Master's Thesis of Public Administration

Factors affecting e-government success in Asia

아시아에서 e-정부의 성공에 영향을 미치는 요인

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Graduate School of Public Administration
Seoul National University
Global Public Administration Major

Phuntsho Wangmo

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Academic Advisor Eom, Seok-Jin

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Graduate School of Public Administration
Seoul National University
Global Public Administration Major

Phuntsho Wangmo

Confirming the master's thesis written by
Phuntsho Wangmo

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Chair	**Im, Tobin**	**(Seal)**
Vice Chair	**Kim, Soon Eun**	**(Seal)**
Examiner	**Eom, Seok-Jin**	[redacted]

Abstract

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Phuntsho Wangmo
Global Public Administration Major
Graduate School of Public Administration
Seoul National University

In recent years, e-government has received much attention and investment from governments all over the world. E-government is increasingly being used by governments to ensure efficient public service delivery to their citizens. However, the state of e-government development differs vastly across countries and regions. Especially in Asian countries, there seems to be a big digital divide or disparity in the e-government development or advancement across nations. On one hand, there have been many advancements and progress in e-government in countries such as South Korea, Singapore and Japan which are in the Top 10 ranked countries in the world while other countries are lagging way behind.

Although there are many academic works and previous research focusing on e-government or what factors have influenced e-government success, not much empirical research is available on the combination of e-government success factors at a cross-country comparision level especially for Asia. Therefore, the focus of this research is to find out the combination of multiple factors producing e-government success in the top 10 countries and bottom 6 countries in Asia by using the Fuzzy Set Analysis method to find

causal patterns for e-government success or the combination of success factors that enables the top 10 countries in Asia to consistently perform well.

This study has used the Fuzzy-set Qualitative Comparative Analysis (fsQCA) method as it is good for exploring the combination of success factors. The result of this study shows there are certain combination of factors that have influenced these cohort of high ranking countries and that there are different pathways that lead to e-government success.

The analysis highlights that there are three different combinations of causal conditions which lead to e-government success to occur as an outcome variable. The policy implication of this on Asian governments is that it emphasizes the need to look at the difference among the Asian nations and have relevant solutions for each country.

For the developing countries in Asia which are in the bottom 6, it is difficult to follow certain combinations as the difference or the distance to frontier scores of each condition are too great. The gap is too much so these ways of e-government development is not recommended for the bottom 6 countries or for other LDCs.

Since many of the countries in Asia are developing countries with scarce resources and many development priorities, the impact of combinations of causal factors with the absence of some other factors will help to prioritize expenditure and to allocate revenue for priorities by investing in combinations which lead to outcome of high-level e-government success.

The Policy implication of the results is that countries in Asia can focus on following the recommended causal pathway for achieving the outcome of e-government success instead of improving just the technology, organizational, institutional or environment factor on its own. Governments should study their e-government systems in depth and prioritize expenditure to allocate revenue in combinations or conditions which will lead to high level e-government success.

It will be interesting for future researchers to study various other combinations of Multi-level factors of e-government success and to compare them with a bigger sample of countries or across regions in the world. For

future researchers or academics, it might be significant to also conduct further research on the other lowest ranked countries in Asia, Americas and Africa to find out if there are combinations of failure factors to be avoided which lead to e-government failure.

Key words: E-government, Asia, success factors, fuzzy-set analysis, f/QCA, combination of success factors.

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List of Abbreviations and Acronyms

APCICT	United Nations Asian and Pacific Training Centre for Information and Communication Technology for Development
CPI	Corruption Perceptions Index
EU	European Union
EGDI	E-government Development Index
f/QCA	Fuzzy-set Qualitative Comparative Analysis (QCA)
G2C	Government-to-Citizen Project
GNI	Gross National Income
HCI	Human Capital Index
ICT	Information and communications technologies
ITU	International Telecommunication Union
LF	Legal Framework
ODA	Official Development Assistance
OECD	Organization for Economic Co-operation and Development
PC	Political Commitment
UN	United Nations

Chapter I: Introduction

I.1 Background and motivation

Although there are different individual country assessments of e-government systems in Asia, there are very few analyses of e-government success done overall on the Asian continent. The most comprehensive one available is the United Nations e-government survey that is done on a bi-annual basis on the 193 UN member countries.

This research aims to find out what combinations of multiple factors produce e-government success in Asia. There are many previous researches that have focused on what factors lead to e-government success. We know which kind of factors have influenced or led to e-governance success, but my focus is on the combination of success factors which produce e-government success.

My interest is due to the reason as shown by the bi-annual UN e-government study that in some Asian countries have been many advancements and progress in e-government while others are still lagging far behind. I want to find out what combination of factors have influenced these cohort of high ranking and low-ranking countries and so, I will study the top ranked and lowest ranked countries using the Fuzzy-set Analysis Method.

I want to find the combination of success factors which enables certain countries in Asia to perform well consistently whereas others lag far behind the world average.

This study will identify the combination of multiple factors that produce e-government success also because there is not much empirical research available on the combination of e-government success factors at detailed country comparision level especially for Asia, although there are many academic works on e-government success of an individual country or cross-country comparision of e-government success.

I will also compare other socio-economic and demographic data so that it is easier to compare and study the stage of development of the country, resources, human capital etc which also influence e-government success in these countries.

This research may also help policy makers working on the area of e-government to set out future policy recommendations for similar countries as recommendations can be specific and fit the country context.

I.2 Scope of the study

This research compares e-government success factors across 16 selected countries in Asia to find out what combination of factors have influenced e-government success in Asia.

The top 10 and bottom 6 were selected as sample for this research. The unit of analysis will be done at the country level.

Therefore, the scope of this study is:

1. To find out the combination of multiple factors producing e-government success in the top 10 countries and bottom 6 countries.

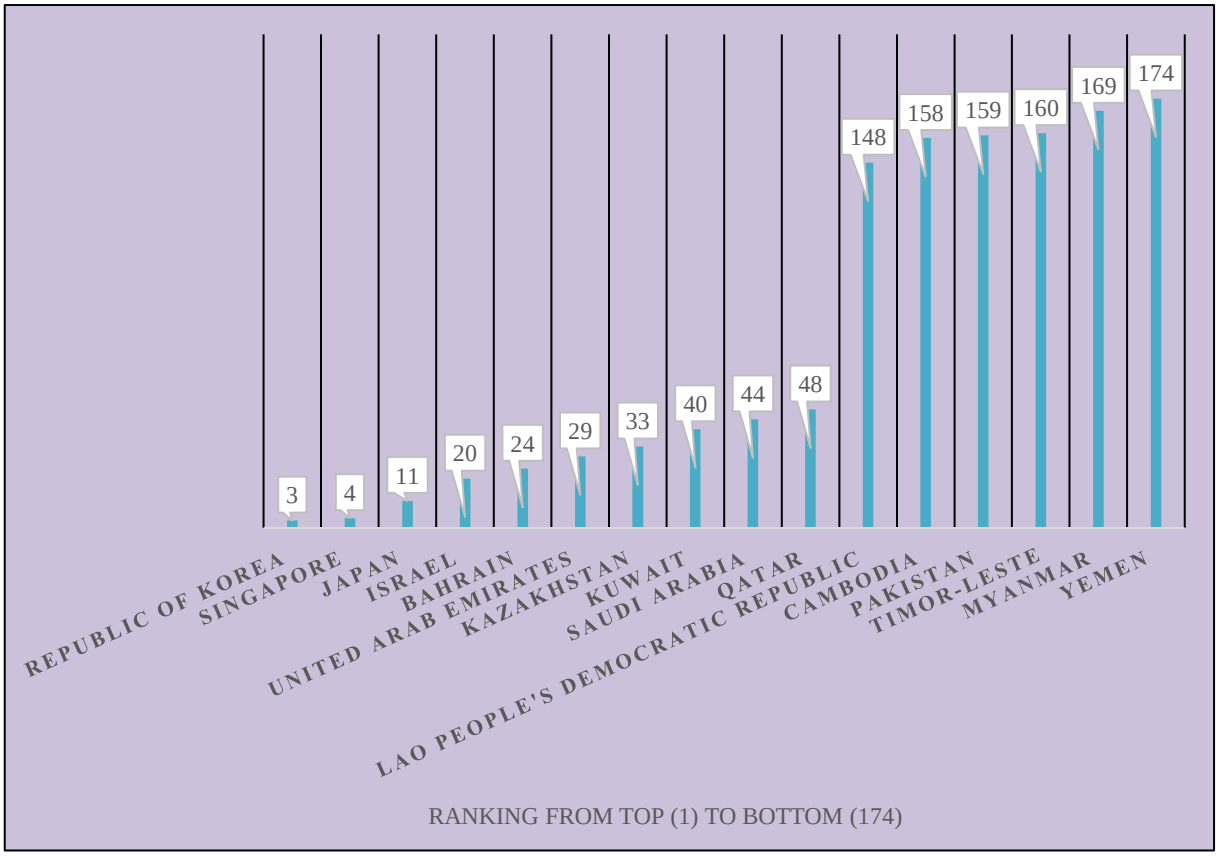
A dataset has been built for all Asian countries from which the top 10 and bottom 6 were selected for this study. The ranking for these countries is as per the UN e-government Study (2016). The top10 ranked countries are Republic of Korea, Singapore, Japan, Israel, Bahrain, United Arab Emirates, Kazakhstan, Kuwait, Saudi Arabia and Qatar.

The bottom 10 countries in Asia are Turkmenistan, Iraq, Lao People's Democratic Republic, Democratic People's Republic of Korea, Cambodia, Pakistan, Timor-Leste, Myanmar, Afghanistan and Yemen. However, this study includes 6 lowest ranked countries in Asia and excludes Turkmenistan, Democratic People's Republic of Korea, Afghanistan and Iraq due to the problem of missing data for some variables for these four countries for the purpose of this research.

A lot of data for these four countries are also not available in the other e-government study and some of these countries websites could not be accessed. This does also reflect the poor e-government status in these lowest ranked countries as data and e-government services are not readily available online.

The combination of e-government success factors across these 16 countries will be analysed.

Figure 1Sample Countries: E-government ranking



I.3 Methods and data

Most of the literature on e-government success factors focuses on the relationship between the dependent variable and the independent variable using survey data and other government data. They study the causal relationship between the variable and its impact on the outcome which is the e-government success.

This research analyses the combination of multi-level factors of e-government success in 16 countries in Asia considering following factors:

1) Telecommunication Infrastructure (TI)

2) Human Capital Index (HCI)

3) Political Commitment (PC)

4) Legal Framework (LF)

5) Net Official Development Assistance (ODA)

6) Economic status of Population (GNI per capita)

According to the available literature, there are many several factors that affect or lead to e-government success or failure across different countries. However, in this research, the above six factors will be studied to find the combination of success factors leading to e-government success.

This study uses compiled data from various sources (table 3.3) and has applied the fuzzy-set analysis using the fuzzy-set Qualitative Comparative Analysis (QCA) to investigate the combination of causal conditions influencing e-government success.

The time span for the data used is data for the year 2016 for all the sample countries. It uses cross sectional data collection for a data collection for a single point in time.

This research uses secondary data sources and a dataset was built from data collected from the UN e-government study for 2016 and other relevant socio-economic indicators from other sources for the selected indicators and variables. A dataset has been built for all Asian countries from

which the top 10 and bottom 6 were selected for this study. The detailed data source is provided in Chapter 3.3.

Chapter II: Theoretical Background and Literature Review

II.1 Definition of E-government

Over the recent years, e-government has become an increasingly popular phenomenon due to the notion of good governance. E-government is a broad concept and so most scholars have different definitions of e-government.

The notion of e-government has also been evolving and changing as the level of e-government changed over the years. The definitions have also been constantly developing according to both the UN e-government definitions as well as other scholars in the field.

E-government services are still changing the way traditional governments work and deliver services all over the world. It has also made it possible for governments to provide better and faster services to citizens, businesses and other stakeholders in a timely and transparent way as well as reduced operational time and costs.

E-government Definition	Source	Year
It is a powerful tool for government administrative reform.	Fountain	2001

The use of ICT and its application by the government for provision of information and public services to the people.	Global e-Government Readiness Report	2004
It focuses on the use of new information and communication technologies by governments as applied to the full range of government functions, particularly the networking potential offered by the Internet and related technologies potential to transform the structures and operation of government.	OECD [1]	2002
A broad concept that includes socio-technical aspects of selection, design, implementation, and use of any kind of information and communication technology in government, from fax machines and mainframe computers to complex inter-organizational systems, cloud computing, information integration, Web 2.0 tools, social media and open government applications.	García, G-R. J	2012
The use of information and communications technologies (ICTs), and particularly the Internet, to achieve better government.	OECD[2]	2013
The use and application of information technologies in public administration to streamline and integrate workflows and processes, to effectively manage data and information, enhance public service delivery, as well as expand communication channels or engagement and empowerment of people.	UN e-government Survey	2016

[1]*E-government: Analysis Framework and Methodology, OECD Public Management Service, Public Management Committee, 2001.*
[2]*OECD, The e-Government Imperative.*

The World Bank defines e-government as ‘the use by government agencies of information technologies (such as Wide Area Networks, the Internet, and mobile computing) that have the ability to transform relations with citizens, businesses, and other arms of government.’ According to the Bank, these technologies enable better delivery of government services to citizens, improved interactions with business/industry, citizen empowerment through access to information, more efficient government management resulting in benefits such as reduced corruption, increased transparency, greater convenience, revenue growth, and cost reductions.

Today, e-government initiatives or government facilities are diverse, extending from services such as provision of simple online information, online financial or payment transactions, mobile applications for real time traffic or disaster information dissemination, e-applications for government services to Interactive Transactions, Tax filing, to systems such as interactive big data or e-government procurement tools among others. Advances in ICT and increased internet connectivity and access through mobile phones have also led to many different e-government applications and different e-government platforms across the world.

E-government is also government activities taking place through electronic communications at all levels of government, citizens, and the business or private sector and other actors. These activities include acquiring and providing products and services; placing and receiving orders; providing and obtaining information; and completing financial transactions.

The UN APCICT Briefing Notes (2010) define e-government as the application of ICTs to enhance the performance of government functions and services.

Various levels of e-government success levels exist around the world. The top five countries for the 2016 UN e-government survey are United Kingdom, Australia, Republic of Korea, Singapore and Finland from first to fifth in order of ranking.

Most recent e-government research and literature incorporates or mentions the UN e-government surveys. The conceptual framework of the UN E-Government Survey compares e-government success across selected countries in the world. The UN survey has adopted a view of e-government development resting on three dimensions: (i) the availability of online services, (ii) telecommunication infrastructure and (iii) human capacity. (UN E-Government Survey Report, 2016).

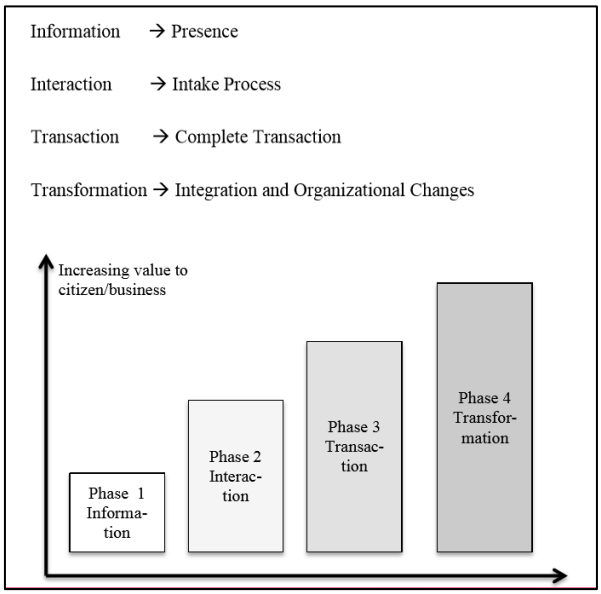
Most of the previous literature has not focused on combination of success factors but the factors have been studied independently. This research aims to find out the combination of factors and not the individual importance of each individual factor.

This research does a cross-country comparison of e-government success across the selected countries in Asia to find out the combination of factors enabling e-government success.

II.2 Maturity Model:

There are different e-government maturity models according to e-government literature. The maturity models range from two to five levels. Gartner (2000) formulated a four-phase e-government maturity model. Gartner's Maturity model consists of the four phases; Information, Interaction, Transaction and transformation. It is depicted in the figure below:

Figure 2 E-governance Maturity Model (Gartner: 2000)

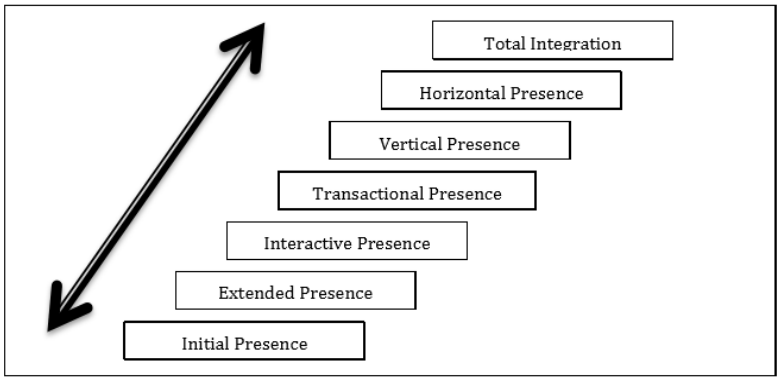


Most of the developing countries which are ranked as the lowest in the UN e-government ranking are in the beginning stages (Phase 1 to III). According to authors, most of these countries lack infrastructure as well as advanced human capacity and citizen engagements. On the other hand, the

developed countries which are on the top of the world ranking are at Phase 4 and have better ICT platforms and infrastructure too.

Figure 3 Seven Stage Model for e-government

(Gil-Garcia: 2012)



The UN has also developed a 4-stage maturity model of e-government. The 4-stage maturity model is used for ranking the UN member states. According to the UN, the 1st stage is "emerging information services" services in which e-government websites provide static information. The 2nd stage is "enhanced information services" in which the presence is enhanced using either one way or two-way communication. The 3rd stage is "transactional services" consisting of two-way interaction with citizens. The 4th stage consists of "connected services" in which e-government websites are more active or proactive and even include or welcome citizen feedback with the use of Web 2.0 tools.

According to the Maturity Model, e-government success means mature services, better services and better technology. According to the easy conceptualization of e-governance which is based on the Maturity Model, success of e-government can be defined as countries which are in the advanced phases of the Maturity Model.

Therefore, based on the many Maturity Models which are currently available in literature and as shown in the UN e-government studies, we can say that the success of e-government is when countries attain the advanced or last stage of the maturity model and offer a very complex level of e-government service delivery to its citizens.

II.3 E-government success factors

According to Gil-Garcia and Luna-Reyes (2007), there are diverse ways to categorize success factors. In the public sector, success measures should go beyond efficiency and cost savings. According to Gil-Garcia (2012), this should include transparency, openness, policy effectiveness, service quality, and citizen participation, among others.

There is no clear set consensus on one e-government definition and because of this, there are many different ideas regarding e-government success factors. Some authors highlight using administrative tools such as process re-engineering to increase chances of probability of e-government success (Anderson et al. 1994; Bandyopadhyay and Sattarzadeh 2010; Davenport 1993; Gulati et al. 2010, Rahman 2010).

According to Gil-Garcia and Pardo (2005), e-government success factors can be classified in five categories: (1) data and information factors, such as data definitions, compatibility, and structures referring to the quality and management of data; (2) technology-related factors, related to the unique characteristics of the technology used; (3) organizational factors and the relationship channels, centralization, and IT success; (4) institutional factors, which apply to any set of rules and informal, regulations, legislation, and more; and (5) contextual factors, with examples of political, economic, demographic, and social variables.

Moreover, Gil-Garcia (2012) also emphasized that there are different ideas regarding e-government success factors due to the lack of a consensus about the definition of e-government, which has led to certain authors emphasizing on using distinct set of tools to increase probability of success of IT projects in various countries.

There are many critical e-government success factors and critical failure factors as well. Different studies list varied factors and there is no set number of factors or minimum or maximum required factor that has been quantified especially at a government level or cross-country comparison level with the government as a unit of comparison.

Therefore, although it is difficult to select few success factors out of the many success factors as stated in various academic papers and government surveys. E-governance success factors in this research refers to selected critical factors as per the above 5 categories classified by Gil-Garcia and Pardo (2005). This is elaborated in the section below:

II.3.1 Technology-related factors

According to Ndou (2004), E-readiness and ICT literacy are also additional factors necessary for citizens to be able to use and benefit from e-government applications. Having the education, freedom and desire to access information is critical to e-government efficacy. There is a high probability that the higher the level of human development, the more likely citizens will be inclined to accept and use e-government services. (Ndou: 2004).

Gil-Garcia (2012), states that all technology characteristics are important in public and in private organizations. Many governments in developing countries often cite that the lack of technological or telecommunication infrastructure is a major reason for failure of ICT or e-government. It is especially more relevant and occurs in developing countries with difficult terrains. When the terrain is very rugged or difficult, it is more expensive and difficult to set up more technological infrastructure or facilities.

It is also important to have systems which are interoperable. For instance, a look at the Eurostat websites of the European Union (EU) shows the standardization or similarity across EU nations which are easy to compare and they have higher interoperability too.

New projects may differ greatly from an older or existing projects design due to improvements in design and technical specifications among others. There may be compatibility issues between the two systems which are difficult to solve. (Baqir and Iyer 2010; Criado 2009; dos Santos and Reinhard forthcoming; Holland et al. 1999; Kelly et al. 1999; Pardo et al. forthcoming; Van Veenstra et al.2001) as cited in Gil-Garcia (2012).

In this study, the selected e-government success factor under this category is: Telecommunication Infrastructure (TI). In this research, Telecommunication Infrastructure (TI) refers to Telecommunication Infrastructure Index (TII) of the UN e-government survey.

This Index is a composite average of the following:

- estimated internet users per 100 inhabitants
- number of main fixed telephone lines per 100 inhabitants
- number of mobile subscribers per 100 inhabitants
- number of fixed broadband facilities/100 inhabitants and
- number of wireless broadband subscriptions per 100 inhabitants

Since many studies also mention Technology and telecommunication infrastructure as one of the reasons for success and failure of e-government projects and initiatives, this study has included TII.

Moreover, the top 10 and bottom 10 countries also differ in their geographical area and population density so including TII also helps as this also takes care of the population and access issue.

II.3.2 Organizational Factors

Child (1972) defines organizational structure as formal distribution of work roles and administrative mechanisms for controlling and assimilating work activities including those that cross formal organizational boundaries.

Organizational structure and processes refer to characteristics, processes, structures, and relationships that occur within an organizational setting, including the project, organizational, and individual levels. Some examples are such as understanding strategic goals, a project management approach, the length of the project, the extent of change in business processes, and the lack of implementation guidelines. (Angelopoulos et al. 2010; Baqir and lyer 2010; Chang et al. 2001; Davenport 1993; Gil-Garcia and Helbig 2006; Hossain et al. forthcoming; Joseph 2010; Rorissa et al. 2010; Seneviratne 1999; Umble et al. 2003; Yang and Maxwell 2011).

The management structure of e-government projects and their future sustainability also have an effect on e-government success. According to Pinto and Moris (2007), there are twelve key behavioral factors that affect success in projects management, such as: personal characteristics of the project manager, motivation of the project manager, staffing and the project manager, cross-functional cooperation and the project manager, project teams and the project manager, leadership and the project manager, communications and the project manager, virtual teams and the project manager, human resource policies and the project manager, conflict and negotiations and the project manager, power and politics and the project manager, and project organization and the project manager.

Executives and managers confront challenges in strategic planning for IT itself and in integrating IT into more general plans and strategies, as well as in procurement and purchasing, creating organizational structure and

designs to incorporate IT and adapt to it, training, recruiting, and many other areas (Barrett and Green, 2001).

Based on the findings of the UN e-government survey, Keping.Y (2016) emphasizes on the need for a central agency, which brings together different ministries and enables them to talk to each other and for easier interaction of databases and services integration.

The following are listed as critical success factors under Organizational structure: Strong and committed leadership, Planning, IT management and change management, Budget preparation and budget execution, Coordination and collaboration, Monitoring and performance measurement, and Government-private sector-citizen partnership. (UNAPCICT, 2012).

Human Capital Index (HCI) is a measure for capturing and tracking the state of human capital development around the world. According to the World Economic Forum (WEF), HCI explores the contributors and inhibitors to the development and deployment of a healthy, educated and productive labour force.

The methodology and quantitative analysis for the WEF rankings are intended to serve as a basis for designing effective measures for workforce planning. While the rankings are designed to create greater awareness among a global audience, this Index also seeks to serve as a basis for dialogue and action by different world leaders at the World Economic Forum to increase public–private collaboration on developing human capital.

The United Nations e-government survey defines and deconstructs HCI into four components, as follows: (i) adult literacy rate; (ii) combination of primary, secondary and tertiary gross enrolment ratio; (iii) expected years of schooling; and (iv) average years of schooling. (UNDESA, 2014). This research will use the HCI from the 2016 UN e-government study for which the original data source was the United Nations Educational, Scientific and Cultural Organization (UNESCO).

As stated by Ndou (2004), that E-readiness and ICT literacy are additional factors necessary for citizens to be able to use and benefit from e-government applications, education is an enabler for ICT literacy as it is easier to teach educated citizens. The HCI of developed countries is higher than most developing nations which fall within the Asian Region.

This can be seen especially in the case of the Republic of Korea, which has is at the forefront of e-government services. In recent years, Korea ranked as the best in e-government in Asia and has been among the top 10 best performers in the world in recent years. Korea has ranked first in the 3 UN e-government surveys in 2010, 2012 and 2014.

Since early 2000's, the Korean government (In this research paper, the term 'Korean Government' refers to the Republic of Korea) has set e-Government as the major national agenda for the new century and focused on implementing 11 major initiatives for e-Government from 2001 to 2002, followed by 31 major tasks for the e-Government roadmap from 2003 to 2007. According to information from the Ministry of Interior, Republic of Korea, in

the late 2000s, the government started to interlink and integrate each respective e-Government system for a wider applicability.

Political commitment for e-governance reforms or projects also ensures that it remains a priority activity in the country's development agenda and that the ICT or e-government projects and facilities will be maintained. This is important since e-government initiatives are usually expensive and for most developing countries in Asia, they have many resource constraints and diverse development needs and priorities. E-government initiatives also need sustained momentum and investment since technology and the nature of services provided keep on evolving and developing.

Due to sustained political commitment to e-government development which is reflected in a government's policy, it can also attract potential investors such as Multilateral Development Banks (MDB) and other Foreign Direct Investment. MDB's such as the World Bank and Asian Development Bank also support and invest in many e-government reforms and projects across their developing member countries such as e-procurement, online tax administration, technical advisory services and e-government capacity building among others.

The countries where the e-government initiatives are sustainable economically as well as with adequate human resources have better chances of sustaining the e-government success.

However, after comparing many organizational factors, I will focus on the following factors:

i. Political Commitment (PC)

ii. Human Capital Index (HCI).

II.3.3 Institutional Factors

According to Scott (2001), as cited by Gil-Garcia (2012), institutional arrangements can be conceived of as laws, norms and meaning systems which not only form guidelines for action but also constrain those actions.

E-government success also includes some of the e-government initiatives such as efficiency, cost-savings, effectiveness, greater service quality, transparency, and increased citizen participation, among others (Gil-Garcia: 2012).

Institutional theory can help explain how information technology influences organizational and institutional arrangements, as well as how these arrangements affect the way information technologies are selected, designed, implemented, and use (Garcia: 2012).

Legal Framework is stated as a critical success factor by many government/project initiatives as well as studies. Under a country's legal framework, law and regulations are important for e-government success. The UNAPCICT states that it is important to plan for sufficient time and direct efforts toward legislative changes that may be required to support the implementation of new processes.

It also suggests that the following laws need to be in place for e-government success: Law on privacy and related issues, Law related to

changes in business processes and information systems, Law regarding the government information technology architecture and establishing an integrated computing center.

Many ITU and UN e-government publications emphasize the importance of the presence of a Legal framework for ICT use and government efficiency. For the condition of Political Commitment, this indicator is taken from a subset or sub-indices in the World Economic Forum's Networked Readiness Index 2016 from the Global Information Technology Report 2016. This variable is calculated as the average of indicators *(8.01)* I*mportance of ICTs to government vision* and *(8.03) Government success in ICT promotion*.

There are many institutional factors which lead to e-governance success factors which different scholars and studies point out. However, out of the many institutional factors that affect e-government success, this study will focus on the following institutional factor:

i. Legal Framework (LF).

II.3.4 Environmental / Contextual Factors

General socio-economic and political environments in a particular place acts as constraints or promotes these initiatives (Fedorowicz et al., 2007; Pardo et al., 2004' Wang; Song, Hamiltion, & Cuewell, 2007; Yang and Maxwell, 2011). The economic, demographic, and social environment of a country has impact on the level of e-government success.

The Economic status of Population of a country is important as the UN e-government Report 2016 highlights a trend over the years. For this research, Gross National Income (GNI) is used to measure and compare economic status of the sample countries.

The UN Report 2016 highlights the trend that there are no low-income countries among the top 50 performers in e-government ranking in the world. All bottom six countries in Asia covered under this research have low to medium Online Service Index (OSI) and no lower Middle-Income Country has High OSI as can be seen from the UN e-government study 2016.

According to the UN e-government Survey (2016), that Least Developed Countries and Developing countries have more urgent needs or priorities such as having a peaceful society (security) and poverty eradication among others due to which e-government and e-government related initiatives do not often stand high in their priority or Agenda list.

The Government capacity or financial budget allocated for e-government projects also affects e-government project success and can also indicate the level of importance given by government.

The UNAPCICT lists the absence of an investment plan as one of the risk factors leading to failure of e-government deployment in developing countries. It also states that many governments of developing states face the difficulties face of limited financial and technical means to embark on meaningful ICT projects and so understanding diverse funding structures and

options available for government to tap into in carrying out ICT for development projects is essential.

Due to this, ODA here is also studied as a causal conditional when combined with other causal conditions as ODA money in developing nations is usually used for capacity building, infrastructure improvements or technical expertise which will also contribute to improving the overall causal conditions which lead to e-government success.

It is also noteworthy that the UN Survey also illustrates a trend of developed countries with higher Gross National Income or Gross Domestic Product performing well on the rankings. Most of the lowest ranked countries are often the Least Developed Countries or Developing Countries in Africa and Asia. Out of the many environmental factors, this study focuses on the following:

i. Economic status of Population (GNI per capita);

ii. Official Development Assistance (ODA).

II.4 Literature Review

II.4.1 Success Factors

According to the UN e-government survey, the methodology for the country rankings are determined by the E-government Development Index (EGDI), which is a weighted average of three normalized scores on scope and quality of online, development status of telecommunication infrastructure and inherent human capital.

According to the UNDESA, especially regarding developing and Small Island States, they state that the following are the key success factors for e-government success: Political Commitment, Legal Framework, Coordinating Body, Sufficient Budget, National e-government Policy, E-awareness and Government Reform.

According to the UN Department of Economic and Social Affairs (UNDESA), the following are 7 key success factors for Small Island Developing States (SIDS) to develop an integrated and comprehensive e-government development strategy: Political Commitment, Legal Framework, Coordinating Body, and Sufficient Budget, National e-government Policy, E-awareness and Government Reform. This is relevant to the developing Asian States which are ranked worst as they also have somewhat similar macro-economic structures.

Therefore this research has included GNI per capita and Official Development Assistance (ODA). If a country has more wealth and resources and wealth, they can invest in infrastructure as well as in improving governance using e-government and technology. The poorer countries will have to invest their scarce resources in more basic services and infrastructure such as roads, health facilities etc.

When it comes to the impact of ODA on a country's development however, there seems to be conflicting views and findings as well. There are empirical studies that have demonstrated that there is a positive impact of ODA or external aid on the growth of the recipient country (Burnside and

Dollar (2004); Tsikata (1998); Lensink & Morrissey (2000) as cited in Lee and Im (2015).

Lee and Im (2015) in their findings highlight the negative impact of ODA on government effectiveness in developing countries. Their findings show that ODA has an adverse impact on government effectiveness. However, they also add that if the government receiving ODA can strengthen its own competitiveness ten aid effectiveness can be achieved.

There is a wide range of literature from different scholars dedicated to studying the effects of organizational, institutional and contextual factors on selection, design, implementation and use of ICT on e-government success. (Azar and Faraj 2008; Caffrey 1998; Herrera and Gil-Garcia 2010).

At a project level, e-Government projects in countries may have the three main outcomes: total failure; partial failure; and success. (Heeks.R, 2011). Based on 26 case studies of e-government in developing/transitional countries, it is estimated that 35% are total failures; 50% are partial failures; and 15% can be completely seen as successes.

Heeks Factor Model identifies a set of ten key factors: external pressure, internal political desire, overall vision/strategy, project management, change management, politics/self-interest, design, competencies, telecommunication infrastructure, and other.

Different authors argue that contextual variables or external pressures may affect the level of e-government success. Gil-Garcia (2008) states that the following three are the most significant factors to represent environments in

which organizations are embedded: Demographic factors, voting preference and size of economy.

Some stress on the importance of Organizational Factors such as political commitment as a very important factor for e-government success. At the UNDESA presentation on the Biannual UN E-government survey, Keping.Y (2016) states that based on their (UNDESA) experience, political leadership and political will from the top level are the most crucial factors for developing successful e-governance.

Others argue that individual behaviour and acceptance of people involved in the technology-related cases is the key to the success of e-government projects (Seddon 1997, Bandyopadhyay & Sattarzadeh 2010; Rowley 2010).

However, during the literature review, although there were some fuzzy set analysis for e-government performance in a particular aspect or e-government security strategy, there was no previous study on finding combinations of multi-level factors lead to e-government success and no cross-country comparison

According to previous literature, there are various success factors such as the ones emphasized above, so therefore, this research aims to find the combinations of conditions which lead to e-government success in Asia with the use of Fuzzy Set Analysis using empirical data for the year 2016.

The UN e-government studies show interesting trends in e-government development. It shows that mobile technology is a strong enabler and cause of successful implementation of e-government initiatives.

Mobiles have a wide reach and are relatively cheaper to acquire now due to new purchase plans and many service providers. The mobile technology is changing and developing and users can even control their homes remotely using their mobiles. For instance, Amazons Alexa and Google Assistant allow users to connect smart devices in the house or office and control them. Even Siri and Samsung's Bixby also allow users to control home accessories. Similarly, service industry and even the government services sometimes use bots or programs to create instant response to queries that have set answers.

Mobile technology is helping users in developing countries to access e-government services easily but they need to be able to use it which highlights the importance of education and human capital in order for new technology to succeed.

Chapter III: Research Design

III.1 Model

This study includes the interoperability of the following:

Telecommunication Infrastructure (TI**),** Human Capital Index (HCI), Political Commitment (PC), Legal Framework (LF), Net Official Development Assistance (ODA), and Economic status of Population (GNI) as the combination of causal factors leading to e-government success in the selected 16 Asian countries. The research model is as given below:

Model Specification:

$$eO = f\ (\mathbf{TI, HCI, PC, LF, ODA, GNI,})$$

Source: Researchers own drawn model

In this model illustrated above, e-government Success (eO) is the Dependent Variable.

The combination of multi-level factors consists of the following:

Indepe-
ndent
Variable

1. Technology Factors (Telecommunication Infrastructure (TI),
2. Organizational Factor (Human Capital Index (HCI) and Political Commitment (PC))
3. Institutional Factor (Legal Framework (LF)and
4. Environmental/Contextual Conditions (Official Development Assistance (ODA) and Gross National Income (GNI).

III.2 Fuzzy Set Analysis Method

The Fuzzy Set Analysis was used to analyze the combination of multi-level factors influencing e-government success. The fuzzy set theory was introduced by Zadeh in 1965. The main feature of fuzziness is that the grouping into classes is dependent on an individuals' judgments and there are no precise defined boundaries wherein uncertain comparisions could be represented by a fuzzy number instead.

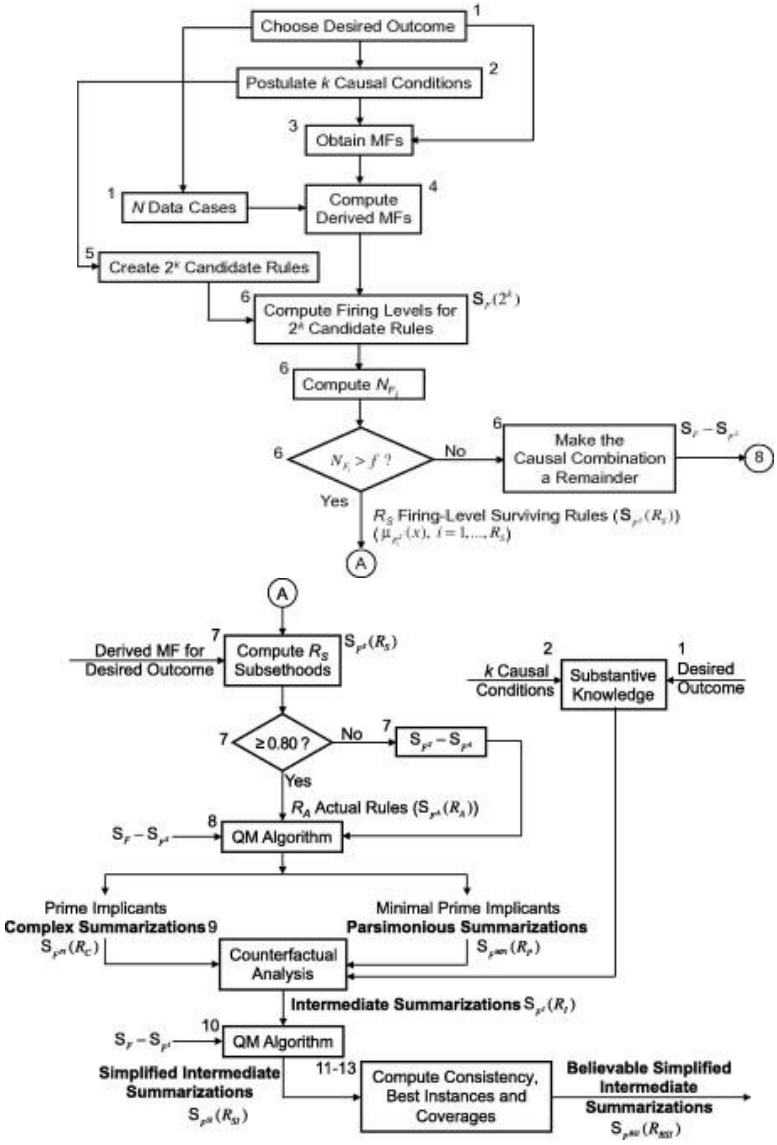
In a fuzzy set, one assigns grades of membership from 0 to 1 to items or variables by defining a membership function as has been done for this research. This research used Fuzzy-set QCA as it is better-suited than regression for this study since it is good for exploring the combination of success factors. Fuzzy Set Qualitative Comparative Analysis (fsQCA) was developed by the social scientist Charles Ragin.

According to Ragin.C.C (2010), fuzzy sets are calibrated using theoretical and substantive criteria external to the data which considers researcher's own conceptualization, definitions and labeling of the sets where the final product results in fine calibration membership degree of cases in sets, with scores ranging from 0.0 to 1.0.

The membership scores depict the varying degree to which different cases belong to a set. The states are quantified as full membership with a score of (1) and full non-membership with a score of 0.

The flowchart figure below shows a mathematical summarization of steps for f/QCA.

Figure 4 f/QCA Flowchart



Source: As illustrated by M.Mendel.J and Korjani.M.M (2013)

According to Eom & Kim (2017), it allows researchers to increase the limited number of cases, the disadvantage of a case-centric strategy, as well as

accepts the basic assumption of a case-centric strategy stating that it aims to find joint causal relationships in the context of each case.

They also add that it overcomes limitations of a variable-centric strategy by calling attention to the phenomenon where several causes are combined in various forms and thereby beget a specific outcome. Therefore, it is appropriate for a diversity-oriented approach which enables researchers to maintain diversity and complexity of causal relationships.

Epstein.J, Duerr.D, Kenworthy.L, Ragin.C (2008) state that the difficulty of interpreting interaction terms with more than two variables makes modeling complex interactions challenging as assessing interactions in regression requires that variables demonstrate a multiplicative effect, whereas QCA treats any case aspects that appear together systematically as potentially interdependent. These are one of the many advantages of f/QCA which is why it has been used for this Research.

I chose to apply this method for my research because I did not find many multi-level factors fuzzy set analysis researches on Asian e-government success and because I also closely followed Eom and Kim's work on Information Sharing Success in Korean Metropolitan Governments which uses Fuzzy Set Analysis.

Another strength of this method is that it uses the fuzzy-set truth table approach which more transparent and enables the researcher to have more direct control over the process of data analysis which helps case-oriented research. (Ragin, 2005)

Therefore, I used the Fuzzy-set Analysis method as the Fuzzification of Asian e-government rankings and other multi-level combinations of success factors enabled me to study these causal relationships more easily.

The causal variable and outcome variable were specified based on theoretical evidence after a lot of literature review. The raw data of each variable were changed into fuzzy membership score from 0-1. The data was then analyzed using the f/QCA software available online.

The logically possible combinations of causal variables were verified with the Truth Table Analysis. However, Ragin also highlights the weakness of taking too many bigger cases and states that when the total number of cases is small, it is more likely that researcher will have more familiarity with each case thereby mitigating the measurement and coding errors.

III.3 Sample Size and Data used

The sample size for this research is 16 countries in Asia that rank on the top 10 and bottom 6 of the UN e-government Survey. The Asian e-governance ranking list is in Table 9. This research was carried out in a single-point in time**.** This research uses secondary data sources. A dataset was built from data collected from the UN e-government study for 2016 as well as other data sources such as the World Bank and others.

This research uses the non-random sampling technique of Judgement Sampling**.** The raw dataset was built for the selected sample of 16 Asian

countries, the top 10 and bottom 6 that were selected for this study. The countries are as follows:

1. Republic of Korea
2. Singapore
3. Japan
4. Israel
5. Bahrain
6. United Arab Emirates
7. Kazakhstan
8. Kuwait
9. Saudi Arabia
10. Qatar
11. Lao People's Democratic Republic
12. Cambodia
13. Pakistan
14. Timor-Leste
15. Myanmar
16. Yemen.

Other secondary data on the selected sample and the region were also used from the World Bank's World Development Indicators and Governance Indicators Database and from the European Union, national government portal, national statistical database of certain countries and government reports.

Data from the International Monetary Fund, UNESCO Institute for Statistics (UIS), Organisation for Economic Co-operation and Development (OECD) and International Telecommunication Union (ITU) was also used for this research. Data from the United Nations Asian and Pacific Training Centre for Information and Communication Technology for Development (APCICT) database is also used.

The data sources and definitions for the success factors are as follows:

1. Technology Factors

- Telecommunication Infrastructure (TI). It refers to Telecommunication Infrastructure Index. The composite average of (Estimated Internet users, Main fixed phone lines, Mobile subscribers, Fixed broadband and Wireless broadband was taken). Source: UN e-government Survey 2016.

2. Organizational Factor

- Human Capital Index (HCI). It is computed as a Composite Index of (i) adult literacy rate; (ii) combination of primary, secondary and tertiary gross enrolment ratio; (iii) expected years of schooling; and (iv) average years of schooling. Source: UN e-government Survey 2016 (original data source for the UN study was UNESCO).

- Political Commitment (PC). This variable is taken from the average of indicators (8.01) Importance of ICTs to government vision and (8.03) Government success in ICT promotion from the subset of Political Commitment ranked from 1-7, with 7 being the best. Source: World

Economic Forum's Networked Readiness Index 2016 from the Global Information Technology Report (2016).

3. Institutional Factor

- Legal Framework (LF).This variable is taken from the Number of Laws (Scoring ranging from 1-7, 7 being the best). Source: World Economic Forum (2016).

4. Environmental/Contextual Conditions

- Official Development Assistance (ODA). It is taken as the Net Official Development Assistance.

- Gross National Income (GNI). This is taken as the Gross National Income per capita of the sample countries. Source: World Bank (2016).

Table 1 Detailed Data Source

Variable	**Conceptual Definition**		**Operational Definition**	**Source**	**Year**
Outcome Variable		Telecommunication Infrastructure	Refers to TII. Composite average of (Estimated Internet users, Main fixed	UN e-government Survey	2016

	Technology Factors	(TI)	phone lines, Mobile subscribers, Fixed broadband and Wireless broadband)		
eO	**Organizational Factor**	Political Commitment (PC)	Ranked from 1-7, with 7 being the best.	World Economic Form	2016
		Human Capital Index (HCI)	Composite Index of (i) adult literacy rate; (ii) combination of primary, secondary and tertiary gross enrolment ratio; (iii) expected years of schooling; and (iv) average years of schooling.	UN e-government Survey (original data source for the UN study was UNESCO)	2016
	Institutional Factors	Legal Framework (LF)	Number of Laws (Scoring ranging from 1-7, 7 being the best)	World Economic Forum	2016
	Environmental	Government Capacity (Net Official Development Assistance)	ODA is defined as government aid designed to promote the economic development and welfare of developing countries. This is the total amount of aid	World Bank Database	2016

	Factors		received.		
		Economic status of Population (GNI)	GNI per capita.	World Bank	2016

Chapter IV: Status of e-government in Asia

According to the UN e-government survey, there exist many differences in e-government development level among the top performing countries and the countries performing badly. The table below shows Asia's average ranking as when compared to the world ranking and the average ranking of regions within Asia. There are 47 countries in Asia covered by the UN Study. Asia is very diverse in socio-economic, geographic and cultural conditions as well and is also the most populated region in the world.

As per the report, at the same time, disparities also remain within and among other regions. Lack of access to technology, poverty and inequality prevents people from fully taking advantage of the potential of information and communications technology (ICTs) and e-government for sustainable development.

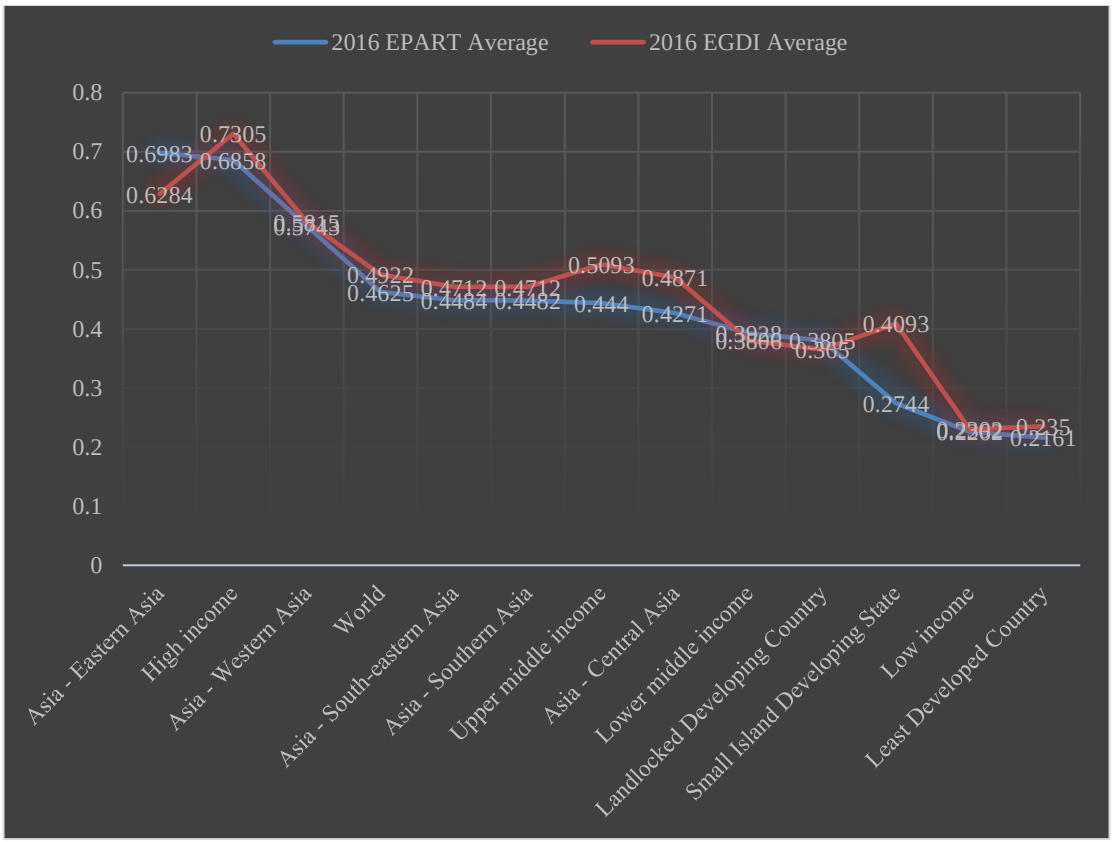
The report states that even in 2016, there is still a huge gap between African countries, with an EGDI average of 0.2882, and European countries, with EGDI average of 0.7241. Europe provides 10 times more services to the poor, persons with disabilities and older persons than Africa and Oceania. As a region, Europe leads the world and coming closer to market maturation.

On one hand Asia is composed of developed nations and big economies like China, Japan, Republic of Korea, Singapore and others. On the other, there are many poorer developing countries in South Asia and South-East Asia which lack both resources as well as technical capacity of both implementers and users. Therefore, the adoption and progress of e-

government in Asia has been different across regions. The UN e-government survey highlights the big disparities across these Asian countries.

According to the UN E-government report 2016, many disparities exist between the Asian Regions. The East Asian Region is above the World Average in e-governance ranking while South Asia, Central Asia and South-East Asia are below the world average. Few countries in the poor performing groups are progressing well and are above the rest. This is illustrated in figure 5 below:

Figure 5Comparision of Asian Regions with others.



Source: Researchers own generated figure using UN e-government Survey data.

The above graph highlights the existing digital divide. The top Technology oriented countries such as Republic of Korea, Singapore and Japan are way ahead of the world average in both e-participation index (EPI) as well as e-government development index (EGDI) while some of the bottom ranked is far behind.

Within the Asian region, as a regional scoring, Eastern Asia performs best with a 0.62 score followed by Western Asia with 0.58 score. Central Asia, South-east Asia and South Asia are behind the world average score with a score of 0.48 and 0.47 and 0.38 average respectively.

The UN e-government survey started in 2001 and it is conducted on a biannual basis. It measures the e-government ranking across the 193-member countries. There are 48 countries in the whole of Asia which are covered in this Survey under Eastern Asia, Western Asia, Central Asia, South-Eastern Asia and Southern Asia.

The Survey presents a systematic assessment of the use of ICT to transform and reform the public sector by enhancing efficiency, effectiveness, transparency, accountability, access to public services and citizen participation (UNDESA). Moreover, the Survey is also adopted by member states as a useful tool for benchmarking e-government development among each other and with other states.

IV.1 Brief overview of the selected 16 countries

The selected sample of 16 countries are very diverse and most countries are very different in the Socio-economic, cultural aspects as well as stage of development. Table 9 in the annexure gives detailed information on the following aspects of these 16 sample countries:

7) E-Government Ranking
8) Population (in millions)
9) Surface area (sq.km thousands)
10) Corruption Perception Index
11) GNI per Capita (Atlas method)
12) Human Capital Index
13) Telecommunication Infrastructure Index (TI)
14) Legal Framework (LF)
15) Political Commitment (PC)

In Part A, the top performing countries are ranked from top 1 to 10 and then in Part B, the worst performing countries are ranked from 1-6 with 6 being the worst. The data of 2016 is compared to 2014 to show/highlight any changes over two years. There is also a two-year gap in data selected as the UN e-government survey is conducted on a bi-annual basis.

However, while comparing countries e-government ranking biannually or against others, the UNDESA also cautions countries and data users that the results of the UN survey should not be taken as an absolute measure as it is a relative measure and a country's decrease in rankings would

usually indicate faster progress by other countries too rather than only indicating a lack of progress in that country.

The Republic of Korea is the top in Asia with a ranking of 3. On the other extreme, Yemen is the worst in e-government in Asia with a ranking of 174. Somalia is the worst in the world with a ranking of 193. Looking at these figures, the digital divide among the Asian Continent is very evident. This may also be due to the lack of common standard or interoperability between systems of different countries unlike the European systems which are very well integrated and follow European Union (EU) standards and similar visions.

While collecting data for this research, the lack of information on certain Asian countries such as Turkmenistan, North Korea and Afghanistan was also an issue. Moreover, Asian region could benefit from a common e-government database like the European database which contains all relevant information and country factsheets.

IV.2. E-government Trends in Asia

The latest UN e-government survey highlights some trends in e-government in countries across the survey range such as of increase in number of countries using e-government to provide public services online through one stop-platforms with an increase from 33 countries in 2003 to 90 countries in 2016.The Survey also highlights that more governments are letting public access their data which is supported by the evidence from 2016 that 128

countries provide datasets on government expenditure in machine readable formats.

This is supported by the fact that the leading nations in Asia such as the Republic of Korea are using Big Data, open data portals, enacting Cloud Computing Legislation (Ministry of Interior, 2015) and using advanced technology such as their '*Ttubot*'- which is an Artificial Intelligence Chatbot to answer user queries and functional 24 hours.

The Survey also shows that generally fixed broadband subscriptions increased across regions but with uneven patterns of increase across regions with Africa at the lowest at 0.6/100 inhabitants, and an overall fixed broadband subscription of *1.2/100 inhabitants*. Asia had an increase of *1.5 users per 100 inhabitants*, Oceania *2.1 users per 100 inhabitants* in the past two years. The Americas had a rise of *1.9* and Europe the highest rise with an increase of *3.5 users per 100 inhabitants*.

This trend highlights the disparities as the Asian Region is the most densely population region in the world with countries such as China and India having a billion plus population which means that the digital divide is even wider.

Chapter V: Data Analysis and findings

This chapter presents the findings and results obtained from Data Analysis after converting the raw data into Fuzzy membership functions or Fuzzy Membership Scores. This was then analyzed using the f/QCA 3.0 software. All the country cases for the combinations of multi-level factors were also analyzed using f/QCA for Truth Table for High-Level Outcome Variable and Low-Level Outcome Variable as well as for necessary and sufficient conditions.

V.1 Measuring the Fuzzy Membership Score

The raw dataset was first converted to the fuzzy membership scores from 0-1 to standardize or normalize data. The following range was used for fuzzification into four values after taking the Minimum and Maximum, Average Values and calculating percentile for 0%, 20%, 50%, 80% and 100% for each set of data for the causal condition:

(0-20%) A fuzzy value of 0 was assigned to data in this range.

(21-50%) A fuzzy value of 0.33 was assigned to data in this range.

(51-80%) Afuzzy value of 0.67 was assigned to data in this range.

(81-100%) A fuzzy value of 1 was assigned to data in this range.

This was followed for all causal conditions except for the Outcome Variable or Indicator of e-government Success (measures in country ranks by

value of rank) which was calculated inversely as the lowest numbers represent the highest value (e.g., Rank 1=100%).

Although there are many ways of fuzzification, this method was chosen as most literature seem to recommend this. Table 1 below shows the fuzzy membership score. *(In the table above and hereafter, ROK: Republic of Korea, SIN: Singapore, JPN: Japan, ISR: Israel, BAH: Bahrain, UAE: United Arab Emirates, KAZ: Kazakhstan, KWT: Kuwait, SAU: Saudi Arabia, QA: Qatar, LAO: LAO Peoples Democratic Republic, CAM: Cambodia, Pak: Pakistan, TL: Timor-Leste, MYN: Myanmar and YMN: Yemen.)*

Table 2 The Fuzzy Membership Score

CountryName	EgovSuccess	GNI	HCI	TII	ODA	LF	PC
ROK	1	0.67	1	1	0	1	1
SIN	1	1	0.67	1	0	1	1
JPN	1	0.67	0.67	1	0	1	0.67
ISR	0.67	0.67	0.67	0.67	0	0.67	0.67
BAH	0.67	0.67	0.33	0.67	0	0.67	0.67
UAE	0.67	0.67	0.33	0.67	0	1	1
KAZ	0.67	0.33	0.67	0.33	0	0.67	0.33
KWT	0.67	1	0.67	0.67	0	0.33	0
SAU	0.33	0.33	0.67	0.33	0	0.67	0.67
QA	0.33	1	0.67	0.67	0	1	1
LAO	0.33	0.33	0.33	0.33	0.33	0.33	0.33
CAM	0.33	0	0	0.33	0.33	0.33	0.33
PAK	0	0	0	0	1	0.33	0.33
TL	0	0.33	0	0	0	0	0
MYN	0	0.33	0	0	0.67	0	0
YMN	0	0.33	0	0	1	0	0

V.2 Truth Table Analysis

Once the Fuzzy membership scoring was completed, the possible combinations of causal conditions/factors were analysed using the fsQCA softwareVersion 2.5. All the tables below show the output of the analysis done using fsQCA.

Table 2 illustrates the f/QCA Truth Table output. The truth table contains all the possible configurations of conditions and the number of cases that belong to that configuration. It also shows the "consistency" of the cases which quantifies the extent to which cases that share similar conditions exhibit the same outcome.

The tables 3and 4 are truth tables. They show the combinations associated with the outcomes of high capability (3) and low capability (4).

Table 3 Truth Table f/QCA output

GNI	HCI	TII	ODA	LF	PC	number	EgovSuccess	raw consist.	PRI consist.	SYM consist
1	1	1	0	1	1	5 (31%)		0.932	0.873606	0.873606
0	0	0	0	0	0	3 (50%)		0.540984	0	0
0	0	0	1	0	0	3 (68%)		0.247191	0	0
1	0	1	0	1	1	2 (81%)		1	1	1
1	1	1	0	0	0	1 (87%)		1	1	1
0	1	0	0	1	0	1 (93%)		1	1	1
0	1	0	0	1	1	1 (100%)		0.853448	0	0

This is the f/QCA output data showing the various combinations and number of cases for the Truth Table Analysis.

Table 4 Truth Table for High-Level Outcome Variable

Configuration	**Causal Variables**						**No. of cases**	**Outcome Variable**			
	GNI (A)	**HCI (B)**	**TII (C)**	**ODA (D)**	**LF (E)**	**PC (F)**		**EgovSuccess**	**raw consist.**	**PRI consist.**	**SYM consist**
AbCdEF	1	0	1	0	1	1	2	1	1	1	1
ABCdef	1	1	1	0	0	0	1	1	1	1	1
aBcdEf	0	1	0	0	1	0	1	1	1	1	1
ABCdEF	1	1	1	0	1	1	5	1	0.932	0.873606	0.873606
Abcdef	0	0	0	0	0	0	3	0	0.54098	0	0
abcDef	0	0	0	1	0	0	3	0	0.247191	0	0

In the Truth table above, the truth table for causal variable and high-level outcome is shown. At both outcome levels, the configurations in the Capital Letters (ABCDEF) refer to situations where the set's membership scores are greater than the threshold point. The lower-case letters (abcdef) denotes situations where the set's membership scores are lower than the threshold point. The threshold point in this case has been set to 0.85.

GNI, HCI and TII are all found in 3 causal sets each. It suggests that countries with better GNI, HCI and TII are likely to be the combination factors that will lead to high-level of e-government success.

ODA is present in only one case which shows that presence of ODA is not the most important in the combination of factors leading to high-level e-government success.

Table 5 Truth Table for Negation

	Causal Variables							**Outcome Variable**			
Configuration	**GNI (A)**	**HCI (B)**	**TII (C)**	**ODA (D)**	**LF (E)**	**PC (F)**	**No. of cases**	**EgovSuccess**	**raw consist.**	**PRI consist**	**SYM consist**

Abcdef	0	0	0	0	0	0	3	1	1	1	1
abcDef	0	0	0	1	0	0	3	1	1	1	1
aBcdEF	0	1	0	0	1	1	1	1	1	1	1
ABCdef	1	1	1	0	0	0	1	1	0.85344	0	0
aBcdEf	0	1	0	0	1	0	1	1	0.8291	0	0
AbCdEF	1	0	1	0	1	1	2	0	0.6328	0	0
ABCdEF	1	1	1	0	1	1	5	0	0.53	0.126394	0.126394

The table above shows the truth table for logical configurations and low-level outcome or Low Capability. It displays only the 7 configurations for which an association with at least one actual case is observed and the ones below this threshold are excluded. The chosen threshold value for the consistency threshold is set at 0.85.

The configurations in the above truth are coded in (0) or (1). The number (1) indicates presence and (0) indicates absence of condition and outcome attributes from that configuration set.

V.3 Analysis of Necessary Condition

After analysing the truth table for both high-level and low-level outcome, the necessary condition analysis was done. The table below shows the necessary conditions in case of high-level outcome variable.

Table 6 Analysis of Necessary Condition

Outcome variable: EgovSuccess

Conditions tested:

	Consistency	Coverage
GNI	0.826597	0.761104
~GNI	0.431551	0.431551
HCI	0.782269	0.898204
~HCI	0.561930	0.462446
TII	0.955671	0.955671
~TII	0.431551	0.397359
ODA	0.086050	0.198198
~ODA	1.000000	0.605367
LF	0.955671	0.814444
~LF	0.345502	0.378571
PC	0.825293	0.791250
~PC	0.432855	0.415000

The Table above shows the conditional analysis of necessary conditions in case of high-level outcome variable/condition.

Table 7 analysis of Necessary Conditions

Outcome variable: ~EgovSuccess

Conditions tested:

Consistency	Coverage	
GNI	0.476591	0.476591
HCI	0.398559	0.497006
TII	0.397359	0.431551
ODA	0.399760	1.000000
LF	0.477791	0.442222
PC	0.438175	0.456250

The Table above shows the conditional analysis of necessary conditions in case of low-level outcome variable/condition.

V.4 Analysis of Sufficient conditions

The table below shows the sufficient condition analysis in case of high-level outcome variable/condition**.**

Table 8 Truth Table Solution

Truth Table Solution

Frequency cutoff: 1consistency cutoff: 0.932

Assumptions:	raw	unique	coverage	consistency
1 GNI*TII*~ODA*LF*PC	0.739244	0.52412	0.943428	
2 ~GNI*HCI*~TII*~ODA*LF*~PC	0.259452	0.0443286	1	
3 GNI*HCI*TII*~ODA*~LF*~PC	0.302477	0.0873533	1	

Solution coverage: 0.870926 solution consistency: 0.951567

The Truth Table Analysis output above shows the following results:

(1) This shows the causal combination of countries where there is a presence high Gross National Income, high-level of Telecommunication Infrastructure, low ODA and high Legal Framework and high political

commitment.

GNI*TII*~ODA*LF*PC

This is a perfect example of the perfect conditions of combination of factors leading to e-government success. This can be seen in the developed countries in Asia**.** This is present in the following 7 countries:

1. Singapore
2. Republic of Korea
3. Japan
4. Israel
5. Bahrain
6. United Arab Emirates
7. Qatar

The countries above are also the top 7 countries in Asia in e-government ranking.

Since these countries have a high GNI, they can invest in the necessary as well as sophisticated technical infrastructure. Along with higher legal framework and political commitment, they have higher Human Capital Index which signifies more education and human capital skills. These scores are much lower for the 6 least ranked countries.

(2) Countries where there is a low Gross National Income, high Human Capital, low Telecommunication Infrastructure, high Legal Framework and low ODA and low Political Commitment.

~GNI*HCI*~TII*~ODA*LF*~PC

This is seen in the country case of **Kazakhstan** which is also among the top 10 ranked countries. In the case of Kazakhstan, the country has high HCI and High LF and even with lower GNI, TII and PC, it was still able to achieve e-government progress.

According to the UN e-government study of 2012, although Kazakhstan's e-government development index ranking was 38, it was the top 3rd country in e-participation index ranking which shows that showing that the citizen engagement is very high.

The government of Kazakhstan has been committed to strong emphasis on education. According to the Ministry of Education and Science of the Republic of Kazakhstan (2018), it has even provided free vocational education among others to upgrade the skills of its citizens.

Moreover, the State Program of the Government of the Republic of Kazakhstan (2018) also aims to increase competitiveness of education and develop human capital. As evident in the UN e-government study, the

emphasis on educating the citizens and improving their Human Capital Index does seem to have contributed a lot to enabling e-government success in Kazakhstan.

However, this combination of factors leading to e-government success may not be applicable for all countries having similar levels of HCI and LF. This needs further study to see the factors that are influencing the e-government success in Kazakhstan will have the same impact in countries with different socio-economic and demographic patterns.

(3) Countries which have high-levels of Gross National Income, Human Capital, technological infrastructure but have low ODA, low legal framework and low political commitment.

GNI*HCI*TII*~ODA*~LF*~PC

This is seen in the case of **Kuwait**. Although it lacks ODA, LF and PC, because it is a rich country with a High GNI, the country and people can afford to invest in TI. Their HCI is also high. Kuwait has a GNI per capita of US $ 41,680 whereas the GNI per capita of the lowest ranked countries ranges from US $ 1040 – US $ 2150.

Although Legal Framework and Political Commitment are low, this has not impeded e-government success as the GNI, HCI and TII are higher which translates into availability of state resources as well as citizens and private sector being wealthy enough to own electronic devices which will lead to more users accessing these services.

The higher TII also means that there is a good level of infrastructure and that the percentage of people having access to telecommunication infrastructure and using it is higher.

This combination can also lead to success, but this is not replicable in the case of the lowest ranked countries which have much lower GNI, TII and HCI.

Since there is a huge gap among the lower ranked countries which are developing countries with human resource constraints, scarce resources and lack of telecommunication infrastructure as the country has many development priorities, it will be harder for the bottom ranked countries to follow this pathway to e-government success.

Chapter VI: Conclusion and Implications

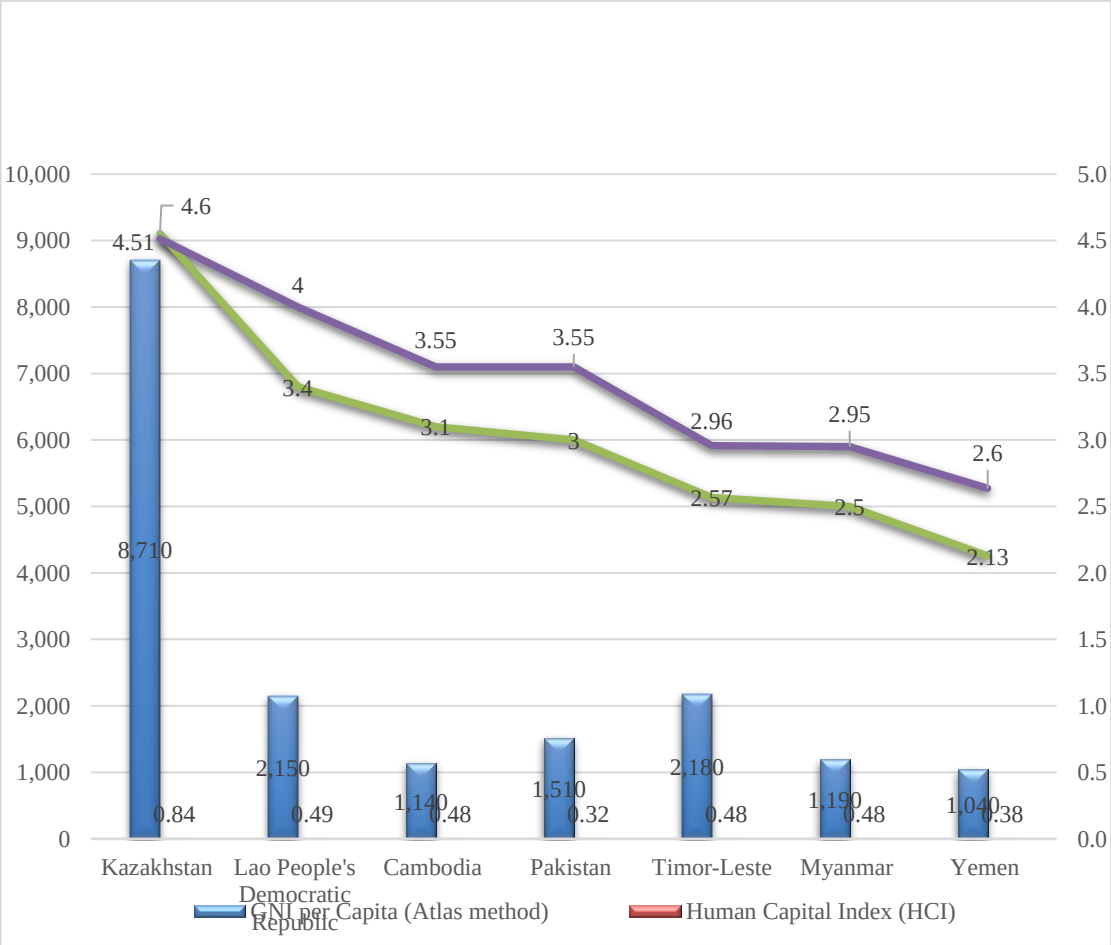
From the Fuzzy Set Analysis, it is apparent that there are combinations of causal conditions which are either sufficient or necessary for e-government success to occur as an outcome variable. The presence of necessary conditions or the absence of sufficient conditions on its own does not lead to e-government success or failure.

The policy implication of this on other countries in Asia emphasizes the need to look at the difference among the Asian nations and have relevant solutions for each country. The outputs above in chapter 5 highlight three ways to achieve e-government success.

But for the developing countries in Asia which are in the bottom 6, it is difficult to follow Case 1 or Case 3 as the difference or the distance to frontier scores of each condition are too great. The gap is too much so these ways of e-government development is not recommended for the bottom 6 countries or for other Least Developed countries elsewhere too.

The Case 2 of Kazakhstan which is ranked top 7 in Asia can be applicable to the bottom 6 countries. Kazakhstan has high HCI and High LF and so even with the absence of GNI, TII and PC, the country was still able to achieve e-government progress. This trend can also be seen in the lowest ranked countries as shown by table 8 below:

Table 9 Cross comparision of Kazakhstan with bottom 6 countries



Since many of the countries in Asia are developing countries with scarce resources and many development priorities, the impact of combinations of causal factors with the absence of some other factors will help to prioritize expenditure and to allocate revenue for priorities by investing in combinations which lead to outcome of high-level e-government success.

Therefore, the more countries invest in human capital, the better their chances of achieving the e-government success as in the case of Kazakhstan. Educated citizens can use e-government facilities better.

Moreover a country with a high human capital index also means that the country has enough expert labour needed for any e-government implementation and this is also more sustainable in the longer run than hiring external experts which is more expensive and time consuming.

A good Legal Framework can also help corruption control and be a good enabling environment for developing e-government in a country.

However, as noted in section IV.5 (2) above, this combination of factors leading to e-government success as in Kazakhstan's case may not be applicable to all countries having similar levels of HCI and LF.

Further study to see if the factors that are influencing the e-government success in Kazakhstan will have the same impact in countries with different socio-economic and demographic patterns if they follow the same pathway will be needed to see if this success story is replicable.

VI.1 Limitations of the Study

One limitation of this research was finding data for the selected countries. Originally the bottom 10 countries were to be compared against the top 10. However, even in the UN and ITU database, there are missing data for countries such as Afghanistan, Democratic People's Republic of Korea, Turkmenistan and Timor-Leste. So, these 4 countries were excluded.

Moreover, while doing this research, the researcher experienced first-hand that due to the lack of interoperability and common standards in Asia such as those present in the EU, it was hard to create a data set whose output was comparable across countries.

In this regard, the Fuzzy Set Analysis was very helpful to normalize available raw data into a standardized format.

Although there are many success factors in literature and as per the EU or ITU e-government tool kits for measuring e-government across nations or evaluating e-government, this research model only includes some selected conditions as most literature and manuals on fs/QCA advise the user to not use too many combinations of causal factors.

There is no guide to a maximum or minimum or optimal level of factors to be taken. It will be interesting for future researchers to study various other causal factors of e-government success and to compare them with a bigger sample of countries.

One thing that was very evident during this research was the issue of standardization across Asia and the case of missing data. There are countries such as Turkmenistan, Afghanistan and Democratic People's Republic of

Korea which do not have a lot of data available so due to which they were dropped from the scope of this Research.

Since these are the lowest ranked countries when it comes to e-governance in Asia and the world, it will be interesting to do further research on these countries and find out if there are combinations of failure factors to be avoided which lead to e-government failure.

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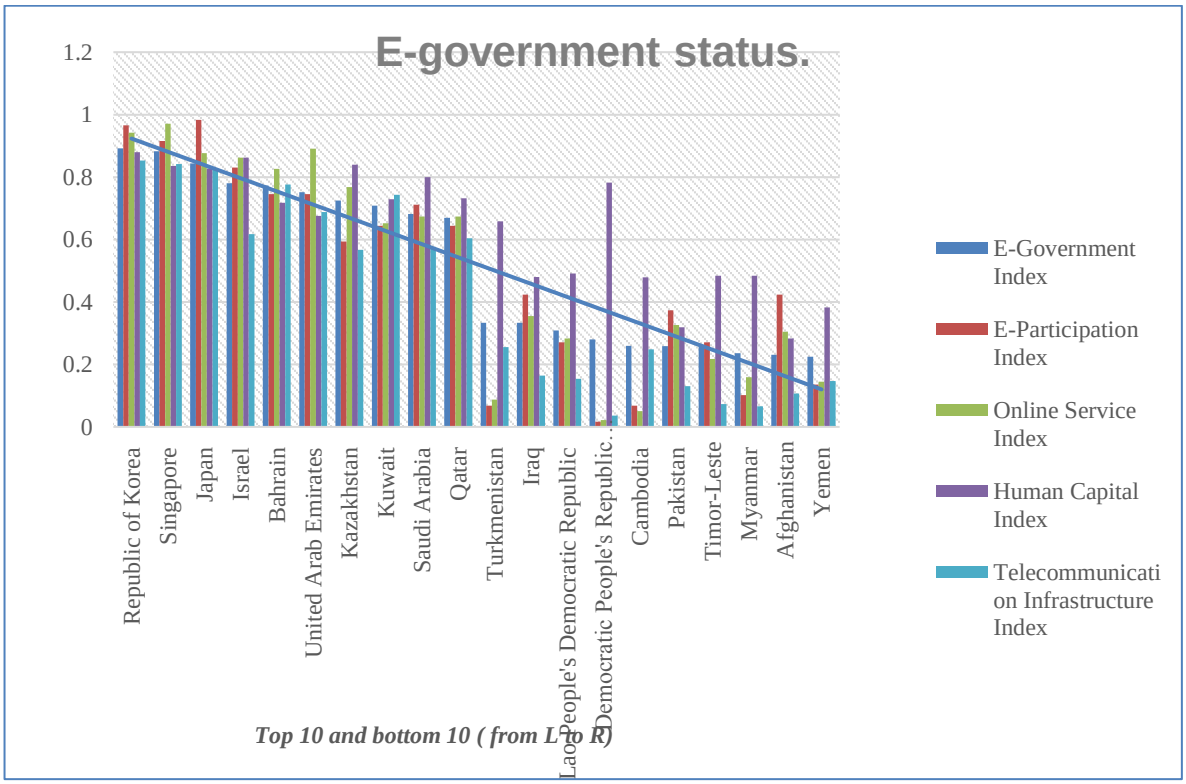
Appendix

Graph 1 E-government ranking (breakdown of components)



Source: Researchers own generated graph (Drawn using UN Survey data, 2016)

Table 10 Overview of sample 16 countries

SL.NO	COUNTRY NAME	E-GOVERNNMENT RANKING	POPULATION (IN MILLIONS)	SURFACE AREA (SQ.KM THOUSANDS)	CORRUPTION PERCEPTION INDEX	E-GOVERNMENT INDEX	GNI PER CAPITA (ATLAS METHOD)	HUMAN CAPITAL INDEX	TELECOMMUNICATION INFRASTRUCTURE INDEX (TI)	LEGAL FRAMEWORK (LF)	POLITICAL COMMITMENT (PC)
1	REPUBLIC OF KOREA	3	51.2	100.3	53	0.89149	27,600	0.87947	0.85296	5.1	5.05
2	SINGAPORE	4	5.6	0.7	84	0.8828	51,880	0.83598	0.84141	5.7	5.9
3	JAPAN	11	127	378	72	0.84397	38,000	0.82738	0.82771	4.8	4.8
4	ISRAEL	20	8.5	22.1	64	0.78056	36,190	0.86189	0.61748	4.7	4.75
5	BAHRAIN	24	1.4	0.8	43	0.77335	22,740	0.71777	0.7762	4.5	5.15
6	UNITED ARAB EMIRATES	29	9.3	83.6	66	0.75153	40,480	0.67516	0.68813	5.3	6.15
7	KAZAKHSTAN	33	17.8	2,724.90	29.00	0.72499	8,710	0.8401	0.56677	4.6	4.51
8	KUWAIT	40	4.1	17.8	41	0.70795	41,680	0.72873	0.74295	3.2	3.25
9	SAUDI ARABIA	44	32.3	2,149.70	46.00	0.68224	21,750	0.79946	0.57334	4.7	5.3
10	QATAR	48	2.6	11.6	61	0.66988	75,660	0.73166	0.60408	5.8	5.85
11	LAO PDR	148	6.8	236.8	30	0.309	2,150	0.49072	0.15366	3.4	4
12	CAMBODIA	158	15.8	181	21	0.25927	1,140	0.47847	0.24862	3.1	3.55
13	PAKISTAN	159	193.2	796.1	32	0.25832	1,510	0.31898	0.12989	3	3.55
14	TIMOR-LESTE	160	1.3	14.9	35	0.25817	2,180	0.48429	0.07284	2.5678821	2.95800601
15	MYANMAR	169	52.9	676.6	28	0.23619	1,190	0.48365	0.06551	2.5	2.95
16	YEMEN	174	27.6	528	14	0.22478	1,040	0.38288	0.14655	2.12786321	2.6

Source: Researchers own generation (from Various Sources[3])

[3]*Refer to Table 3.3 Data Sources*

국문초록

아시아에서 e-정부의 성공에 영향을 미치는 요인

Phuntsho Wangmo

서울대학교 행정대학원

글로벌행정 전공

최근 몇 년간 e-정부는 전 세계 정부들로부터 많은 관심과투자를 받았다. 시민들에게 효율적인 공공 서비스 제공을확보하기 위해 점차 많은 정부가 e-정부를 활용하고 있다. 그러나 e-정부 개발 상태는 국가나 지역에 따라 큰 차이를 보인다. 특히 아시아 국가들에서는 e-정부 개발이나 발전에 있어서 국가간에 큰 디지털 차이를 보인다. 한편으로는 세계 10 위권에 드는 한국, 싱가포르, 일본과 같은 국가들에서 e-정부는 많은 진전과 진보가 있었지만, 다른 국가들은 한참 뒤쳐져있는 상태이다.

비록 e-정부나 e-정부의 성공에 영향을 미치는 요인에 초점을 맞춘 많은 학술 저작과 과거의 연구가 있었지만, 특히 아시아의 국가간 비교 단계에서 e-정부 성공 요인의 조합에 관한 실증적 연구는 많이 없는 실정이다. 그러므로 이 연구의 초점은 Fuzzy Set 분석 방법을 사용하여 아시아 상위 10 개 국가와 하위 6 개 국가에서 e-정부를 성공하게 하는 다양한 요인의 조합을 찾고, e-정부 성공의 인과적 유형이나, 아시아 상위 10 개국에서 지속적으로 성과를 보이게 하는 성공 요인의 조합을 찾는 데에 있다.

이 연구는 Fuzzy-set 양적 비교 분석 (fsQCA) 방법을 사용하였다. 이 방법은 성공 요인 조합을 탐색하는 데 유용하다. 이 연구 결과는 상위 국가군에 영향을 미치는 특정한 요인 조합이 있으며 e-정부 성공으로 가는 다양한 방식이 있음을 보여준다.

분석 결과, 결과변수로서 e-정부의 성공을 이끄는 인과적 조건의 세 가지 다른 조합이 강조된다. 이것이 아시아 정부들에서 가지는 정책적 함의는 아시아 국가들간의 차이점을 살펴볼 필요가 있으며, 각각의 나라에 적합한 해결책이 있다는 점이다.

아시아 하위 6 개의 개발도상국에서는 개별 조건의 차이나 기업환경평가점수가 너무나 커서 특정한 조합을 찾기에는 무리가 있다. 그 차이는 너무나 커서 하위 6 개국이나 다른 저개발 국가에서 e-정부의 개발을 위한 이러한 방식은 추천할만 하지 않다.

이 연구 결과가 가지는 정책적 함의는 아시아 국가들은 e-정부의 성공을 성취하기 위해 기술적, 조직적, 제도적, 혹은 환경적 요소들을 개선하는 대신에 인과적 추천 경로를 따라갈 수 있다는 것이다. 정부는 자신들의 e-정부 체계를 깊게 연구하여 고도의 e-정부 성공을 이끌 조합이나 조건에 예산을 할당하는 지출의 우선순위를 매겨야만 한다.

e-정부 성공의 다평면의 여타 다양한 조합을 연구하거나 그 조합들은 세계 다른 지역의 더 큰 국가 표본과 비교해보는 것은 다음 세대 연구자들에게 흥미로울 것이다. 미래의 연구자들이나 학자에게는 아시아, 아메리카, 아프리카의 다른 저 순위 국가들을 연구해 e-정부 실패를 유도하는 피해야만 할 실패요인의 조합을 밝히는 작업도 의미있을 것이다.

핵심어 : e-정부, 아시아, 성공요인, fuzzy-set 분석, f/QCA, 성공요인조합

학번 : 2016-23416

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