A Cross-Cultural Study on e-Government Services Delivery

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Abstract: Considering e-Government services provision as one of the top priorities in the national agenda, governments worldwide have allocated resources into online applications development. However, despite of huge resource investments, the adoption rate of e-government initiatives over the world is far from expectations. By the year 2014, a large number of UN member states remain in the bottom third of the Online Service Index (OSI). There's still a huge difference in OSI between countries sharing similar national income and telecommunication infrastructure levels. These evidences suggest that apart from technical aspects, non-technical aspect such as social and organizational factors as well as the heterogeneity between countries such as national culture should be taken into consideration when implementing e-government. Given the challenges discussed above, questions have been raised concerning what determinant might influence to the discriminant in e-service provision among countries. Most of previous studies found in the literature either utilized primary data in which the results was constrained to a specific case study, or employed secondary data sources which can be criticized for lacking of explanatory power due to omitting important factors. In order to bridging this gap, this paper employs Technology – Organization – Environment (TOE) framework cooperatively with Hofstede's national culture dimensions to provide a comprehensive insight about e-service adoption process. For validating above hypotheses, this study utilizes secondary data from different sources: the culture dimension scores from Hofstede et al. (2010)'s survey; the World Economic Forum (WEF)'s Global Information Technology Report; and the IAC-Waseda E-government Ranking. Different methods were used to analyze data sample. The result suggests that management optimization process, government IT leadership, ICT legislation framework and national culture have influences to the e-service provision. The development pattern of online service is different across countries, subject to country-specific characteristics and IT leadership level. The implications and limitations of this study are discussed. Several recommendations are proposed to help policy makers to realize the strengths and weaknesses of the country's current status of e-government development, thus to provide proper adjustments.

Keywords: e-service, TOE, national culture, cross-cultural, Hofstede, e-government service

1. Introduction

The term of e-service (short for electronic service) or e-government service could be defined as: "deeds, efforts or performances whose delivery is mediated by information technology (including the Web, information kiosks and mobile devices). Such e-service includes the service element of e-tailing, customer support and service, and service delivery" (Rowley, 2006). E-government services are expected to bring huge benefits to governments and citizens such as time saving, reduced cost, enhanced transparency and greater convenience. Considering e-service delivery as one of the top priorities in the national agenda, governments worldwide have continuously allocated sufficient resources to strengthen theirs online service capability.

However, "E-Government projects do not always deliver the full promised benefits, and users do not automatically use available e-government services" (OECD, 2009). Despite of huge resource investments, the adoptions rate of e-government initiatives over the world are far from expectations. As demonstrating in Figure 1, by the year 2014, a large number of UN member states remain in the bottom third of the Online Service Index (hereafter labelled OSI) due to the missing of prerequisites such as an adequate ICT infrastructure or comprehensive security mechanisms to unlock higher levels of online public services (UNDESA, 2014). Some countries, despite of having a great penetration rate of Internet users, still score relatively low in Online Service Index (UNDESA, 2014). The adoption level of e-service also varies significantly across nations. Among countries sharing similar national income and telecommunication infrastructure levels, a huge gap in online service level still exists (UNDESA, 2014). These evidences suggest that apart from technical aspects, non-technical aspect such as social and organizational factors as well as the heterogeneity between countries such as national culture should be taken into consideration when implementing e-government.

Given the challenges discussed above, questions have been raised concerning what determinant might influence to the discriminant in e-service provision among countries. This topic has been of interest to researchers recently (Kovacic (2005), Moghadam & Assar (2008), Khalil (2011), Zhao (2011), Al-Hujran et al. (2011), Cabinakova et al. (2013), Lee et al. (2013), Zhao et al. (2014)). Most of studies either utilized primary data in which the results was constrained to a specific case study with small samples, or employed secondary

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data sources which can be criticized for lacking of explanatory power due to omitting important factors. In order to bridging this gap, this study aims to deliver a more comprehensive investigation on e-service delivery in the global scale by using alternative secondary data sources with robust data analysis methods. The implications of this study would help policy makers to realize the strengths and weaknesses of the country's current status of e-government development, thus to provide proper adjustments.

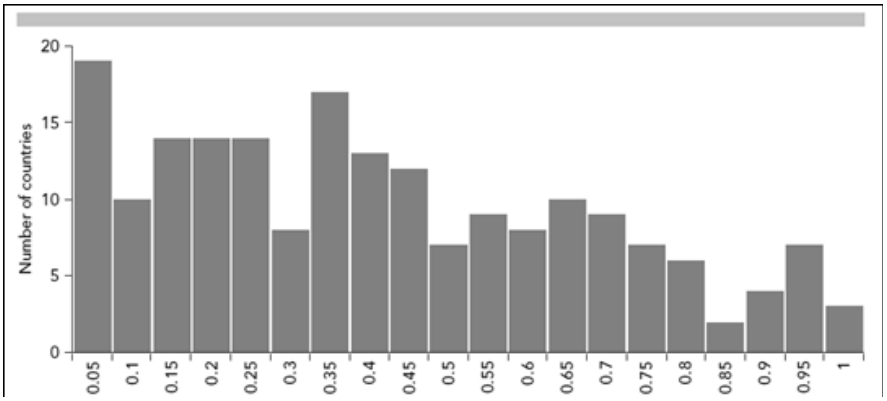

Figure 1: Online services distribution (UNDESA, 2014).

The rests of this paper are organized as follow: the next section is about theoretical background and literature review. The third section presents the research framework including research model, hypotheses and methodology. The data analysis and findings are described in section four. The final section discussed the contributions and limitations of the study.

2. Theoretical background and literature review:

2.1 Technological - organizational - environmental framework

Tornatzky and Fleischer introduced their TOE model in the book "The Processes of Technological Innovation" (1990). The model describes three contexts consisting of various factors which are posited to influence a firm's innovation adoption and implementation process. These three are the technological context, the organizational context and the environmental context. The technological context refers to both the internal and external technologies relevant to the organization. This contains existing technologies which are implementing inside the firm (internal), as well as those are available in the industry (external). The organizational context is defined in term of firm's characteristics and resources including managerial structure, firm size, internal communication process, human capitals and the amount of slack resources. The environmental context indicates the space in which the firm operates its business –the current infrastructure, the industry structure, the legal framework, competitors, and the availability of suppliers. In general, these three groups demonstrate "both constraints and opportunities for technological innovation" (Tornatzky & Fleischer, 1990).

There has been a substantial body of studies in the literature which employed TOE framework to explore and validate the effect of different factors to technology adoption and the model has demonstrated a great explanatory ability across various research domains and scopes. Possible factors having impact to information system adoption were revealed through a number of investigations conducted at firm levels (Zhu et al. (2004), Kuan & Chau (2001), S. H. Teo et al. (2006)). In the context of e-government, an analogue phenomenon occurs where various technological, organizational and environmental determinants were found as driving forces or barriers to the e-government development status (Srivastava & S. H. Teo, 2006), e-government assimilation (Pudjianto et al., 2011), e-government adoption rate of public sector organizations (Ebrahim et al., 2004), m-government readiness (Mtingwi & Belle, 2013). These studies, however, focused only on a single scenario which made the results are unable to generalized. This research will try to fill in this gap by extending the empirical analysis to a broader sense where TOE model is applied across a larger number of countries.

2.2 National culture dimensions

It is widely recognized that national culture, as the source of behaviors and attitudes, influences to the way people think and act toward technology adoption. Among various cross-cultural frameworks, perhaps

Hofstede's cultural classification is the most influential one. Hofstede (2010) defined culture as "the collective programing of the mind that distinguishes the members of one group or category of people from others". His findings were derived from a country level factor analysis on a large body of survey data about the values of employees in a large multinational corporation – IBM – in more than 50 countries around the world. By 2010, there are six culture dimensions as follow: Power distance (PWD) refers to "the extent to which the less powerful members of institutions and organizations within a country expect and except that power is distributed unequally" (Hofstede et al., 2010); collectivism versus individualism (INV) indicates the degree to which individuals are attached into groups; feminity versus masculinity (MAS) implies the difference between a competition, ambition, performance focus society (masculinity) and a solidarity, equality, consensus seeking and social relationships caring culture (feminity); uncertainty avoidance (UAI) reflects the extent to which the members of a society feel threatened by ambiguous or unknown situations; long-term versus short-term orientation (LTO) describes how every society has to preserve its traditional while dealing with the challenges from the present and future; and indulgence versus restraint (IVR) represents a bipolar dimension with allowing basic and human desires related to happiness, joyful in one side and controlling, restricting that such gratification by strict social norm in another side. Figure 2 shows an example of cultural differences by comparing the national culture indexes of the US, Japan and China.

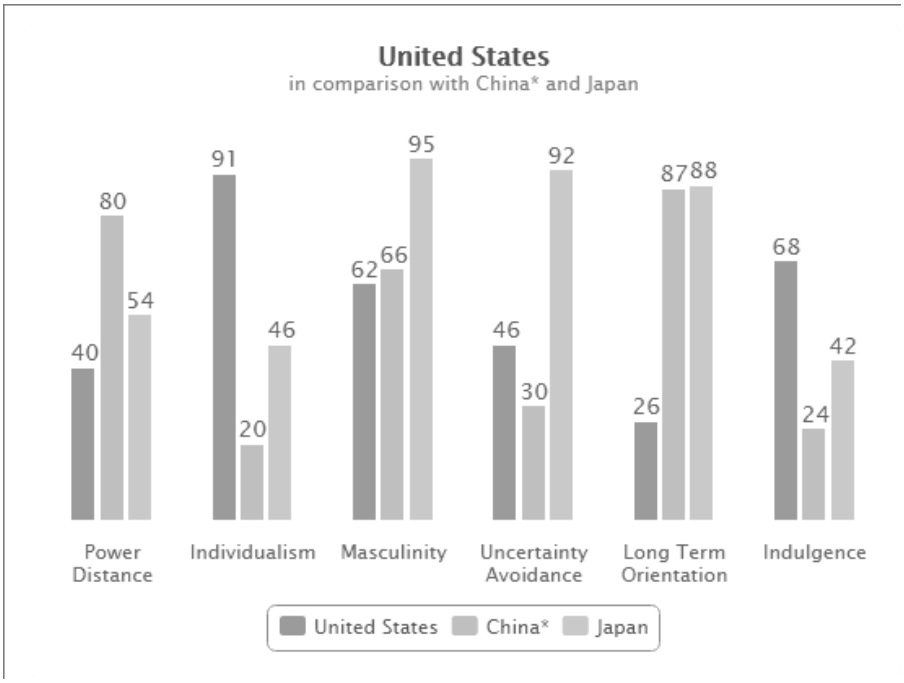

Figure 2: The culture differences between US, China and Japan (generated by http://geert-hofstede.com/)

From its original publication date 35 years ago (1980), Hofstede's groundbreaking conceptualization of culture has attracted a great deal of attentions from cross-cultural researchers worldwide. The analysis of Taras (2009) on 121 instruments for quantifying culture in the literature found "97.5% of all reviewed measures contain at least some dimensions that are conceptually similar to those introduced by Hofstede" (Taras et al., 2009). Hofstede's framework has been applied and validated in a wide range of studies to understand the effect of culture differences on individual attitude and behavior, cross-regional product diffusion, technology acceptance, decision-making, negotiation, conflict management, and so on. Despite of criticism, Hofstede's culture model has been favored by researchers because of its "clarity, parsimony, and resonance with managers" (Kirkman et al., 2006). Therefore, Hofstede's culture framework will be employed in this research as the foundation to examine the influence of culture on e-government service delivery.

2.3 Previous researches on the influence of national culture on technology adoption and e-government service delivery

The relationship between national culture and information system adoption level has been widely acknowledged in previous studies. By renewing Iran's cultural index based on Hofstede's Values Survey Module 1994, Moghadam & Assar (2008) found that there are noticeable differences in the way people behave toward ICT adoption, even they were from the same group. Taking into consideration those

differences, the authors suggested several guidances for ICT adoption within Iran's culture context. Lee et al. (2013) utilized Hofstede's cultural dimensions to explore the effect of culture differences between two types of culture (Type I: Individuallism, Low Uncertainty Avoidance and Shor-term Orientation versus Type II: Collectivism, High Uncertainty Avoidance and Long-term Orientation) on the degree of mobile phone adoption. The analysing of data collected from official sources demonstrated significant differences of adoption pattern between the United State (Type I) and South Korea (Type II). In particular, the study claimed that people in individualistic culture are more likely to make decision independently from the social context, thus may increase the adoption rate at the initial stage. Meanwhile, in the context of Type II culture, people tend to emphasize on "we" rather than on "I" which means they do not use mobile phone on the basis of self-assessment but rather on immitation effects such as subjective norm or word of mouth (Lee et al., 2013). Applying two Hofstede's dimesions – PWD and UAI – into the case study of Jordan, Al-Hujran et al. (2011) argued that these two culture dimensions had a significant positive indirect impact to the level of citizen intention to use e-Government services. Similarly, Cabinakova et al. (2013)'s comparison study of Germany and Slovakia found that UAI was highly relevant to the adoption level of e-Government services of Solovakian citizens but was not for the case of Germans. This result led the authors to the conclusion that there are different impact of cultural factors on adoption of e-Government services. Although the contribution to the literature of above studies could be acknowledged, they were all suffered from a common limitation: most of them concentrated on individual countries but not on a global scope.

In the global scale, several studies found conducting the analysis of the influence national culture has on e-Government adoption by combining culture frameworks with the available secondary datasets. Kovacic (2005) analized e-Government readiness level of 95 countries using data from the United Nation Global e-Government Survey 2003 and Hofstede's national culture score to investigate whether the differences in worldwide e-Government readiness are caused by cultural variables. The results confirmed the significance impacts of INV and PWD to the level of e-Government readiness. Similar conclusions were drawn by Zhao (2011) and Zhao (2013) using the 2010 version of the United Nation e-Government Survey for 84 countries. Apart from relying on Hofstede's culture classification, the association between culture and e-government adoption was also validated by utilizing another culture framework. Two among several studies of this kind are of Khalil (2011) and Zhao (2014) which adopted House and his colleagues (2004)'s ten-year research project, known as GLOBE, to discover the correlation of e-Government readiness and national culture. Both studies highlighted the important effect of culture factors such as collectivism, future orientation, gender egalitarianism, uncertainty avoidance and performance orientation to nations' preparedness for e-Government initiatives.

The most widely used dataset for measuring e-government is the United Nation e-Government Survey series. Although the UN survey has been considered as an effective tool for benchmarking and comparing e-Government development status among countries, it used a composite measure of e-Government which draws on only three sub-indices (telecommunication infrastructure index, human capacity index and online service index) which may inadequate to describe the nature of e-Government. There are also other factors may have influences to e-Government development. With respect to previous studies' contributions and limitations, this research aims to enrich the literature review by taking into consideration the effects technical and non-technical factors as well as the heterogeneity between countries.

3. Research framework and methodology

3.1 Research model and hypotheses

Grounded on the theoretical perspectives and the literature review discussed above, this study proposed the research model as showed in Figure 3.

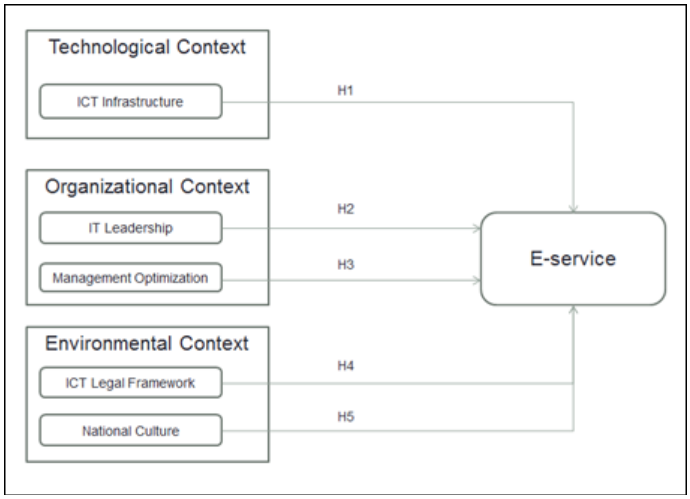

Figure 3: The research model

The maturity level of e-service is the dependent variable. Other independent factors are examined in the three contexts of the TOE framework as explanations below:

3.1.1 Technological context

ICT Infrastructure

"The presence of a well-developed national ICT infrastructure and an overall conducive technological environment appears to be critical for the development of e-Government" (Srivastava & S. H. Teo, 2006). In the context of e-service, since moving to higher stages of online service typically requires additional technical platforms to facilitate online transactions and secure data, an adequate technical infrastructure (internet connectivity, bandwidth capacity, secure servers, computers, and so on) should be the top priority. Therefore, the first hypothesis is proposed:

Hypothesis 1: National ICT infrastructure is positively related to the e-service provision level.

3.1.2 Organizational context

IT Leadership

Within this context, numerous organizational factors were explored in the literature. Among those, many authors believed the engagement of IT leadership could be considered as a major driving force to IS adoption (Mtingwi & Belle (2013), Zahril Shahida Ahmad (2015)). Other authors put IT expertise as a construct inside the technological context (Pudjianto et al. (2011), Hsiu-Fen Lin (2005)), thus underestimated the role of leadership just as simple as a "technical-guy". In term of e-Government, this approach seems not to be appropriate, given the fact that e-Government adoption is not just about technical matters. IT leadership therefore could be defined as "the presence of experts who have mandate to align management strategy with ICT investment in order to achieve a balance between the business strategy, organizational reform, and management reform" (Waseda Institute of E-Government , 2014). This definition implies that the role of an IT champion for any e-Government project is no longer limited to technical aspects but has been expanded to a wider scope to handle more complicated tasks such as policy planning, budget management, IT investment, risk assessment, and so on. Based on the above discussion, the second hypothesis is posed:

Hypothesis 2: IT leadership is positively related to e-service provision level.

Management optimization

Apart from IT leadership, effective e-government development requires a comprehensive strategic planning (S. H. Teo et al. (2006)), the alignment of technology to the current business process and a strong collaboration relationship among government agencies (Zhu et al. (2006)). Those activities were recommended by Waseda Institute of E-Government (2014), known as "management optimization", in order to "enhancing the internal management process of government agencies", thus facilitate online service provision. The analogue opinions could be found in IS adoption literature review. For instance, Zhu et al. (2006) recommended that top managers should put high priority on technology integration together with organization restructure and business reengineering in order to ensure smooth implementation of e-business. Focusing on e-commerce

field, S. H. Teo et al. (2006) suggested that having clear visions and strategies is critical to keep e-commerce plan aligned with business plan. Davison et al. (2005) also claimed that it is necessary to have significant cooperation and communication among government agencies in order to reach higher level of online services. Grounded on the aforementioned perspectives, this research expects that:

> *Hypothesis 3: The level of management optimization is positively related to e-service provision level.*

3.1.3 Environmental context

ICT legal framework

Climbing to higher stages of online services as transactional or connected level typically requires robust data protection mechanism and online payment system (UNDESA, 2014). This poses the demand for endorsing required ICT rules and regulations to facilitate online transactions and prevent various types of cyber-attacks. Similar suggestion was proposed by S. H. Teo et al. (2006) in the context of e-commerce. These authors believed that without appropriate standards for security, encryption, authentication and payment systems, it will be difficult for users to use the system and have confidence in e-commerce. This is also consistent with Zhu and Kraemer (2005) who argued that governments could promote e-business usage by establishing supportive laws to create a trustworthy online environment for conducting business. From the above discussion, it is hypothesized:

> *Hypothesis 4: Country has higher level of regulatory support will achieve greater level of e-service provision.*

National culture

National culture could be considered as one among the heterogeneities between societies influencing to the environment (political, social, economic, and so on) in which e-Government adoption activities take place. For example, technology adoption decisions are highly subjective to the attitudes of policy makers who belong to a specific society and they may consequently be influenced by its cultural characteristics (Erumban & Jong, 2006). Strategy formulation could also be affected by national culture since organizations obtain, examine and validate necessary information from the relationships between the organization with its environment, and the relationships among people within an organization (Schneider, 1989). Guided by these perspectives, this paper considers national culture as the environment in which e-service delivery process may be enabled or delayed.

In the high power distance environment, the social position of superiors and subordinates is distinguished, organization power is centralized as much as possible in a few hands and subordinates expect to be told what to do (Hofstede et al., 2010). In this kind of society, most of previous authors believed that power distance is negatively related to e-government adoption and diffusion. Reasons for this opinion, according to Khalil (2011), could be resided on the possibility that the penetration of IT in society may remove the traditional distribution of power and encourage freedom information.

Uncertainty avoidance was hypothesized negatively relating to e-government adoption in previous empirical studies. Arslan (2009) argued that countries characterized by high level UAI tend to avoid new ideas and innovations. Zhao (2011), Zhao (2013) and Zhao et al. (2014) had the similar perspectives, perceiving e-government diffusion as a new trend in which potentially contains risks and should be avoided in high UAI societies. Theoretically, Hofstede et al. (2010) claimed that in low UAI societies, “ambiguity and chaos are sometimes praised as conditions for creativity”.

In term of LTO, Arslan (2009) supported the perspective that the countries with long-time orientation would show a higher adoption rate of e-government. Since people from LTO cultures don’t focus on tradition as much as the others, they are more likely to open to innovation ideas. In addition, long-term orientation cultures are expected to have a high demand for information and government service to support their long-term socioeconomic development strategy, and therefore, will be likely to allocate sufficient resources to strengthen their IT capabilities (Khalil, 2011). Zhao (2011) concluded that countries with LTO culture are more willing to take-up e-Government initiatives because they tend to have long-term vision and forward-thinking mindset.

The effect of IVR to e-government development has not been validated in the academic literature due to its infancy. However, originating from Hofstede et al. (2010)’s definition, this dimension refers to the perception

of happiness and life control. In indulgent societies, e-mail and internet are more frequently used for contacting, freedom of speech is viewed as relatively important and higher approval of external information such as foreign music and movies. This leads to to a hypothesis that, e-government initiatives could be fostered in a more freedom and less restricted society.

Given above supportive arguments, the following hypotheses are formulated:

Hypothesis 5a: Country with higher level of power distance scores lower in e-service delivery level.

Hypothesis 5b: Countries with higher level of uncertainty avoidance score lower in e-service delivery level.

Hypothesis 5c: Countries with long-term orientation shows higher level of e-service provision.

Hypothesis 5d: Countries with indulgence culture shows higher level of e-service provision.

3.2 Methodology

3.2.1 Data

For validating above hypotheses, this study utilizes secondary data from different sources: the culture dimension scores from Hofstede et al. (2010)'s survey; the World Economic Forum (WEF)'s Global Information Technology Report; and the IAC-Waseda E-government Ranking. A total of 35 countries appears in three data sources during the period 2010 - 2015 were included.

3.2.2 Measurements

E-service is the dependent variable taken from the Online services/Applications indicator of IAC-Waseda E-government ranking survey. This indicator evaluates the maturity level of five online service applications: e-tax, e-custom, e-health, e-procurement and one-stop shop. Different levels of e-service provision are: no plan found; no online presence; static website; one-way interaction; two-way interaction; and online transaction enabled.

ICT infrastructure was constructed based on the Infrastructure and Digital Content pillar of WPF's Network Readiness Index. This indicator captures the development of ICT infrastructure (including the mobile network coverage, international Internet bandwidth, secure Internet servers, and electricity production) as well as the availability of digital content (World Economic Forum, 2014).

Management optimization is taken from IAC-Waseda E-government Ranking. Management optimization refers to the activities carried out by government in order to improve government organization's internal process (Waseda Institute of E-Government , 2014). This indicator reflects the effort of strategy planning, the degree of information system integration, business process reengineering and cross-agency collaboration.

IT Leadership is another construct delivered from IAC-Waseda E-government Ranking survey. This index is evaluated based on the presence of government chief information officer (GCIO), GCIO mandate, CIO organization and CIO development programs.

ICT legal environment is a pillar directly taken from the Political and Regulatory Environment pillar of WEF's Network Readiness Index. This indicator reflects - the extent to which the national legal framework facilitates ICT penetration and a safe development of business activities, taking into account general features of the regulatory environment as well as more ICT-specific dimension (World Economic Forum, 2014).

National culture: PWD, UAI, LTO and IDG are four dimensions of Hofstede's national culture framework.

4. Data analysis

For empirical analysis, the author employs the Hausman-Taylor estimator to find out the probable effects of both time-variant and time-invariant factors to the level of e-service delivery in a country. The Hausman-Taylor estimator is preferable in this study because this method overcomes the known limitations of random-effects

and fixed-effects methods. A pre-test for endogeneity of random-effects model has supported for this choice. To maintain the consistency of measurement unit, the indicators of IAC-Waseda survey and World Economic Forum are re-calculated based on percentage scale. The descriptive statistics of data from 2010-2016 are provided in Table 1.

Table 1: Descriptive statistics for all variables of 6-year sample

Variable (source)	Mean	Standard deviation	Min	Max	Number of observations
eservice: the online services development score (Waseda)	70.96457	18.26386	21.05	102.22	210
ictinfr: the basic ICT infrastructure development score (WEF)	70.94966	19.57496	30	100	210
ictilegal: the ICT regulatory environment (WEF)	67.86735	12.82988	42.85	90.43	210
itleader: the Government CIO score (Waseda)	51.48729	23.20833	0	100	210
optm: the Management Optimization score (Waseda)	80.783	20.23787	18.18	100	210
pwd: the Power Distance score (Hofstede)	56.57143	21.14514	18	100	210
uai: the Uncertainty Avoidance score (Hofstede)	57.42857	22.64131	8	95	210
lto: the Long-term Orientation score (Hofstede)	53.02857	22.00237	21	100	210
idg: the Indulgence versus Restraint score (Hofstede)	51.14286	19.0328	16	97	210

Note: Waseda: IAC Waseda e-government ranking; WEF: World Economic Forum Global Information Technology report.

The underlying equation model is:

$eservice_{it} = \beta_1 + \beta_2 * ictinfr_{it} + \beta_3 * ictilegal_{it} + \beta_4 * itleader_{it} + \beta_5 * optm_{it} + \beta_6 * pwd_i + \beta_7 * uai_i + \beta_8 * lto_i + \beta_9 * idg_i + u_i + e_{it}$ (1)

In which:

- $variable_{it:}$ the variable score of country i at year t.
- u_i : the random-effect error.
- e_{it} : the random error.

The data was analysed using Stata 13. The potential endogenous explanatory variables in this model are: *ictlegal* and *itleader* as they could be correlated with other unobserved variables which are included in the random-effects error. All four Hofstede's culture dimensions are time-invariant variables due to culture is relatively stable. The estimation result is reported in Table 2.

Table 2: The estimation result using Hausman – Taylor estimator

Number of observations: 210 Number of groups: 35 Observations per group: minimum: 6, maximum: 6, average: 6						
eservice	Coef.	Std. Err.	z	P > | z |	[95% Conf. Interval]	
TVexogenous						
ictinfr	.096	.102	0.94	0.348	-.104	.297
optm	.128	.064	1.97	0.048	.001	.254
TVendogenous						
ictlegal	.856	.23	3.73	0.000***	.406	1.304
itleader	.194	.076	2.53	0.011**	.044	.343
TIexogenous						
pwd	.144	.14	1.03	0.302	-.13	.418
uai	.21	.103	2.05	0.040*	.01	.412
lto	-.26	.122	-2.13	0.033*	-.5	-.02
idg	-.232	.151	-1.54	0.124	-.528	.064
_cons	-8.85	24.6	-0.36	0.719	-57.08	39.38

Note: TV refers to time varying; TI refers to time invariant.

***, ** and * denotes significance at the levels of 1%, 5% and 10% respectively.

The data analysis indicates that there are significant positive effects of ICT level framework, management optimization and IT leadership to the development of e-service, which confirms H2, H3 and H4. ICT legal has strongest effect to e-service growth. Meanwhile, ICT infrastructure, power distance and indulgence are found to be not significantly correlated to the provision level of e-service, thus H5a and H5d are not supported. Other two culture dimensions: uncertainty avoidance and long-term orientation are significantly related to e-service delivery; however, they have contradictory effects with what were anticipated in H5b and H5c.

A further analysis using mixed-effects model:

It is reasonable to assume that countries had different initial levels in online service development journey, therefore the intercept in above equation may not be constant across countries. In addition, due to national-specific attributes, countries may have dissimilar growth rate of online service over time. In order to reflect these facts, a mixed effects model with maximum-likelihood estimator was developed to examine both fixed-effects (of ICT infrastructure, management optimization, IT leadership, ICT legal framework and four out of six cultural dimensions) and random-effects (of countries' starting level and development rate of e-government services).
The analysis started with the random intercept model. Aside from the whole-sample fixed intercept β_1, each country *i* is allowed to have its own intercept u_{0i}. The original equation (1) becomes:

$$eservice_{it} = \beta_1 + \beta_2 * ictilegal_{it} + \beta_3 * itleader_{it} + \beta_4 * optm_{it} + \beta_5 * pwd_i + \beta_6 * uai_i + \beta_7 * lto_i + \beta_8 * idg_i + u_{0i} + e_{it} \quad (2)$$

Table 3: The estimation result for random intercept model using Stata 13 with maximum-likelihood regression

Number of observations: 210 Number of groups: 35 Observations per group: minimum: 6, maximum: 6, average: 6						
eservice	Coef.	Std. Err.	z	P > | z |	[95% Conf. Interval]	
ictinfr	.114	.095	1.20	0.229	-.072	.3
ictlegal	.613	.17	3.60	0.000***	.28	.946
optm	.138	.063	2.20	0.028**	.0153	.261
itleader	.217	.06	3.62	0.000***	.1	.334
pwd	.088	.107	0.82	0.411	-.122	.3
uai	.17	.08	2.11	0.035*	.0124	.328
lto	-.23	.095	-2.41	0.016*	-.416	-.042
idg	-.179	.118	-1.52	0.129	-.411	.052
_cons	5.448	18.65	0.29	0.77	-31.1	42
Random effects parameters	Estimate	Std. Err.	[95% Conf. Interval]			
var(_cons)	53.94	20.31	25.79		112.86	
var (Residual)	155.34	16.77	125.72		191.95	
LR test vs. linear regression: chibar2(01) = 19.80 Prob >= chibar2 = 0.0000						

Note: ***, ** and * denotes significance at the levels of 1%, 5% and 10% respectively.

As reported in Table 3, for fixed-effects part, the coefficients of ictlegal, optm, itleader, uai and lto are statistically significant. The result also proves the existence of random-effects at country level which implies the starting point of e-government services varies across countries during 6-year period (estimated variance is 53.94 with standard error 20.31). A likelihood-ratio test confirms that the random intercept model provided a

significant improvement over the ordinary linear regression model (p = 0.000). This model serves as the baseline model for further analyses.

Next, the random effects of slopes (the coefficient for each of predictor) is taken into consideration. Several competent models are examined and compared with the baseline model. Only random-coefficient of itleader shows a significant improvement over the original model. The equation derived from (2) is now including the random slope u_{1i} of the independent variable *itleader* as demonstrated in (3):

$$eservice_{it} = \beta_1 + \beta_2 * ictilegal_{it} + \beta_3 * itleader_{it} + \beta_4 * optm_{it} + \beta_5 * pwd_i + \beta_6 * uai_i + \beta_7 * lto_i + \beta_8 * idg_i + u_{0i} + u_{1i} * itleader_{it} + e_{it} \quad (3).$$

The result of estimation process is reported in Table 4.

Table 4: The estimation result for random intercept and random slope on IT leadership model using Stata 13 with maximum-likelihood regression

Number of observations: 210 Number of groups: 35 Observations per group: minimum: 6, maximum: 6, average: 6						
Log likelihood = -844.40206	Wald $chi^2(8)$ = 47.84			Prob > chi^2 = 0.0000		
eservice	Coef.	Std. Err.	z	P > | z |	[95% Conf. Interval]	
ictinfr	.058	.094	0.62	0.533	-.126	.243
ictlegal	.674	.17	3.97	0.000***	.341	1
optm	.154	.06	2.59	0.01**	.038	.271
itleader	.2	.07	2.76	0.006**	.055	.324
pwd	.095	.112	0.85	0.396	-.124	.313
uai	.143	.08	1.8	0.073	-.0132	.3
lto	-.255	.099	-2.57	0.01**	-.45	-.06
idg	-.168	.113	-1.49	0.137	-.39	.053
_cons	6.986	17.82	0.39	0.695	-27.945	42
Random effects parameters	Estimate	Std. Err.	[95% Conf. Interval]			
var (itleader) var(_cons)	.029 8.79e-07	.0321 .00002	.0033 4.03e-27		.255 1.92e+14	
var (Residual)	143.52	25.3	101.5		202.9	
LR test vs. linear regression: $chi^2(2)$ = 25.94 Prob > chi^2 = 0.0000 LR test vs. baseline model: $chi^2(2)$ = 7.51 Prob > chi^2 = 0.023						

Note: ***, ** and * denotes significance at the levels of 1%, 5% and 10% respectively.

In fixed-effects part, except uai, other predictors (ictlegal, optm, itleader and lto) show significant influences to eservice. The random coefficient of itleader seems to be significant as anticipated, implying the existence of country to country variation in the contribution of IT leadership to the development of online service. Although the estimated variance is slight (0.29), the likelihood-ratio test versus the baseline model (only random intercept) in previous step confirms the difference (p = 0.023). The random-effect of intercept becomes too small that the variation of initial level of online service across countries could be ignored. Figure 4 demonstrated the estimated random coefficient of itleader for 38 countries. The random effect ranges from -0.36 (South Africa) to 0.29 (Estonia).

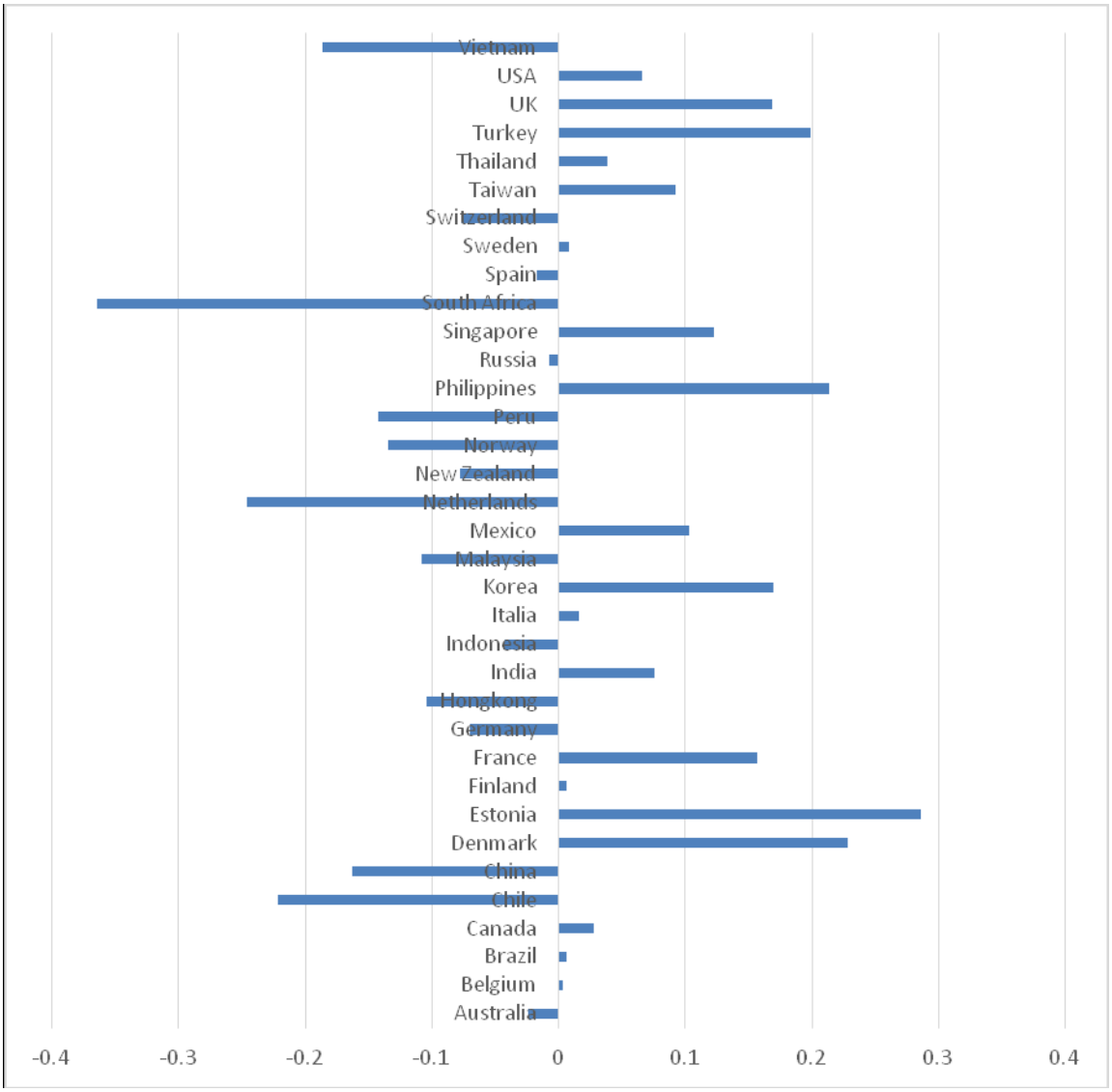

Figure 4: Change in online service score with 1% increase in IT leadership score.

5. Contributions

In general, the result suggests that management optimization process, government IT leadership, ICT legislation framework and national culture have influences to the growth of online service. This result is consistent with previous studies in this area. This paper also confirms the existence of inequality initial level of e-government service and the different contributions of IT leadership to online service development across countries.

The study has revealed valuable insights about the role of IT champions in different government levels to e-service development process. Governments should focus on enhancing human capability by training more government chief information officers who have both technical and policy making skills. However, the difference in random coefficient of itleader variable gives a caution that an effective leadership strategy in a specific country can be counterproductive in another and that different leader styles may yield different impacts to e-government services development. It is recommended that, leadership training programs should be designed in the way to fit with environment and cultural contexts.

Regarding ICT legal framework, with its most significant effect to online service development, it is not exaggeration to say that having a comprehensive and supportive regulation environment is the most essential prior condition for the successful provision of e-government services. Delivering public online services involves lots of activities and situations that required the support from laws and policies. Policy makers should address all relevant issues such as information sharing, digital signature, online transaction, identity authentication,

data collection and protection policies, and so on, and then transform them into regulation policies. However, creating a supportive legislation environment does not always mean enacting more regulation documents. In some situations, removing unnecessary regulations is necessary to handle bottlenecks and facilitate business process. For example in the context of infrastructure investment, in order to attract private enterprises to invest their money into broadband network (which in turn facilitating online service delivery), governments should simplify regulation procedures and encourage a market free-for-all. In term of management optimization, the result confirms the fact that in order to reach higher levels of online services, it is required to change the way governments are operating. Government agencies should avoid "silos" working style and open themselves to more cooperation and collaboration with other government bodies for better quality service delivery. In fact, this argument is backed with several real world examples. Australian government has adapted the proven Federal Enterprise Architecture Framework (FEAF) developed by the United States Government for deploying Australian Government Architecture (AGA) which aims to provide a common language across agencies and to identify reusable and shareable services. In South Korea, the On-nara BPS is a new business process management system implemented within Korean government organizations since 2008. The system has steadily improved the efficiency and transparency of administration process by handling, recording and managing all government's online procedures in a standardized manner. In sum, it is not difficult to conclude that optimizing internal business process and improving interoperability among public organizations are essential elements for an effective and mature online service delivery system.

Surprisingly, ICT infrastructure impact is not as significant as it has been expected. However, the role of ICT infrastructure should not be denied. Instead, the result implies a new direction for e-service development strategy: countries remain low in online service provision despite of its high level of ICT infrastructure and internet user should consider investing in other enablers of online services delivery such as facilitating backend process reform and cross-agency collaboration, enhancing supportive regulatory environment and upgrading the quality of government IT leaders.

Regarding national culture, the result highlights that it is essential to be aware of culture effects when formulating e-service strategy. Unlike previous studies, UAI was found to be positively related to e-service provision. This could lead to an explanation that, the more uncertainty situations are forecasted and prevented, the higher success rate could an e-government project be achieved. Erumban & Jong (2006) posited a similar conclusion: a new technology might go smoothly when uncertainty around the product and the uncertainty concerning the implementation process are lowered. The Japanese has long been famous for a set of strict principles and punctuality in working environment in order to reach the highest level of efficiency which illustrate its near-perfect uncertainty avoidance index (92). Therefore, it is critical to include risk assessment and change management mechanisms in the deployment process of e-government projects to guarantee the final goals. With respect to the long-term orientation, this dimension was negatively correlated with the level of e-service, which poses an inconsistent result with existing evidences found in the literature. Actually, with the "respect for tradition" nature, people in short-term culture societies tend to understand their current situation of e-government readiness, thus be able to propose a more appropriate plan. In addition, a long-term strategy is not always necessary given the fact that e-government development is a complex process containing a huge amount of unpredicted risks and challenges. A short-term plan is more proper and effective in this situation since the outcome could be evaluated in short periods and any change arises could be foreseen and adapted. An example in this argument is the case of the US with only 26 scores in LTO. According to Hofstede, American enterprises usually evaluate their performance on a short-term basis, with profit and loss statements being calculated on a quarterly basis. Striving for quick outcomes is their priority. In line with this argument, Khalil (2011) concluded that long and short term policies should be formulated accordingly to a specific culture profile in order to enhance e-government readiness.

6. Limitations

The limitations of this study could be useful for future researchers. Although the combination of various secondary data sources revealed valuable factors in the context of e-service, the missing of other determinants due to the availability of data is unavoidable. Future researches should consider discovering potential factors that can further explain the discriminant levels of e-service provision among countries.

Another question needs to be addressed by future researches is how cultural dimensions affect to the influence of other predictors to the development of online services. For instance, it could be possible to

hypothesize that in higher power distance societies, the contribution of IT leader to services maturity may not be as strong as it is in lower power distance cultures. In addition, the negative random-coefficients of IT leadership in the third model raise a question about whether the presence of IT champions could be an obstacle for the adoption of e-government services. Since leader' style and behavior are highly cultural sensitive, deeper investigations on the interaction between culture and other predictors such as leader and management styles need to take place in order to enhance e-government development effectiveness.

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