

A Study on Strategy Planning and Outcome of EA in Korea

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Abstract— Recently Enterprise Architecture (EA) has been receiving growing attention again from the public sectors. It is because EA maturity result is reflected to the organization's informatization level and EA maturity ratio has been enlarged. There has been more participation from the Chief Information Officers of the public sectors. EA research in the public sectors has influenced IT environment since the research started in late '90, the legislation work done in '05, and the maturity model developed in '06. However, there are some remaining tasks to solve. EA policy is introduction oriented, its contribution to the consecutive the best UN e-Government rank is limited, and its user-friendly responding system is still lacking. Related research outcomes are rather microscopic focusing only on the models and maturity than implicating on the public policy in a macroscopic manner. In this respect, this study will provide the implication on how EA policy should be. Requirements derived from EA stakeholders and the tasks will be arranged in accordance with its domain, then the performance and tasks will be demonstrated. As guiding EA stakeholders and information related officers to setup the EA policy with these results, this study is expected to support information the policy drivers.

Keywords — Enterprise Architecture(EA), E-Government, IT ROI

I. INTRODUCTION

In recent years, Enterprise Architecture (EA) has been receiving growing attention from the public sectors. It is because the result of EA maturity has been reflected to the organization's informatization level and EA maturity ratio has been enlarged. There has been more participation from the Chief Information Officers (CIOs) of the public sectors in the development of EA. This trend suggests the conversion to a new phase of EA policy, which has so far focused on the introduction of EA. The role and performance of EA in the public sectors can be a measuring device for the implementation process of EA in e-government and national informatization.

Around 2005, when EA was introduced to the public sectors in full scale, was a growth period of e-government. It was also the time period when the 11 initiatives (2001-2002) and 31 initiatives (2003-2007) of e-government were implemented. Now, after those periods of time, e-government is in its maturity of integration and connection [1]. As a consequence, e-government has been positioned consecutively

at the top in the evaluation of e-government by UN in 2010 and 2012.

To date, there have been considerable changes in EA, including laws, institutions, technology, and supporting systems. With respect to the institutions, the Act on Efficient Introduction and Operation of Information System and its enforcement decree, as well as 2 public notices and 1 standard were enacted. In addition, 2 guidelines and 4 manuals were developed. In terms of technology, 5 reference models (performance, business, service, data and technology), EA Metamodel and EA maturity model were developed and applied in practice. With regard to the supporting systems, the Government-wide EA Portal (GEAP) was established and currently in operation, in addition to the Enterprise Architecture Management System (EAMS) of each agency.

Most of the previous studies of EA on the aforementioned aspects employed a micro-approach, such as model and maturity, and were deficient in properly suggesting a macro-direction as a public policy tool. In addition, they could not raise questions and present solutions to the current issues: the implementation of EA policy focusing more on the introduction of EA, the limit of EA's role under the current position at the top e-government by UN evaluation, and the lack of user-friendly response system.

With these questions in mind, this study aims to provide the implication of how to implement the EA policy direction in the public sectors. For this purpose, the process of EA implementation will be viewed on the basis of time-series. In addition, the performance to date will be analyzed in terms of EA policy and technology, and supporting systems, and its implication will presented. Furthermore, the stakeholders of EA and the requests made from the practice will be organized, and the performance and future plan will be drawn. Through these findings, we seek to provide assistance for the more efficient implementation of informatization policy by supporting the establishment of future policy direction on EA implementation to the EA stakeholders and the people in charge of informatization.

II. Status Review

A. EA Institutions

In order to institutionalize EA, the Act on Efficient Introduction and Operation of Information System was enacted in Korea in December 2005. The motivation behind

this enactment was from the inefficiency of information resource management and unsystematic situation found from the survey on the information resources of the public sectors in April 2002.

Since then, the following steps have been taken: establishment of the 1st stage EA basic plan and enactment of related guidelines (Dec. 2006), establishment of the government-wide EA (Dec. 2009), preparation and implementation of a comprehensive measure to prevent double investment in the EA-based national informatization project (Mar. 2010), and preparation and implementation of the 2nd stage EA basic plan [2]. The key contents are specified in the Framework Act on National Informatization and Electronic Government Act as follows:

- ① Controlling EA of agencies mainly by CIO
- ② Consulting the EA related policies at the CIO Council
- ③ Implementing e-government based on EA
- ④ Establishing the EA basic plan and the government-wide EA plan
- ⑤ Obliging the introduction of EC in the public sectors
- ⑥ Promoting the introduction and operation of EA
- ⑦ Analyzing and diagnosing EA performance

The laws above are structured such that they are connected, as shown in Figure 1, respectively at the levels of nation, governments and individual agencies, which encompass government policy goals and national strategy. As presented in the figure, EA helps support presentation, link and optimization of the principles and standards of informatization, and decision making on IT investment at the government-wide level.

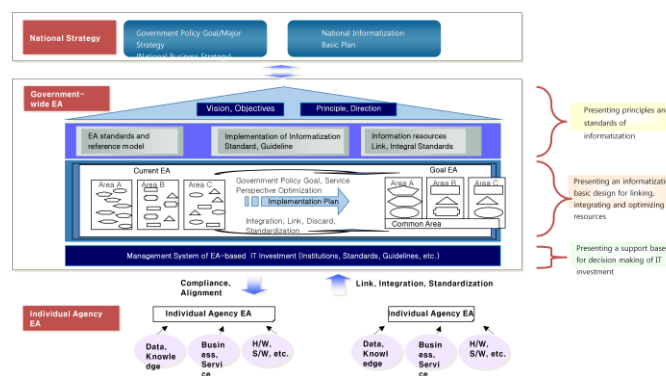


Figure1. Structure of government-wide EA

Today, 67% of countries are undertaking a government-wide EA or similar programs to enhance interoperability between the systems related to public administration informatization, to relieve the redundancy of projects, and to maximize the investment effect [3].

Not many countries, however, specify the implementation of EA in the laws, apart from Korea and the US. There exists a

difference in the perspectives of the legislation between the two countries. While the US focuses more on the external aspects, Korea places more emphasis on the internal aspects. The US focuses on the external factors of EA, such as the multifaceted operation of EA including planning, investment, project performance, performance management and evaluation through the Information Technology Management Reform Act of 1996 (ITMRA, 1996) and the E-Government Act of 2002 [4]. On the other hands, Korea emphasizes the internal and procedural factors of EA.

The survey on EA of the public sectors is undertaken by the Ministry of Public Administration and Security under the Article 68 (Analysis and Diagnosis of Performance) of the Electronic Government Act. Its purpose is to accurately identify the current status of EA in the public sectors and to utilize it as the basic data for the establishment of the future EA related policies at the government-wide level. At the level of individual agency, it is used as the basic data that reflect the reality of the agency to present its future direction.

The number of agencies subject to the introduction of EA in 2011 is 168. Of these, the number of agencies which have already introduced EA is 110, increased by 10 from 100 in 2010. By the type of agency, the number of central administrative agencies has increased by 3 and that of other public agencies by 7. In the rate of introduction, central administrative agencies showed 92.8%, local governments 100% and other public agencies 50%, indicating that the rate other public agencies is relatively low, compared to central administrative agencies and local governments.

Table 1. Introduction of EA by Year

Type of Agency	2011		Increase by Year					
	No. of Agencies Subject to Introduction	No. of Agencies Already Introduced EA (%)	'11	'10	'09	'08	'07	'06
Total	168	110* (65.5%)	10	4	25	21	21	29
Central Administrative Agency	42	39 (92.8%)	3	1	3	5	10	17
Local Government	16	16 (100%)	-	-	13	2	-	1
Other Public Agency	110	55 (50%)	7	3	9	14	11	11

※ The number of agency that has already introduced includes the agencies that are scheduled to introduce EA in 2011 and local governments that use the government-wide EA.

In the meantime, let's look into the survey result that was conducted in the form of a multiple response on the tasks utilizing the EA of 76 agencies, which currently use EA in their tasks. The result indicates that 60.5% use it in business planning and 56.6% in IT operation and maintenance, while 22.4% and 19.7% use it for business improvement and performance management, respectively. By agency type, 77.1% of central administrative agencies and 50.0% of local governments use it for budgeting, while 75.7% of other public agencies use it for IT operation and maintenance [5]. As for

the measurement of maturity, the introduction, operation status and performance of EA are analyzed under the legal base above. This result is supposed to be reported to the National Informatization Strategy Committee. The Committee then use the measurement result as a reference for the future EA policy.

B. EA Technology

In this paper, EA technology was examined by focusing on the several EA models that were considered to have relatively more technological factors.

The EA models used in the public sectors only include 5 reference models and Metamodel, and maturity model. Reference model is defined according to the “common criteria for classification and expression that are used for forming architecture.” This aims to obtain consistency, uniformity and interoperability of various EAs of the related agencies.

The government-wide EA Metamodel specifies ‘government-wide standard information’ that must be included when each agency establishes EA information. The information is provided to each agency at the government-wide level, and each agency must establish the link information with its own EA information in accordance with the most recent government-wide reference model. When necessary, it is possible to establish an agency-unique reference model based on the government-wide reference model. The current EA maturity model is presented in Figure 2. The EA maturity model is composed of 9 measurement items for the domains of establishment, management and utilization, and is measured by 5 stages in each domain

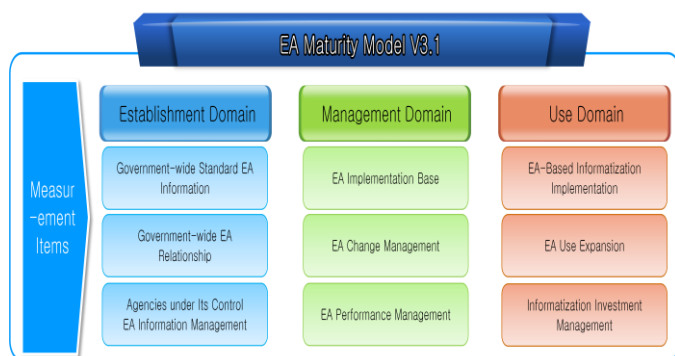


Figure2. Structure of EA Maturity Model (v3.1)

C. EA Support System

The support systems for the smooth operation of EA in the public sectors include EA management system, education and promotion, and the management of guidelines and manuals. The EA management system is divided into the levels of government-wide and individual agency. There is a government-wide EA portal (GEAP) at the government-wide level.

The major function of the EA management system is to maintain the up-to-dateness and accuracy of EA information through the actualization of EA function. Moreover, it enhances the accuracy by reducing the workload of

information registration through the automatic link between GEAP and individual agency’s EAMS [5]. With respect to EA education, a total of 3,073 have completed education from 2005 to 2011.

Table2. EA Education

Course Title	Total No.
EA Basic Course	1,921
EA Practical Course	696
CIO Course	150
Online Course	306

Started with EA basic and practical courses, EA education includes CIO course, online course and practicum, and has opened additional 1 course each year. There are 3 kinds of guidelines and 4 kinds of manuals. By the type of guideline, there are a government-wide EA use guideline, informatization investment management guideline and Metamodel application guideline. In manuals, there are EA overview, EA establishment, EA management and EA use.

III. Status Analysis

A. Change in Environment

The examples of the change in environments related to EA in the public sectors largely include increased recognition of e-government home and abroad, deepened change in new IT technology, and expansion of EA application domains in the public sectors.

As seen in Table 3, the level of e-government in Korea is already on the top level across the world [6]. As mentioned earlier, this can be largely attributed to the supports at the government-wide level, including the discovery of large scale projects, such as the 10 initiatives and 31 initiatives of e-government.

Table3. Evaluation Result of E-Government of Korea (Ranking)

Classification	2005	2008	2010	2012
e-Government Development Index	5	6	1	1
Online Service	4	6	1	1
Information Communication Infrastructure	9	10	13	7
Human Resources	14	10	7	6
Online Participation Index	5	2	1	1

However, the EA philosophy, which is a government-wide and individual agency’s ‘informatization blueprint’ included here should not be overlooked. The reason is that most of the portals of each sector, including the level of online service, which is one of the evaluation factors for UN e-government evaluation, and the administration related to the online participation index, are established based on the EA concepts. In addition, the unique architectures are embedded in the websites of the ministries related to health, social welfare, education, labor, finance, international relations and environment, including Minwon 24, which was subject to evaluation.

Overseas cooperation and the export of e-government are active, as the goal of overseas export reaches \$300 million thanks to the evaluation result. Even though the request for e-government has increased from overseas, it should be noted that they request 'EA-based' informatization. This is because overseas customers request for informatization based on 'informatization blueprint', not just demanding unreasonably. Therefore, an alternative needs to be prepared to prevent EA from showing its limitation to meet the demand of customers, although the internal and external recognition on e-government has been enhanced.

Meanwhile, the informatization domain of the public sectors has been recently paying more attention to such concepts as cloud computing, big data and Project Management Office (PMO). Under the circumstance, Gartner Group said that EA can control the explosion of big data [7]. To efficiently respond to this issue and prevent the confusion from the change in new IT technology that is rampant in the public sectors, a measure needs to be taken in the perspective of EA.

Another change in informatization environment in the public sectors is the expansion of EA application domain. In the early 2000s, the interest in EA in the public sectors was how to efficiently introduce EA, whereas now it is more in how to utilize it. Another aspect in the expansion of EA use is the change in the goal performance on the introduction of EA. The main purpose of introducing EA in the beginning was to secure interoperability. This is because it benchmarked the US Department of Defense (DOD), which used ITA in a most exemplary manner. Since, however, interoperability was technically too difficult, it was switched to the efficiency of information resources management. Since this goal was also too broad due to the complexity of linking performance, it changed to the removal of overlapping, and now evolved into the efficiency of investment management [8].

B. Institutional Aspects

In the institutional aspect of EA, the strength of informatization in Korea is that it secured an incentive to strongly implement the EA policy through legislation. It is more effective than voluntary participation or recommendation through standards or guidelines. The other strength is an effort to enhance the level of EA at the government-wide level by measuring EA maturity. The survey and maturity measurement through this effort make it possible to identify the general situation of informatization in the public sectors and to maintain the consistency of policies.

On the other hands, there are pending issues to be solved: reviewing the direction of EA implementation that embraces the changes, strengthening support for informatization link of planning-performing-evaluating and feedback system, and increasing EA use in the process of public informatization governance. As seen earlier, the overall maturity level of Korea is at the 2nd level out of 5 level (2.43), while that of central administrative agencies is at 3rd level (3.17), indicating that the systems for introducing and establishing

EA have been settled. This suggests that the EA policy needs to be converted from introduction to utilization in the future.

In addition, even though the level of e-government has improved overall, and consecutively evaluated as the top level from the UN evaluation, the global support policy for EA is still absent. Each agency is trying to export its own information system, it may be a one-time event because the effort is made without the picture of the basic 'informatization blueprint.' An alternative is needed to make it possible to export both the blueprint of EA level and application system, so that the customer countries can implement a more systematic informatization.

In terms of strengthening supports for informatization link and feedback system, it is in need of presenting and measuring informatization performance using EA and adjustment devices. To overcome this situation, an alternative is needed to support the business activities of a CIO, the highest decision maker of each agency, so that he can play their role appropriately.

C. Technical Aspects

One of the difficulties of EA tasks in practice is the prejudice that the term EA is not easy to understand [9]. The term EA was initially converted from Information Technology Architecture (ITA), and has recently been replaced by the term 'Informatization Blueprint.' However, the EA stakeholders, including CEO/CIO, designer, developer and operator [10], are still all experiencing the difficulties. For this reason, there are considerable burdens for the management activities, such as setting a plan, securing the budget for informatization, and communication with users. It can also cause burdens and inefficiency in the process of applying EA in practice, although the domestic administrative agencies are moving beyond the introduction stage of EA. To remove this phenomenon, the glossary associated with EA needs to be polished and arranged based on the experience gained in practice.

The purposes of implementing EA in the public sectors are diverse. One of the purposes is to align the strategy of an organization with the entire picture of informatization [11]. Therefore, it is possible that EA cannot bring about desired effect unless the public sectors become sensitive to the internal and external changes and manage the changes. In particular, when a new technology, management technique or concept emerges, its effect on EA needs to be reviewed for the overall planning of EA, institutions, reference model and guidelines.

D. Systematic Aspects

In order for EA to be well settled in the public sectors, the entire support systems are important. Table 4 summarizes the requests from the fields regarding the implementation of EA made at a workshop in April 2012, in which 291 EA practitioners participated.

Table4. Difficulties in the Implementation of EA Tasks

Classification	Central Ministries	Local Governments	Public Agencies
Problems and difficulties	- Lack of support for EA organization and personnel - Lack of understanding by managers and staff - Unclear purpose of using EA - Uniform implementation of EA focusing on maturity	- Lack of recognition on the necessity of EA - Limitation on the implementation in informatization organization - Sharing information and disseminating best practices - Support for customized education	- Necessity to connect informatization project and budget - Measurement of maturity suitable for the characteristics of the agency - Links with ITSM, IRM and etc. - Strengthening support system for the EA of public agencies

Based on the difficulties above, the implications on the implementation of EA in the future are summarized as follows:

For the smooth implementation of EA, the field supports need to be strengthened so that the CIO or EA practitioners can prepare for the condition to perform EA tasks. The organizational characteristics or environment of each agency are diverse. Although it is not easy to directly discuss about obtaining workforce, which can be a burden for implementing the policies, an opportunity for systematic support, such as education or exchange, should be provided.

In addition, the EA information at the government-wide level and that of individual agency should be smoothly linked. For this, a one-stop service system is needed so that once EA information is entered it is automatically linked with the EAMS and GEAP.

Also, while the existing EA policies are supplier-oriented focusing on the introduction of EA, the future EA should be directed to the perspectives of users. For this purpose, the agencies taking well advantage of EA should be actively discovered and fostered.

IV. Development Plan

By far, we have drawn the implications through the current status and analysis of EA by dividing the implementation process of EA in the public sectors into EA institutions, EA technology and EA support systems. Based on the implications, this chapter presents the future direction of EA.

A. Institutional Direction

First, the paradigm of EA should be converted from the introduction to the strategy focusing on the use of EA.

In order for the implementation of informatization to be successful, it should be used in practice and the users need to be satisfied [12]. User satisfaction can be enhanced by upgrading the policy direction so that performance can be improved through the use of EA. By so doing, sustainable

growth can be guaranteed through the systematic and stabilized EA.

Second, the institutional frameworks should be improved so that the implementation processes of national informatization can be linked with the base of EA.

Previous studies argue that the EAs of the government-wide and individual agency should be organically linked so that consistent and systematic EA can be implemented for the systematic adjustment and management of informatization [13]. By so doing, the 12 procedures of planning-performance-evaluation-feedback and 82 tasks [13], which are the major implementation processes of national informatization, can be seamlessly carried out, leading to a more efficient operation.

Third, the support activities for the stakeholders should be strengthened to enhance the effect of EA system. Various institutional systems should be prepared so that the CIO, who is responsible for the overall implementation of informatization including EA, can perform his duty smoothly. Creating a condition for these people to work more efficiently is directly related with the performance of EA.

B. Technical Direction

First, an effort should be made for the technical interpretation and provision of the EA concepts that are appropriate for the reality of public informatization, including purification of terminology. As discussed earlier, the reason is that it is important to maintain the philosophy of technology that is appropriate for the practice, although it is necessary to maintain the concepts of EA itself with regard to the domains of all informatization.

Second, a more sophisticated EA methodology should be developed and distributed at the government-wide level for the implementation of informatization in the public sectors. Although EA is known to affect the lifecycle of the entire informatization from the planning stage to the evaluation of informatization, the tasks in practice should be performed only with the EA reference model. The efficiency of tasks should be enhanced by at least systematizing the standard procedures and criteria, methods, and outputs. This is because EA in many cases is used with the management methodology/1 not properly actualized in practice in the public sectors.

Third, the most recent technological changes should be reflected in EA. A measure should be taken considering that how the newly emerged technological concepts, such as cloud computing, big data and PMO, should be reflected in EA policy, reference model and support systems. To achieve this, a more sophisticated research should be performed in the perspectives of EA having connectivity among the models.

C. Systematic Direction

The direction of systematic aspects for the vitalization of EA can be outlined as the following 3 aspects: improvement of GEAP, operation of incentive system, and establishment of support system in the perspectives of users.

First, a one-stop service support system linked with GEAP and EAMS should be established. One of the most difficult

areas is the management of EA information. It is because the EA information of individual agency should be not only inputted one by one and actualized, but inputted in GEAP at the government-wide level as well. Therefore, the system should be upgraded so that a correct process of imputing is undertaken and the imputed contents can be linked with the related agencies or individual agencies which need information in an automatic manner.

Second, an environment should be created so that the EA effort implemented by individual agencies can be compensated. Recently, approximately 240.4 billion won of informatization budget was saved for 3 years [14]. It can be possible to create an environment of win-win structure as well as the synchronization of EA implementation by providing an incentive where the performance of EA by individual agencies goes back to the agencies.

Third, the EA support system should be developed and strengthened in the perspectives of users. Various systems need to be developed and implemented so that the EA policy is aligned with the perspectives of users. For example, best practice can be developed and shared to reduce the trial and errors of individual agencies. Also, several manuals and guidelines can be integrally developed and systematized.

V. Conclusion

The purpose of this study is to review the outputs of the EA policy that have been implemented for the past 10 years in the public sectors, and to draw related issues and present the implications of how the future EA policy direction can be set.

In this study, the major pending tasks to be solved in the future are as follows: seeking the direction of EA implementation focusing on EA use, establishing an EA role appropriate for the world's top e-government and exploring a user-friendly EA implementation direction. As a result, the following implementation direction is set in terms of institutional, technical and systematic aspects of EA based on the analyses and implications above.

In the institutional aspect of EA, first, the paradigm of EA policy should be converted from introduction to use-orientation. Second, the institutional frameworks should be improved so that the implementation processes of national informatization can be linked with the base of EA. Third, the support activities for the stakeholders should be strengthened to enhance the effect of EA system. In the technical aspect of EA, first, an effort should be made for the technical interpretation and provision of EA concepts that are appropriate for the reality of public informatization, such as purification of terminology. Second, a more sophisticated methodology should be developed and distributed at the government-wide level for the efficient implementation of informatization in the public sectors. Third, the most recent change in technology should be reflected in EA. Finally in the systematic aspect, first, a one-stop service support system linking GEAP and EAMS should be established. Second, an environment should be created so that the EA effort made by individual agencies can be compensated. Third, a strategic

direction, in which an EA support system is developed and strengthened in the perspectives of users, was presented.

However, the following limitation was revealed in the process of the study: it was difficult to set the appropriate scope of study. That is, the performance of EA implementation was presented only with the simple outputs. To address this issue, the future study should be performed through a more systematic and qualitative methods. In addition, the definition and classification of various data in the fields should be more systematized. It is hoped that the result of this study will be helpful for the efficient implementation of informatization policy when the EA stakeholders and informatization staff in the public sectors set the policy direction of future EA.

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