

Key Factors on Software Reuse of e-Government Common Framework

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Abstract— Over the last few decades, software reuse has been stressed as a key factor for the developers to improve the productivity and the quality of information systems. However, some drawbacks of a vendor-dependent proprietary framework from major SI companies can also be formed in e-Government systems. This paper is differentiated from other prior studies in that it involves field experimental research to find out key managerial factors on the reusable component in the public sector. The result of this paper shows that the reuse of common components has a relatively high correlation on the type of agencies, project period and the size of agencies, budget volume and business domain affects the reuse without any distinction. In addition, this paper shows the key factors on the managerial perspective, with more future research needed for the technical and political factors to verify reuse factors.

Keywords— e-Government, Software reuse, eGovframe, Open innovation, Common component, eGovFrame

I. INTRODUCTION

Most countries have actively developed e-Government systems as a crucial means to make its government more efficient and transparent by leveraging up-to-date information technology. As a result, e-Government has been established in all areas of the public sector and produced both tangible and visible results. Recently e-Government applications have been continuously built by individual governments around the world. When an e-Government system has been developed, the reusable software framework and common component has been mostly used so as to not only eliminate redundancy but also improve interoperability between information systems. Software framework and common component have been used in e-Government service development in the public sector.

However, due to the participation in the development of a specific vendor dependent and proprietary framework, e-Government systems are developed by different vendors in different e-Government projects. It is for that reason that there have been increases in development costs and some limitations to reuse e-Government software from different vendors such as major system integration (SI) companies. Nevertheless, the individual institutions and agencies have suffered some barriers by developing redundant business functions of e-Government systems. It seldom reuses the same functions and common components to improve system

interoperability and scalability in the silo systems. Most public agencies welcome engagement from different vendors to develop e-Government software applications. This results in unfair competition as the government agency is locked-in in choosing the original vendors.

Generally, it is often said that the e-Government framework is kind of systemic strategy to manage business processes and IT service processes in the public sector. It consists of a legal framework, guidelines, standards and norms, etc. It includes all of the IT project life cycle from planning, budgeting, execution to evaluation and auditing. It could be coordinated with four categories of the e-Government framework in mind, including; political, managerial, operational and systemic perspective. However, it focuses on a common software framework of e-Government to enhance the interoperability of business applications by reusing a common framework for developing e-Government systems in this paper. Most e-Government applications have been developed by different vendors for various IT projects in the public sector.

Meanwhile, there are some drawbacks that have originated from vender's software frameworks. By applying software frameworks, e-Government projects become highly dependent on IT vendor's proprietorial framework. Consequently, it is difficult to maintain business application for the technical support without a framework provider who implemented these applications. In the case of long term projects, the framework applied in the previous project works as a technical barrier to a new competitor, which eventually caters to a vicious cycle of unfairness in the software market due to the provider's proprietary assets. For that reason, the business logic of an e-Government application is also dependent on a certain vendor's framework. Due to the black box type of software framework, only the IT provider can maintain the e-Government application, which results in a lock-in to that specific framework. Besides, multiple frameworks in the multiple agencies cause redundancy in application development, system operation and maintenance.

In order to overcome these issues, the open source-based e-Government software framework and common components, a specifically designated 'eGovFrame' has been adapted for e-Government system development in public sector since 2009. The eGovFrame is a common set of software tools for developing and operating e-Government

services in order to improve the efficiency of IT investment and the quality of e-Government services. It enhances the reusability of e-Government systems and interoperability of business applications by using a common software framework. In addition, it reduces the vendor dependency more or less by adopting open source software modules and strengthens the competitiveness of small and medium enterprises by sharing the tools through various means and channels. Most governments often encounter the complex issues of the interoperability of e-Government developed by different vendors in different e-Government projects. Based on the open source framework, eGovFrame enhances the quality of the information system and investment efficiency based on open standards, resulting from the reuse of common components.

There are reported six types of the reusability values: cost-benefit models, amount of reuse metrics, maturity assessment models, failure modes models, reusability assessment models, and reuse library metrics [12]. Software reuse is the process of developing software systems from existing software rather than building information systems [19, 14]. The effectiveness of a reuse technique was evaluated in the intellectual effort required to use the technique in two ways: higher abstractions from the software system in the reuse technique and the effort required to the abstractions to an executable implementation [5, 8].

It is thought that the difficulty of information systems derive from inadequate software design and development practices. Poor design choices result in complex software that is costly to support and difficult to change [1, 2]. For a framework design, class-based modelling with role modelling concepts and introduces frameworks as explicit design and implementation artefacts with well-defined boundaries [26]. The analysis of software productivity ranges and the software value chain led to the major opportunity areas for improving productivity. It is getting the best from people, automation portions of the development and evolution process, eliminating rework, writing less code by reusing software components, developing and using application generators and fourth-generation languages and avoiding software gold plating [5-7]. Software reuse criteria were examined to understand how much reuse technologies and evaluate what kinds of factors influence the rate of reuse in an organization [12].

Recently in software industry ecosystem, open innovation has the benefits to the potential for overall benefits. It argues that openness may generate positive externalities by enabling knowledge diffusion [20, 27]. These externality effects are unlikely to work through their effect of open innovation practices. Instead, they positively influence innovation outputs by increasing knowledge diffusion and strengthening competition [8, 19, 27]. Sometimes, government regulation can inhibit knowledge sharing actions among competitors and reduce technology and the knowledge resource influences from external participants. The many requirements ranged from terminological changes to more detailed characterizations of elements of reusability

framework [4, 13]. The findings have the externalities from openness in innovation process have a rationale for public policy and positive benefit from public intervention to increase the level of openness from socially sub-optimal levels [9, 10].

Some of the key factors are derived from empirical evidence of reuse practices [24]. In a variety of business domains, most procedural development approaches are related with high commonality between applications and have at least reasonably mature processes [22]. Three main causes of failure were not introducing reuse-specific processes, not modifying non-reuse processes, and not considering human factors. The success was achieved when a potential for reuse because of commonality among applications to enhance reuse processes, modifying non-reuse processes, and addressing human practices [21]. These kinds of development from multiple IT provider case studies identify some key factors and its sub-factors affecting the adoption of new technology [23].

Open source software development method is generally classified into two governance models [17]. First is the Cathedral model that is available with each software release, but code developed software releases is restricted to an exclusive group. Second is the Bazaar model. Open source software development has evolved to be less bazaar-like with emphasis on strategy for market [25]

The importance of improving software productivity: some national, international, and organizational trends indicate the significance of improving software productivity. Some of the pitfalls and paradoxes is studied to define and measure software productivity and how best to deal with them [2, 3]. The externalities of openness in innovation has the potential spill over benefits of open innovation beyond the focal firm for such externalities related to buzz, structured inter-firm linkages and competitiveness effects[11]. This suggests a positive benefit from public intervention to increase the level of openness from socially sub-optimal levels [15]. This paper is an attempt to identify the key factors of the common component reuse of the e-Government software framework. This research is the first attempt to observe in a large scale of e-Government which includes more than 436 e-Government projects adopted in the public sector. In the case of technological factors, the author presents the reusable architecture, the life cycle of information system which includes; runtime environment, development, operation environment and management environment [16].

II. RESEARCH MODEL

The purpose of this study is to determine the key factors of the common component reuse of the e-Government software framework in the public sector. It has been adapted from a field experiment that analyzed sixty-seven e-Government projects from 2004 to 2007. The criteria that extracted common functionalities for component were high probability

on repeated development for enhancing reusability among government systems and standard adoptability. After five refining processes were passed, four environments of eGovFrame and a total of 219 common components were selected. This paper uses the result of 436 e-Government projects (517 information systems) which were implemented in the public sector, which had been observed in a whole dataset from 2009 to 2013 over the period of time.

The attributes of 436 e-Government projects comprises the size of organization, the size of public agencies, project period, business domain and so on. The eGovFrame aims to provide a common set of software tools for developing and running e-Government applications to improve the efficiency of IT investment and the quality of e-Government services. It focuses on utilizing a common framework for developing software of e-Government that is ensuring the independency from IT vendors by adopting open source software tools and enhancing the competitiveness of IT SMEs by sharing these non-proprietary tools. In general, it categorizes the key factors of e-Government as political factors, managerial factors and technological factors. This study approaches it from the perspective of managerial factors which are related in the attributes of e-Government project management such as the type of organization, project period, IT budget volume, etc.

It identifies three main classes of enhancing factors to influence the management of knowledge in organizations. There are managerial influences, resource influences and environmental influences. In the aspects of knowledge management issues, managerial issues are concerned with building a trusting environment conducive to sharing knowledge. In order to be a reusable framework, eGovFrame also has been concerned with establishing a more trusting environment from a variety of stockholders. Mostly, The eGovFrame settled as a cross-government platform for holistic e-Government services. It comprises of standardized software tools for developing and operating e-Government applications with standardized templates and interfaces for various e-Government services across the business area of government.

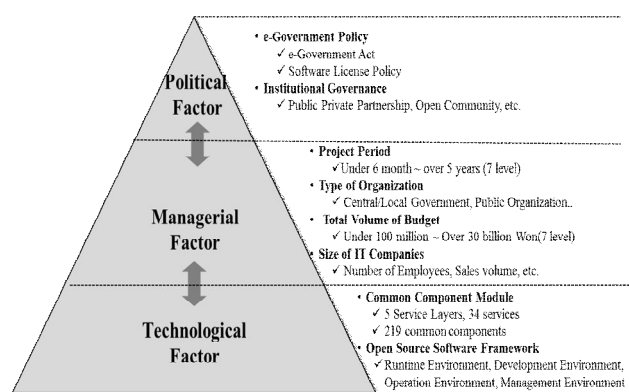


Figure 1. Three Level Factors of eGovFrame

The easy implementation of linkages among e-Government systems increases public satisfaction by offering simple one stop services which have been previously in the past fragmented in a silo-based e-Government system. As the e-Governments systems are prevalent, it would be required that the interoperability and reusability be critical for reducing development costs and programming efforts. Among the key factors that directly impact the e-Government software framework, could be categorized as three factors, including; political factors, managerial factors and technological factors as shown in Figure 1.

2.1 Hypothesis

This study is a first step to take a look at key factors that affect to the reusability of e-Government services from the perspective of project management. The variables are extracted to explain how the project attributes are related in the acceptability of the reusable common components. As a part of the result, an attempt to identify the rational foundation for diffusing the eGovFrame in the public sector has been made.

Table 1. Variables of e-Government Project Management

Variables	Definition
Type of Organization	Categories include: central government, local government, public organization
Size of Agency	Total number of employees in a public agency with 1-7 point of usage groups who reuse software framework
Project Period	Total period of e-Government development at seven sections of each 6 month period for up to five years.
Budget Volume of Project	Reusable ratio in a base of budget size of each project
Type of IT Provider	Category of major SI company, Medium-size company, Small-size company
Size of IT company	Total number of employees in a company with 1-7 point of usage groups who reuse software framework
Business Domain	Adaptive ratio of reusable component in a business area such as construction, tax ,health etc.
Business Area of Government	Based on business reference model of Government EA such as citizens, finance, social economy etc.

2.2 Open Innovation Strategy

As one of project management steps, e-Government development environment and functionality analysis were carried out on major IT companies' frameworks as well as a survey and intensive interviews with every stakeholder. With the software framework, it is possible to remove redundancy in the manpower structure. There are a variety of technological infrastructures that require different sets of manpower. The framework operation organization is formed

to support each separate application development teams with technology and framework by sharing high level architect and framework developers, required number of manpower decreases and manpower utilization is maximized. When silo type of the development with vendor's framework is utilized, each application development is conducted separately.

The development processes of eGovFrame are open to the public thereby creating an environment that collects extensive opinions from a variety of stakeholders. Moreover, a variety of public private collaboration that leads the understanding and consensus of many stakeholders took over. The eGovFrame has been developed through the participation of an array of stakeholders. Over 500 stakeholders were identified and actively engaged in the project to manage the engagement process, the stakeholders were separately categorized into groups, each with their own concerns and goals.

Generally, open innovation is a paradigm that assumes that various external ideas are adapted and included as well as internal ideas to advance technology, product and services. The boundaries between the individual organization and its environment have become more tightly coupled so that innovations can easily transfer inward and outward. The main idea behind open innovation of eGovFrame is widely exchanged and its knowledge, companies cannot afford to rely entirely on their own businesses and services, but should instead buy or license their package software or patent inventions from other providers. In addition, internal inventions not being used in their own business should be taken outside the company.

In order to solve the problems that were derived from the common software framework for e-Government, a strategy has been implemented that is based on an open innovation paradigm which makes use of outsourcing innovative technology and experts. It requires not only the government's effort and promotion, but also many stockholders' knowledge and experience from private sector participation and feedback all put into and included in the eGovFrame. To clarify these requirements for realizing the standardization and application of e-Government framework, virtuous phases are composed which include; open sourcing, open processes, open outputs and an open ecosystem. The overall structure of open innovation cycle is shown in Figure 2.

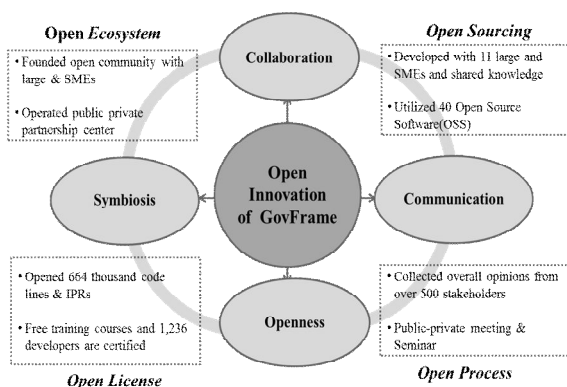


Figure 2. Open Innovation of eGovFrame

In many IT services areas, open innovation builds upon earlier academic work and has indicated up until now that new contributions and emphasis on open innovation can bring about a synergy effect. Open Innovation offers a new collaboration scheme in a technology driven business fields around the world towards implementing the processes of industrial research and development. In this common framework of e-Government, it has been deployed for a variety of open innovation approaches where it has been adapted in eGovFrame and some potential sources of data to bring insight into those areas. As a result of such efforts, the framework can be beneficial to many software developers and customers. The open software framework consists of the two external ecosystems created by the e-Government market as a 'demand pull' and open common platform through the private sector and public private partnership (PPP) based 'technology supply' and the private sector as an open innovation as a 'technology push' in the public sector as shown in Figure 3.

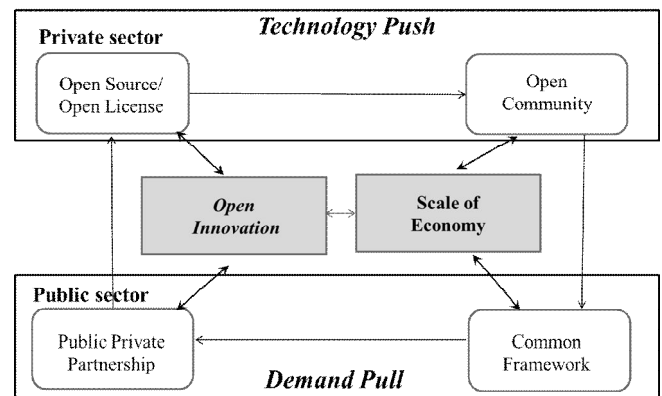


Figure 3. External Ecosystem of eGovFrame

There is a limitation to open innovation in that is more readily applicable to the public sectors. However it is also detected that barriers seem to arise for small and medium enterprises. Indeed, the context in which innovation occurs is evolving. The IT services ecosystem is changing the processes by way of open innovation. Knowledge is flowing almost at a zero marginal cost and more rapidly between people and businesses than ever before. These flows are crucial in understanding open innovation. The business of open innovation is becoming truly global in its scale of economy with a IT driven new service models and business partnerships. Public Private Partnership (PPP) fosters and builds an open innovation ecosystem by voluntary contribution. Not only are new technology and information being shared, but the open innovation development model is establishing itself and will bring about voluntary contributions of functional improvements.

The reusable eGovFrame is one of the practices of open innovation to jointly develop common components to support a variety of benefits to the IT SMEs, package solution providers and large SI companies to make the

software ecosystem as shown in Future 4. The IT SMEs are able to focus on specific software solutions and reduce R&D costs through open innovation and take advantage of the developer pool. Moreover package-solution providers can reduce outsourced development licensing costs, and major SI companies have an opportunity to be involved in e-Government projects.

As the creation of an e-Government ecosystem with the 4Ps is a key success factor of eGovFrame, it includes; Public private partnership; People who are eagerly participating at the open community; Project of e-Government system; and Portal of eGovFrame for downloading all the software and common components. IT providers have mutual benefits for acquiring global IT projects as compared to major SI companies, R&D cost savings to IT SMEs and solution compatibility certification to package vendors with e-Government framework and 219 common components.

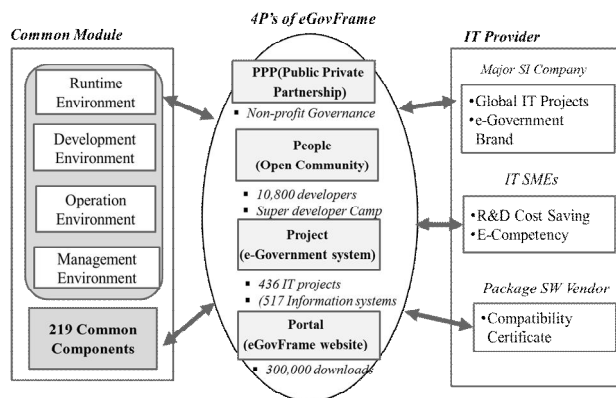


Figure 4. e-Government Ecosystem with 4Ps of eGovFrame

2.3 Casual Loop Diagram

In terms of the software ecosystem of eGovFrame, it could be approached by system dynamics that were influenced by past actions and future actions to adjust the three basic principles of feedback. System dynamics has been applied to various fields to analyze the socio-economic system has been widely utilized as the most powerful feature of the dynamics of complex systems analysis of nonlinear systems. These system dynamics as a perspective and set of conceptual tools makes it possible to know the structure and dynamics of complex systems. It is important to look at the means as to why there is an emphasis that shows the feedback structure of the system changes in external variables rather than the internal variables. For the changes in the external variables described in the system by a system in order to change the behavior of the policy can be difficult or unclear to understand. Internally, however, the change of the system variable can be explained, the system and the behavior of the policy change in the model can be increased.

The success or failure of the policy of most parameters associated with a particular variable is attributable to reject that kind of explanation. Rather, the success or failure of the policy conditions that exist between variables associated with

various feedback mechanisms discover that the reason of policy success or policy failure in terms of the structure to make policy prescriptions can be understood. The open source software-based common framework of e-Government focused on IT ecosystem model. It is made up of virtuous software market ecosystems because it is one of the major tools of complex systems analysis that can be approached from the system dynamics model with a causal casual loop diagram as shown in Figure 4-14.

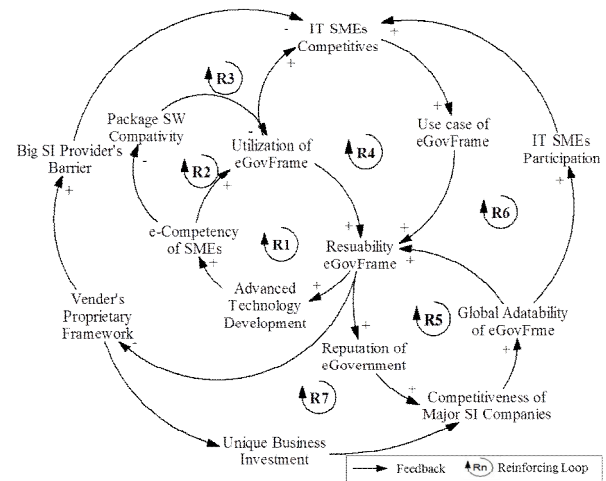


Figure 5. Causal Loop Diagram of System Dynamics

III. DATA ANALYSIS

In order to determine the relation between each independent variable, the Pearson Correlation Coefficient was measured. The Pearson Correlation Coefficient has a more than one variable measuring scale or a scale ratio that normally distributes values based on statistical principles in a 1-7 point scale. When the Pearson Correlation Coefficient has a value between -1 and 1, positive (+) or counterclockwise (-), it indicates that there is indeed a correlation. The Pearson Correlation analysis of the correlation coefficients as shown was obtained. In other words, x variables and y variables are correlated with each other.

3.1 Pearson's Correlation

A statistic result quantifies a linear relation between the two scale variables. A Pearson Correlation Coefficient of 1.00 and an absolute value if the complete positive (+) or negative (-) refers to the relationship, the high correlation value between 0.70 to 0.40, 0.40 to 0.20. The correlation coefficient is not affected by the measurement of the values between 1 and -1.

The reusable components affect the size of the organization, project implementation agencies/companies, project implementation period, budget volume, and business domain. These managerial factors identify the correlation at the number of common components reuse. If the absolute

value of 1.00 means a complete correlation, then an absolute value indicated between 0.70 to 0.40 correlates highly. The absolute value between 0.40 and 0.20 indicates a low correlation. In the Pearson Correlation, the value of coefficient analysis shows that among a large number of sizes of organizations, budget volume and a high correlation between the branches and agencies as well as the use of reusable components and a weak correlation with the number of project attributes.

Table 2. Result of Pearson Correlation

Context	Type of Organization	Size of Organization	Project Period	Budget Volume	Type of Provider	Size of IT Company	Business Domain	Type of Business	Reuse of Common Component
Type of Organization	1	-.088	.576**	.536**	.326**	.456**	.387**	.487**	.651**
Scale of Agency	-.088	1	.061	-.069	.027	.036	.038	-.110	-.105
Project Period	.576**	.061	1	.731**	.549**	.662**	.473**	.659**	.755**
Budget Volume	.536**	-.069	.731**	1	.610**	.596**	.514**	.686**	.694**
Type of Provider	.326**	.027	.549**	.610**	1	.517**	.460**	.544**	.509**
Size of IT Company	.456**	.036	.662**	.596**	.517**	1	.638**	.717**	.666**
Business Domain	.387**	.038	.473**	.514**	.460**	.638**	1	.611**	.506**
Type of Business	.487**	-.110	.659**	.686**	.544**	.717**	.611**	1	.645**
Reuse of Common Component	.651**	-.105	.755**	.694**	.509**	.666**	.506**	.645**	1

** This means that correlation is significant at the 0.01 level (2-tailed).

These statistics indicated that the budget of organization, business orders for institutions have a relatively high correlation with the reuse of common components. Also, the business organization sizes of government have a high correlation with the reuse components. The budget of the project and project period and the size of your organization, indicates a high correlation for the number of reuse of components. Business domain has a relatively high correlation and the number of reuse of components is identified as having a negative correlation as shown in Table 5-3. If it has a (-) value, this means the reverse correlation. The Pearson Correlation Coefficient was -.105 between the size of organization and the reusable common components. That could be interpreted or mean that if the sizes of public organizations are smaller, the reuse of common components can be higher or if the sizes of organization is bigger, the reuse of common components is lower.

3.2 Linear Regression

Finally, this study is concerned with the independent variables of e-Government projects and the dependent variables of reuse of common components. R square value of the regression model significantly means that the ratio of the analysis is greater than 0.40. When the significance

probability is less than 0.05 (95 percent), the hypothesis adopts Beta values that are measured differently for each of the independent variables. It can be interpreted that Beta values for each of the independent variables impacts significantly to the dependent variable. For example, the type of organization is in the form of a beta value of 0.247, thereby meaning that it can be interpreted as 24.7 percent.

Table 3. Summary of Findings

Dependent Variable	Predictors	Standard Error	Beta	Significance Probability
Reusability of Common Components	(Constant)	.046	-	.957
	Type of Organization	.061	.247	.000
	Size of Agency	.049	-.100	.042
	Project Period	.081	.340	.000
	Budget Volume	.080	.137	.088
	Type of Provider	.062	.033	.591
	Size of IT Company	.077	.212	.007
	Business Domain	.067	.017	.796
	Type of Business	.081	.009	.910
	R = .834, R square = .696, Adjusted R square = .679 F = 40.118, Sig. = 0.00			

The eight independent variables and the dependent variable (the reuse of common components) is an analysis of the impact. It means that the regression model is a probability of 0.00 and the F value represents a value of 40.118, R square value of the analysis of 0.696, which means 69.6 percent, represents the ratio of the analysis.

This causal IT ecosystem map has seven reinforcement loops (reinforcing loop) that it is composed of, and is shown in the above Figure 5. Over time, the centered framework for e-Government standards within the group consisting of IT ecosystems is increasingly showing a positive direction for the eGovFrame development. Based on open source software development framework and common components of e-Government is simply to improve software development productivity rather than swelling the overall IT ecosystem, the effects of this measure is positive because it impacts the dynamics of the system and is also a useful perspective. In particular, all the policy issues rather than the short-term and long-term ecosystem that are obsessed with the consequences also becomes important to predict.

These dimensions can be trusted when viewed from the perspective of ecosystem models developed in the performance measurement and execution of useful IT policies. This study did not cover the existing reuse research but made an attempt to assess the impact and enhance the development of e-Government framework and common components of the IT ecosystem. However, this study aims to present a model for the assessment to be focused and to be followed by further empirical research. This paper has been

made in order to explain a standard framework that major SI companies and SI software entrepreneurs and small businesses can utilize in order to improve their own e-Government development capacity.

Table 4. Summary of Hypothesis Testing

Hypothesis	Description	Result
Hypothesis 1	The type of organization has a (+) correlation in terms of the reuse of common components	Adopted
Hypothesis 2	The size of organization has a (+) correlation in terms of the reuse of common components	Adopted
Hypothesis 3	The period of IT project has a (+) correlation in terms of the reuse of common components	Adopted
Hypothesis 4	The volume of IT budget has a (+) correlation in terms of the reuse of common components.	Rejected
Hypothesis 5	The type of IT provider has a (+) correlation in terms of the reuse of common components	Rejected
Hypothesis 6	The size of IT company has a (+) correlation in terms of the reuse of common components.	Adopted
Hypothesis 7	The domain of business has a (+) correlation in terms of the reuse of common components	Rejected
Hypothesis 8	The type of business has a (+) correlation in terms of the reuse of common components	Rejected

3.3 Findings and Implications

As a result of analyzing the dataset, the reuse of common components highly correlated with these predictors; business type, business area (domain), project period, the type of ordering agencies. This type of business has a relatively high correlation. It can be interpreted that the government agencies pursue high interoperability among other agencies and businesses and prefer to be independent to any specific vendors. On the contrary, the size of organization has a negative correlation with the reuse of common components. This is inferred that the smaller the size of organization is, the more they reuse the common components. The Project Implementation Period also has a high correlation due to a single year of the project implementation period and the development of information systems to take advantage of reusable components is implemented in a variety of the business application software. Budget volume is highly related with the size of IT project which is quite large in scale and has a lot of common functions in the e-Government projects while leveraging common components that also can be increased.

The type of provider also has a relatively high correlation. Probably all the developers of the major SI companies mostly use their own proprietary framework while IT SMEs prefer to reuse the common components. Especially small

and medium IT companies related to higher components reuse because the development capacity is low and also have to operate within the limits of its own framework. The customers or public agency information systems software are reluctant to reuse a specific vendor dependent framework when they execute the outsourcing development. Finally, the type of business domain is relatively less correlated. That can be inferred that the reuse of common components is available regardless of business reference model (BRM) of the government enterprise architecture.

Also the reuse of common components has a high correlation with the size of the organization because of the high correlation of business areas, similar to the system to take advantage of information within the organization. This means that if there are a large number of internal members that have secured interoperability among education, personnel, and administrative improvements within the organization such as the common services, this makes it easy to share information because they can be interpreted. However, from the analysis, if the budget shows a low correlation with reusable components in order to reduce the toll in terms of quality, rather than an emphasis on information systems and services and, in particular, to solve the dependency on operators, significant correlation between the budget, was in this case, largely not interpreted.

IV. CONCLUSIONS

As a considerable part of e-Government systems, software frameworks were applied with a useful tool to increase the productivity and quality for application development. Software frameworks have become a popular tool for developing e-Government applications, but there are some drawbacks which have originated from some propriety software frameworks so there must try to reduce their dependency on proprietary software by moving towards an open source platform. This paper is a first step to take a look at key factors that affect e-Government development projects with an experimental 2009-2013 dataset reviewed. This result also verifies the rational foundation on the perspective of managerial factors which is related to the attributes of e-Government project management such as the type of organization, project period and budget volume.

In addition, this paper also outlines the bounded rationality among these various stakeholders and how open innovation became one of the key factors when the open source software-based eGovFrame was developed and diffused in the public sector. From the results of analyzing the data, the key factors of reusable common components has a positive affect from the type of organization, project period and the size of IT companies as it was found to be highly correlated. The result of this study showed that the reuse of common components is relatively high correlated to the type of agencies, project period and budget volume and less correlated with the size of agencies and business domain. The implication on the reuse of common components

provides a rationale for e-Government policy aimed at promoting open source-based software framework in the public sector.

These findings will help government officials and developers in the development of e-Government systems when they attempt to adopt an open source software framework. Furthermore, the result of this paper will be helpful to promote the utilization of open source software in e-Government. Based on the eGovFrame, the reuse of common components is verified regardless of business domain, and organization type in the public sector. Mainly the focus of this paper was on the administrative component which was verified through this research project but there is a need for future research on both technical and political factors. This study could be referred to for the spread of e-Government orders for agencies overseas, as well as software developers when they use the e-Government software framework.

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