LTO-EGDI	0.473	0.000	0.350	0.000	Supported (1and2)
H1f: INDL-EGDI	0.161	0.417	0.183	0.031	Not Supported
H2: GDPP-EGDI	0.739	0.000	0.348	0.000	Supported (1 and 2)

This result (table 5) indicates that the positive effect of individualism and long-term orientation on the development of e-government is balanced by slower development rate of e-government at a higher level of economic development. The difficulty in the interpretation of interaction effects is huge. Therefore, we use the Aiken, West, and Reno (1991) method to examine the interaction effect graphically. Figure 3 and figure 4 represent the relationship between individualism and e-government development and between long-term orientation with e-government development for developing and developed countries, respectively. The distinction between the developing and the developed world is made based on per capita income drawn from the World Bank (2016). Husted (2005) argues that the GDP of a country interacts with culture and have a

multilevel impact on new initiatives. 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 a majority of their resources in fulfilling the basic requirements of their citizens. Therefore, it is a prudent way to examine the impact of culture on e-government development on developed and developing countries separately.

In table 5, since individualism and long-term orientation have a positive effect on the EGDI, the negative coefficient of interaction term represents that its positive effects are minimized at a higher level of GDP per capita. In figure 3 and figure 4, as we move from developing countries to developed countries, the slope becomes less positive. This movement explains the negative sign of interaction term for both long-term orientation and individualism.

To understand the e-government development in developing and developed nations, the authors conducted a two-sample t-test. From the list of 78 countries given in appendix A, 37 are developing, and 41 are developed countries. The countries are categorised in developing and developed based on World Bank (2016) criteria. Table 6 indicates that developed and developing countries vary significantly in e-government development.

Table 6: Two sample t-test

	Developing Country	Developed Country
Mean	0.441	0.758
Variance	0.014	0.011
Observations	37	41
df	76	
t Stat	-12.286	
P(T<=t) one-tail	0.000	
t Critical one-tail	1.665	
P(T<=t) two-tail	0.000	
t Critical two-tail	1.991	

6. Discussion

The findings indicate that economic development, which is measured by per capita GDP significantly and positively drives the e-government development. The result of correlation and regression shows that nations that favor individualism are more inclined to e-government development, which supports the findings of Kovacic (2005) and Zhao (2013).

The findings also indicate that e-government development is faster in long-term orientation countries. This finding is consistent with the regression result but not compatible with the correlation result performed by Zhao (2013). The reason for inconsistency in finding may be attributed to sampling size. Our study uses a large data set, which has helped to get a consistent result in correlation and regression. This study extended Zhao's work by doing the statistical analysis of LTO and contributed to the literature. South Korea, Japan, Germany, and China exhibit long-term orientation culture. Cultures favouring LTO adapt new situations easily, such as e-government services and expect to get a long-term gain.

Our correlation and regression analysis have shown some inconsistent result. Firstly, power distance and e-government development have a significant correlation, which is supported by the findings of Kovacic (2005) and Zhao (2013).
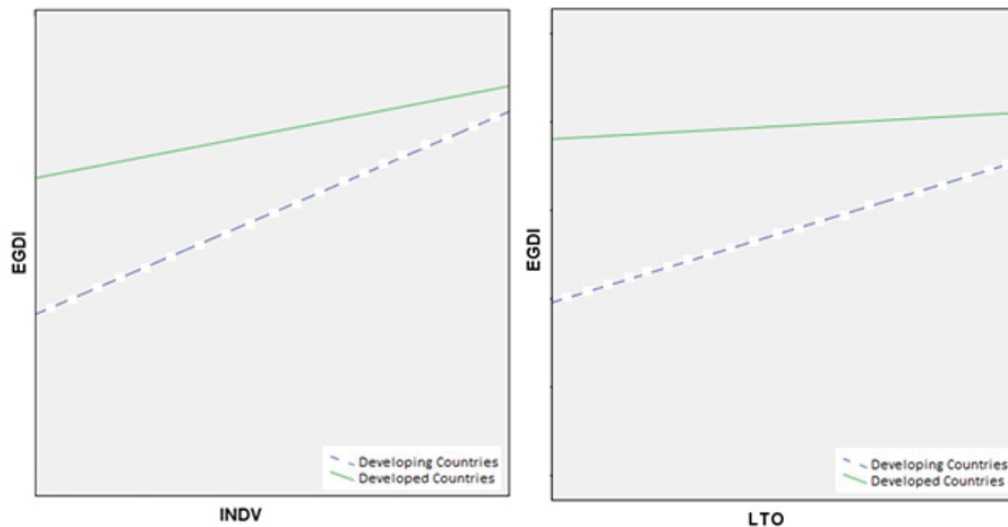
Figure 3: Interaction of individualism and GDP per capita on EGDI(L)

Figure 4: Interaction of long-term orientation and GDP per capita on EGDI(R)

In contrast, regression results indicate that power distance is not significant with e-government development, which is consistent with the findings of Zhao (2013) but is inconsistent with the findings of Kovacic (2005). We believe that some unaccounted factors may be responsible for the inconsistency in the relationship between power distance and e-government development. The reason of inconsistency could be as follows: frequent corruptions and volatile political dynamics may affect the existing power distance and alter the behavior of citizen towards e-government initiative. In turn, citizens may not trust the government and show less activity towards the reception of the e-government development.

Secondly, uncertainty avoidance is not significant in correlation but significant in regression analysis. As we understand that cultures with favoring UA (Uncertainty avoidance) tend to avoid the unknown, surprising situation by strict law and code of conduct. E-government initiatives help to prevent the uncertain situation by providing a continuous flow of information. Some country-specific factors may be responsible for the inconsistency in the relationship between UA and e-government development.

Thirdly, indulgence is found to be significant in regression analysis. This study extends the Zhao's work by performing statistical analysis of indulgence and filling the knowledge gap. We explain our finding as countries favoring indulgence tend to show free gratification of basic desire and high level of happiness. They 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. However, indulgence is not significant in the correlation analysis. This may be explained by the presence of some nation-specific factors such as autocratic government or frequent political turmoil, which in turn reduces the citizens' reception of e-government. We did not find any relation between masculine culture and e-government development, which is consistent with the finding of other researchers (Kovacic, 2005; Zhao, 2013).

As seen in interaction graphs (figure 3 and figure 4), the impact of individualism and long-term orientation on e-government development appears to vary with the economic development of a country. Economic development in the developing countries such as South Africa, India with individualistic culture tends to foster the development of e-government at an increasing rate. Similarly, countries such as Bulgaria, Albania, which rank high in long-term orientation but poor GDP per capita, accepts new initiatives for the development of e-government.

7. Implications and Strategies

There are several practical and public policy implications of the results. First, these results assist in explaining as to why e-government development is higher in some countries than in other countries. For example, Serbia is ranked 39 in the year 2016, whereas Iran is ranked 106 in e-government development (United Nations, 2016) while both have a similar level of per capita GDP. In the year 2014, Serbia was ranked 69 and Iran was ranked 105. An examination of the cultural dimensions of Serbia indicates that it has a higher power distance

(86) and lower individualism (25) than power distance (58) and individualism (41) of Iran. But Serbia has higher uncertainty avoidance (92) and long-term orientation (52) which are favorable dimensions for e-government development. Therefore, the reason for considerable investment by Serbia for development of e-government is embedded in the cultural profile of the country.

Second, as we understand that the cultural dimension tends to stay stable over time, we can't manipulate in order to achieve some policy objective. However, a policymaker can certainly take account of the favoring cultural dimensions for the country while designing a policy 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.

Third, we understand that relationship between culture and e-government is two ways. Result explained that long-term orientation and individualism have a direct effect on the development of e-government, but both dimensions are more important for developing countries than for developed countries. For example, India and Pakistan both have a similar level of economic development and long-term orientation of 51 and 50 respectively, but India has higher individualism (48) than that of Pakistan (14) which explained why India is ranked 107 whereas Pakistan is ranked 159 in e-government development. Also, nations that are moving from low to high per capita income should build policies that favor individualism and long-term orientation for successful implementation of the program. For example, there are countries such as the Dominican Republic which has shown an increasing trend in per capita income but a receding trend in their e-government ranking which changed from 60 in 2003 to 98 in 2016. One explanation for the decline in ranking could be that few more countries have been included in the e-government ranking list from 2003 to 2016. Also, an analysis of the cultural profile of Dominican Republic indicates that it scores very low in long-term orientation and low in individualism. These two cultural dimensions have a greater interactive effect with economic growth on e-government development.

8. Conclusion and Directions for Future Research

E-government is transforming the way governments are offering services to citizens and governments. The development in e-government is heavily driven by advances in ICT as well as the aspirations of citizens. The aspiration as well as the response of government varies across countries. The present study employs secondary data on national culture and e-government development to explore the relationships between cultural dimensions and e-government development. It can be concluded from this study that national culture greatly influences the development of e-government in a country. Policymakers can understand the nuances inherent in culture and design policies to reach their objective with minimum hindrances. United Nations survey indicates the development of a culturally relevant program for e-government development brings citizens closer to the government. This work also reinforces the aspect that the economic development measured by GDP per capita plays an important role in indicating the preference for e-government services. Culture and economic development are interrelated. Hence, the developed and the developing countries respond differently towards reception of e-government.

The implications of this study are significant and on the varied front. Nevertheless, the study has some limitations and future directions. Out of 197 countries in the world, e-government development data is available for 193 countries, whereas cultural data for all dimensions are available for only 78 countries. Although the study used the largest available dataset, future studies can encompass data from all countries. Future research may include the support of nation-specific scholars who can help in uncovering some specific regional level impact of culture and e-government. Future research may also use cultural dimensions from other studies such as Schwartz (1994) to explore and examine the effect of different dimension on e-government. E-government development is also dependent on regional factors which should also be taken into account in future studies. Future research should move beyond from statistical analysis of country-level indices to individual level by using various methodologies such as survey, interview, and/or ethnographic study. Also, future studies may include more variables which may provide insight into the effect of variables in e-government development.

Appendix A: The list of 78 countries included in the study

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	Thailand
Canada	Indonesia	Nigeria	Trinidad and Tobago
Cape Verde	Iran (Islamic Republic of)	Norway	Turkey
Chile	Iraq	Pakistan	Ukraine
China	Ireland	Peru	United Kingdom of Great Britain and Northern Ireland
Colombia	Italy	Philippines	United Republic of Tanzania
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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