

## E-Government Interoperability and Integration Architecture Modeling Using TOGAF Framework Based On Service Oriented Architecture

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**Abstract.** *Development of e-Government in Indonesia continues to roll and run in every government agency, both in central government and local government. Implementation of e-Government means that there are government's efforts to build and improve the quality of public services and internal operations in each regional apparatus organization effectively and efficiently. These activities inline with one of the bureaucracy reform mission, that is the modernization of government bureaucracy through the using of information and communication technology optimization to support bureaucracy reform vision and the creation of good governance. The development and implementation of e-Government currently mostly implemented by each regional apparatus organization. This condition makes it difficult to exchange data and information related to multisectoral activities due to data and information spread across various databases from different applications, platform, environment and architecture without good documentation. In preparation for arranging the e-Government architecture, we will use The Open Group Architecture Framework - Architecture Development Method as an enterprise architecture framework. The purpose of this research is to study and conceptualize e-Government interoperability and integration solutions of all existing applications and providing some model documents such as e-Government Architecture Vision, Integrated Business Model References Architecture, and Integrated Data Model References Architecture.*

**Keywords:** *E-Government, interoperability and integration, service oriented architecture, TOGAF-ADM, information and communication technology*

### 1. Introduction

E-Government is an activity related to the efforts of all government agencies in working together to utilize communication and information technology, so it can provide accurate information and electronic service to the internal government, individual society and business world. With the development of e-Government, it is necessary to structure the system and work processes in the government environment through the utilization of information technology (Ahmadjayadi, 2006).

Utilization of information technology includes two activities that are directly related such as data processing, information

management, management systems and electronic work processes and also utilization of advances in information technology so that public services can be accessed easily and cheaply by people in all regions of the country (Instruksi Presiden RI Nomor 3, 2003).

There are great expectations on advanced e-government solutions coming from politicians, public administrators and citizens (Goldkuhl, 2008). Development of e-Government in Indonesia continues to roll and run in every government agency, both in central government and local government. Some regional apparatus organizations have drafted their concept and implementation plan, and some have even begun to

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implement it. Implementation of e-Government means that there are government's efforts to build and improve the quality of public services and internal operations in each regional apparatus organization effectively and efficiently. These activities inline with one of the bureaucracy reform mission, that is the modernization of government bureaucracy through the using of information and communication

technology optimization to support bureaucracy reform vision and the creation of good governance.

System transformation and work processes of governance manually into the implementation of governance based on ICT (Information, Communication, Technology) can be seen in Figure 1.

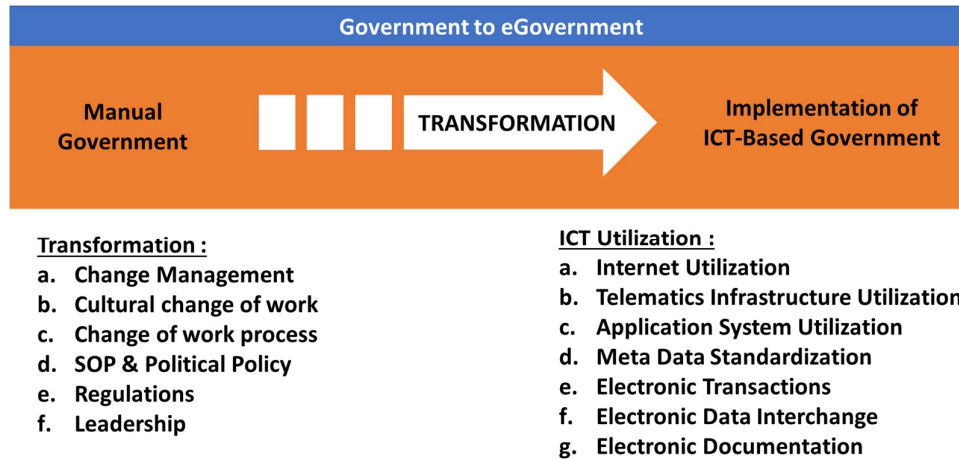


Figure 1.  
Government Transformation Becoming e-Government  
(Source: Diskominfo, 2011)

The development and implementation of e-Government currently mostly implemented by each regional apparatus organization. This condition makes it difficult to exchange data and information related to multisectoral activities due to data and information spread across various databases from different applications, environment, and architecture. In addition, many duplicate/redundant data are found, inputted by regional apparatus organizations to each different application because there is no integration between the databases in it. Interoperability of information systems and data integration becomes absolutely necessary because it is impossible for one information system to stand alone without requiring data from other information systems. The problem becomes more complicated when various information systems built in governments use different platforms. Another problem arises when the

information system does not have good documentation so that it can not communicate with information systems owned by other parties. The implementation of e-Government integration and interoperability requires an architectural design that suits the needs of the Indonesian government. In addition, it is necessary for the role of many parties for the realization of interoperability and integration of all information systems within e-Government, including non-technical factors such as sectoral ego which are the main issues that need to be avoided. The idea that government institutions task is to serve the public needs to be improved so that all parties must have a paradigm that the data they have is in order to meet the needs of other government agencies and the entire Indonesian people, so the quality of public services will increase.

## 2. Literature Study

### *E-Government*

According to The World Bank Group, E-Government is an effort to utilize information and communication technology to improve efficiency, effectiveness, transparency, and accountability of government in providing better public service. E-Government refers to the use by government agencies of information technologies (such as Wide Area Network, the Internet and mobile computing) that have the ability to transform relations with citizen, businesses and other arms of government (Falih & Bintoro, 2010). Another definition of E-Government is the use of information technology by government agencies such as Wide Area Networks (WAN), internet, mobile computing, which can be used for building relationships with communities, businesses, and others government agencies. Diskominfo defines E-Government as a public service organized through the government website where the domain used also shows the Indonesian government domain (go.id) (Samudra, 2009).

While in the book E-Government in Action (2005) describes that E-Government is an attempt to create an atmosphere of governmental administration in accordance with shared objectives/goals of a number of interested communities. Therefore, the vision should also reflect the shared vision of the existing stakeholders e.g.: (Indrajit & Richardus, 2005).

1. Improve government operational productivity and performance within serving its people in the community;
2. Promoting clean and transparent government;
3. Improving the quality of community life to public service performance;
4. Ensure the creation of a democratic state.

### *Interoperability and Integration*

Interoperability in the IEEE Standard Computer Dictionary is defined as the ability of two or more systems or components to

exchange information and to use the information that has been exchanged (IEEE, 1990). Another interoperability definition based on information from the Dublin Core Metadata Glossary is the ability of different types of computers, networks, operating systems, and applications to work together effectively, without prior communication, in order to exchange information in a useful and meaningful manner (Dublin Core, 2008). Technically, interoperability describes the ability of two or more systems to exchange data or information and mutual use of data or information is exchanged through the capabilities of a product or system whose interfaces are fully expressed with the limits of agreed access. Interoperability must be achieved in the diversity of use of hardware and software both operating systems, databases and programming languages available today and in particular that have been used in various central or regional government agencies. Through this diversity of information technology A.P. Sheth (1998) shares the diversity of information technology into categories corresponding to the interoperability level, ie system, syntax, structure, and semantic. Interoperability in this diversity can only be achieved through the standardization of data exchange format, which is technically currently widely performed using an XML base. Each related party shall be obliged to use the established standards as a common reference.

E-Government interoperability can reach its maximum potential development if we know about the barriers that affect IS interoperability followed by the success factors that should be applied. The main obstacles that are faced during Interoperability of e-Government program can be listed such as ICT Infrastructures, Top Management Support, Human Resources, Data and Information Integration, Security and Privacy, and Business Processes. There are other challenges such as leadership styles, financial support, cultural attitudes, bureaucracy and customers' needs which influence interoperability of e-Government

programs. Meanwhile, some of the factors that can enhance interoperability of e-Government are listed such as High level e-Government interoperability goals, Commitment of government bodies, and Customer focus. (Sulehat & Taib, 2016).

Main barriers that affect e-Government interoperability are shown in figure 2 below. As has been explained earlier in this paper, there are six important variables that have an influence on the success of interoperability in e-Government projects.

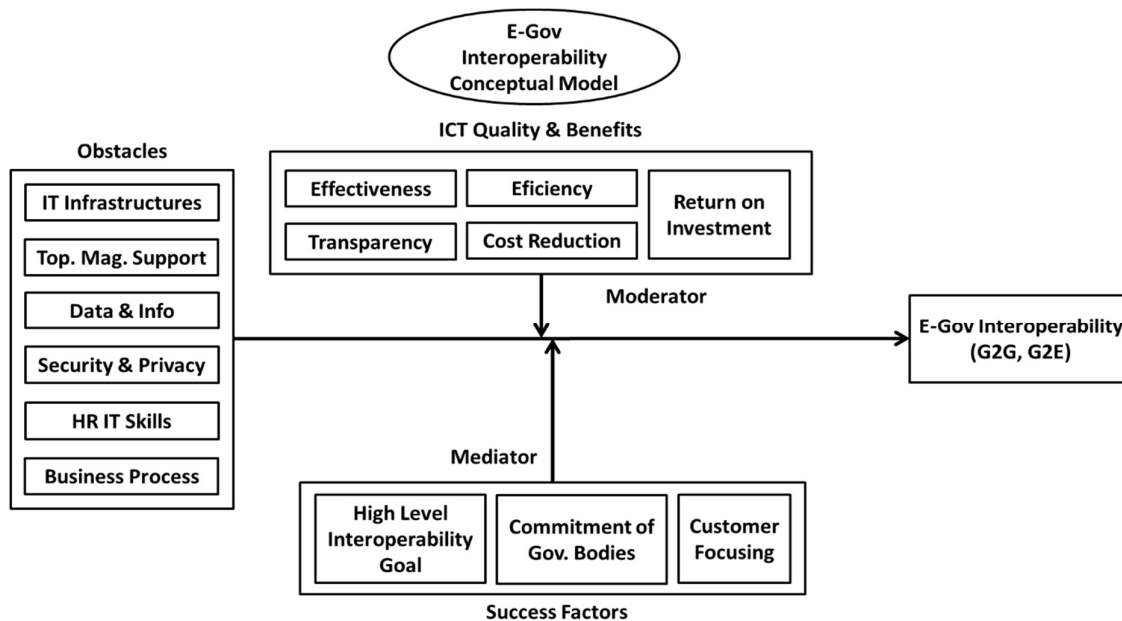


Figure 2.  
e-Government Interoperability Conceptual Model  
(Source : Sulehat & Taib, 2016)

The integration architecture is usually built systematically in multiple layers with the aim of solving the problem into several smaller sub-problems and solving each sub-issue step by step. Some types of an integration architecture that must be known include data level integration, application level integration, business process level integration, and presentation level integration.

There seems to be needs for conceptual clarifications and developments of the notion of government interoperability. First, the concepts of integration and interoperability need to be conceptually distinguished (Scholl & Klischewski, 2007). Integration (as a more

abstract concept) could mean to bring some parts together and make them a coherent whole. Such integration could mean that different information systems are integrated into one system. Integration could however also mean that the parts remain as separate entities but that they work together in a wellfunctioning manner (as federated systems). Interoperable systems are systems that can work together, but they still remain as separate systems. They are linked together through some exchange of data (Goldkuhl, 2008). The proposed integration concept for e-Government implementation for Provincial Government in Indonesia can be seen in Figure 3 following.

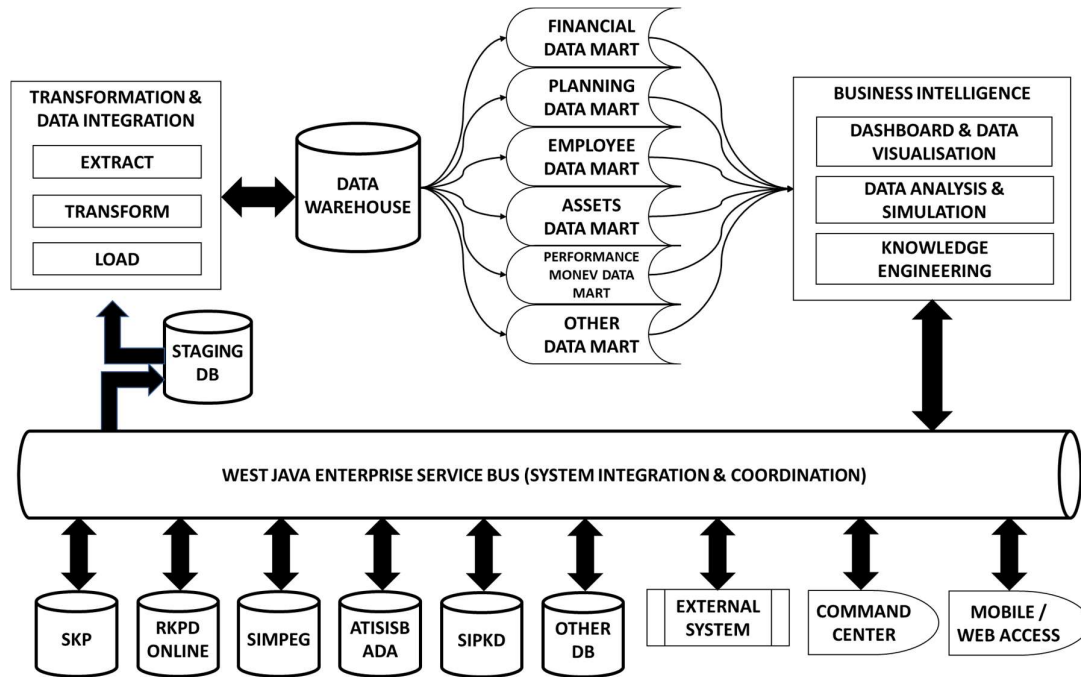


Figure 3.  
The Concept of e-Government Integration of Provincial Government

The explanation of figure 3 above can be seen as follows (Hasibuan & Santoso, 2005):

1. The earliest level is what is called E-Government to show the face of a good government and hide the complexity that is in it.
2. The second level of E-Government, began to be marked by the existence of transactions and online interactions between a government institution and the community.
3. The third level of E-Government requires online collaboration between several institutions and communities.
4. The fourth level of E-Government is increasingly complex. Not only requires collaboration between institutions and society, but also involves increasingly complex technical architecture.
5. The fifth level, where the government has provided packaged information according to the needs of the community. In this case, the government can provide what is called "information-push" which is oriented to the community.

6. E-Government systems must be balanced with character changes from government officials and employees. With e-government systems, all public service activities are fast and controlled.

#### Service Oriented Architecture

Service Oriented Architecture (SOA) is a software architecture concept that defines the use of web services to meet the needs of a software. SOA is an open standard framework architecture that allows institutions/ organizations to integrate data previously held only in meetings in each work unit. This service can not only be used by the shading system but can be used also by other different systems, so that integration between systems can be achieved. Compared with distributed object-oriented architecture, SOA is more suitable for integrating heterogeneous systems and more adaptable to environmental changes. Integration is done to facilitate accurate data input from sources that are trusted, systematized and connected easily between systems so as to produce accurate and quality information.

Integration is done for the entire application so that the creation of interconnected applications. The definition of Service Oriented Architecture (SOA) according to the W3C Working Group is a set of components which can be invoked, and whose interface descriptions can be published and discovered. Service Oriented Architecture is defined as a policy, practice, framework that allows application functionality to be provided and consumed as

a set of services in a unit that suits customer service needs. Services can be used, disclosed, discovered, and abstracted using interface standards (Spratt & Wilkes, 2004). SOA describes a pattern that helps a client application connect to a service. The pattern presents a mechanism used to describe a service, publish and find service, and communicate with the service. The pattern is illustrated in Figure 4.

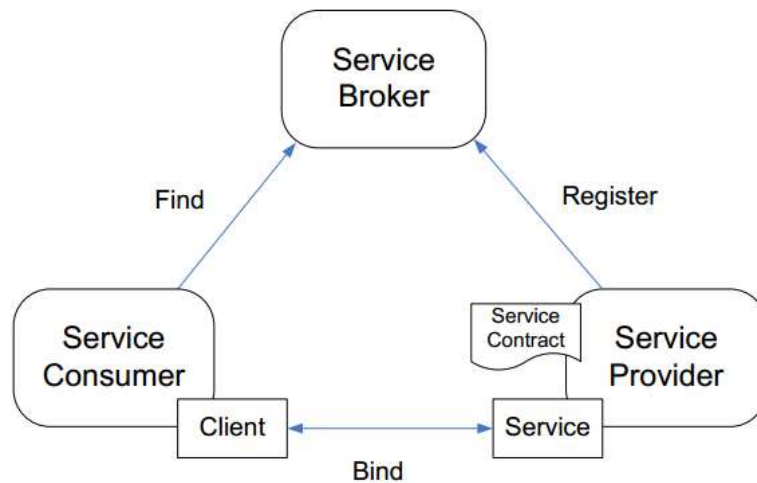


Figure 4.  
Service Mechanism Patterns At Service Oriented Architecture  
(Source: Manes, 2003)

*The Open Group Architecture Framework - Architecture Development Method (TOGAF-ADM)*

The Open Group Architectural Framework (TOGAF) began in the early 1990s as a methodology for the development of technical architecture and has been developed by The Open Group into the framework of enterprise architecture. In 1995, TOGAF 1.0 was presented in reference to the Technical Architecture For Information Management (TAFIM) at the US Department of Defense with the latest version is TOGAF 9.1 launched on December 1, 2011 (Setiawan & Yulianto, 2017).

TOGAF (The Open Group Architecture Technique) is a framework that provides a comprehensive approach to design, plan, implement and manage Enterprise Architecture as a whole and integrated. The key element of TOGAF is the Architecture Development Method (ADM) that provides a specific overview of the enterprise architecture development process. ADM is able to define business requirements and build a specific data architecture to meet agency needs. ADM consists of some stages in building enterprise architecture. The stages of the ADM can be seen in Figure 5 (www.opengroup.org, 2017)

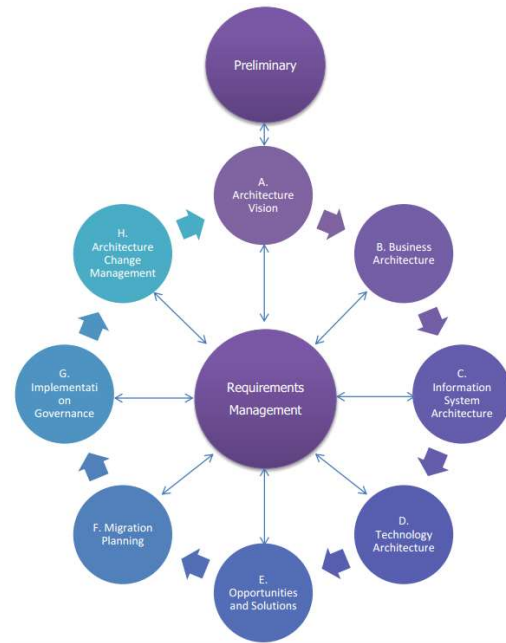


Figure 5.  
Stages of Architecture Development Method (ADM)  
(Source: [www.opengroup.org](http://www.opengroup.org), 2017)

As a core component, TOGAF ADM provides a series of iterative processes starting from the architectural arrangement, transition and managing the process of architectural realization. TOGAF ADM consists of ten stages of work, but in the preparation of e-Government architecture in this study, we will only be done five stages only:

1. Preliminary Phase  
This phase includes preparatory activities to construct architectural capabilities including TOGAF customization and define architectural principles. This phase must specify who, what, why, when, and where from the architecture itself.
2. Architecture Vision Phase  
This phase is the initiation phase of the enterprise e-Governance architecture development cycle that includes the definition of scope, stakeholder identification, architectural vision, and approval to begin architectural development.
3. Business Architecture Phase  
This phase includes the development of

the business architecture to support the vision of an agreed e-Governance enterprise architecture. At this stage, the tools and general methods used for modeling such as Unified Modeling Language (UML) can be used to build the required model.

4. Information System Architecture Phase  
At this stage emphasizes the activities of how information system architecture is developed. The definition of information systems architecture in this stage includes the data architecture and application architecture that will be used by the government. Data architecture focuses more on how data is used for the needs of business functions, processes, and services. The purpose of this phase is to develop the destination architecture in the data and application domains. The purpose of the data architecture is to define the type and main source of data needed to support the business in a way that is understandable to stakeholders, complete, consistent and stable. The purpose of the application architecture is to define the types of application systems that are



essential for data processing and business support. Applications are not described as computer systems but as logical groups of the ability to organize data objects in a data architecture and support business functions in a business architecture.

5. Requirement Management

In this phase, the process of testing the management of architectural needs during

the ADM cycle takes place. The expected result of this phase is the requirements catalog.

Based on the stages in the TOGAF framework, the hypotheses development that will be examined in our research can be seen as figure 6

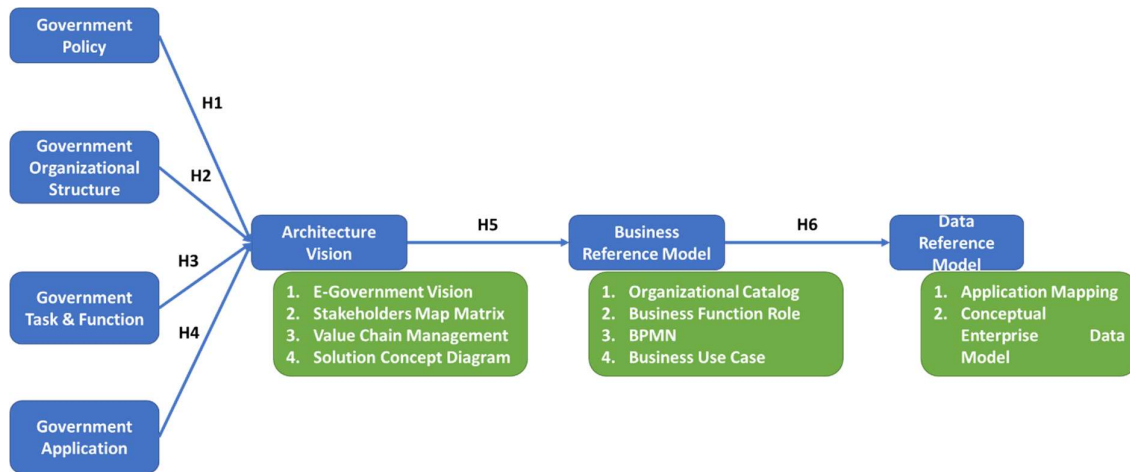


Figure 6. E-Government Hypotheses Development

3. Methodology

All business processes and information islands spread across the organization of regional apparatus Provincial Government in Indonesia is an asset that must be considered together in order to be able to synergize and in the long term both in terms of quality of public services as well as internal operational performance. In doing the work of arranging the e-Government architecture of the Provincial Government in Indonesia, we are based on one of the most popular frameworks for enterprise architecture, the TOGAF-ADM (The Open Group Architecture Framework - Architecture Development Method) with the following stages:

1. Preliminary Stages

At the preliminary stage, we are doing the preparation of the study and the

determination of the business model architecture model and the integrated data architecture model to be used. In addition, we also collect data and information through literature studies based on regulatory review, interviews, and focus group discussions. From this stage we obtained the results of data sources assessment, namely the list of regional apparatus mapping, governance organizational structure, basic tasks and functions mapping from each regional apparatus organization, and vision and mission of Provincial Government and Diskominfo that will be the principles catalog or work foundation at the stages of Architecture Vision, Business Architecture, and Information System Architecture (Data Architecture).

2. Stages of Architecture Vision

At the stage of architecture vision, we make alignment between the vision and



mission of Provincial Government with the vision and mission of the Ministry of Communications & Informatics to further mapping. In addition, we do mapping stakeholders in the form of Stakeholders Map Matrix which will be part of Value Chain Management and Solution Concept Diagram.

3. Stages of Business Architecture

At the business architecture stage, we are doing business process mapping in accordance with the basic task and function of each regional work unit in Provincial Government. The results of the mapping will be grouped into organization catalogs and business functions. The next activity is to create Business Use Case diagrams generated from the acquired basic task and function combined with the classification of affairs, both in terms of legislative matters, control affairs, mandatory government affairs, government affairs of choice, and support of government affairs. The final output of this stage is the Business Reference Model (BRM) that will be evaluated and validated through Design

Review Meeting.

4. Stages of Information System Architecture

In the stages of information system architecture, we are mapping the current application model to be identified and gap analysis, and then proposed the design of the integration and interoperability architecture required for e-Government of Provincial Government in the form Data Reference Model (DRM) to be evaluated and validated through Proof of Concept (PoC).

Please note that in the Information System Architecture stage there have 3 (three) sub-phases, namely data architecture, application architecture, and technology architecture, but in this scope of work will only discuss one sub-phase related to the data architecture of the mapping of existing applications.

The development chart of e-Government enterprise architecture of Provincial Government can be seen in Figure 7 as follows:

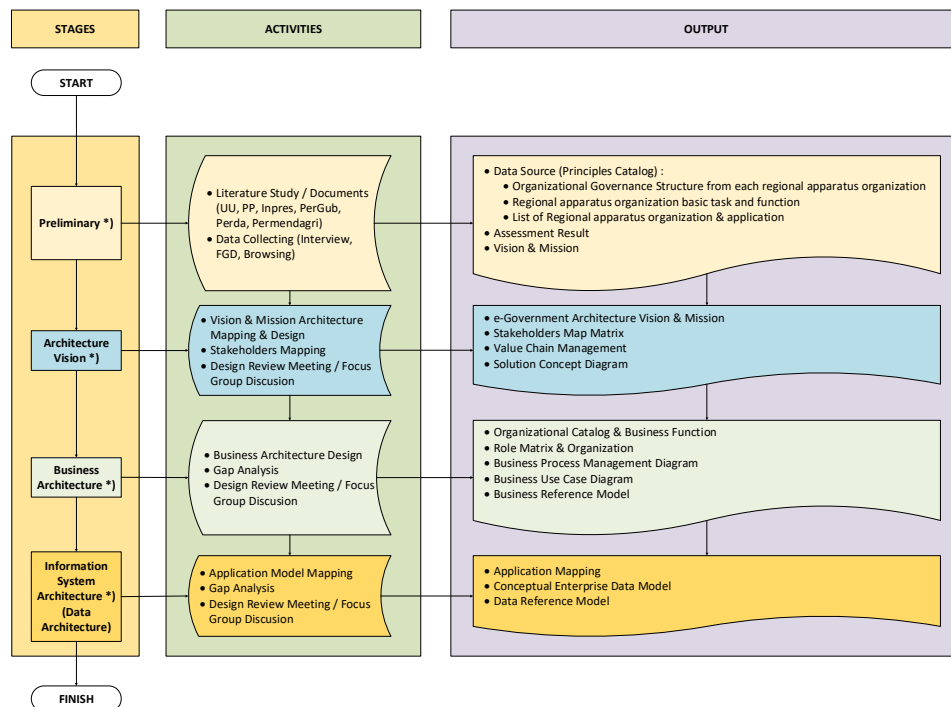


Figure 7. E-Government Research Methods

#### 4. Finding and Discussion

##### *E-Government Architecture Vision*

Proposed Provincial Government e-Government architecture vision should be in line with the vision set by the Provincial Government internally, including supporting the vision of the Ministry of Communications and Information and President of Republic Indonesia. Provincial Government must take the necessary concrete steps in accordance with their duties, functions, and authorities for the implementation of e-Government development according to Presidential Instruction number 3 of 2003 which states that e-Government development is an effort to develop governance based on electronics in order to improve the quality of public services effectively and efficiently.

Vision and Mission of the Ministry of Communication and Information Technology refer to the Vision and Mission of President Joko Widodo and Vice President M. Jusuf Kalla. The big picture of the vision to be realized is "Realization of a Sovereign Indonesia, Independent and Personality Based on Mutual Cooperation".

The mission that accompanies the vision is defined as follows:

1. Realizing national security that capable of maintaining regional sovereignty, sustaining independence economic by securing maritime resources, and

reflecting the personality of Indonesia as an archipelagic country.

2. Creating an advanced, balanced and democratic society based on the rule of law
3. Realizing free and active foreign policy and strengthening identity as a maritime country.
4. Realizing the high quality of Indonesia human life, advanced and prosperous.
5. Realizing a competitive nation.
6. Making Indonesia be an independent, advanced, strong and nation-based maritime state
7. Realizing a society of personality in culture.

The steps that will be done in determining the e-Government architecture vision are as follows:

1. Identify keywords of each vision and mission that will be aligned
2. Identification of stakeholders according to ISO 26000 are individuals/groups having an interest in organizational decisions and activities.
3. Mapping the keywords and stakeholders that have been done in the previous stage as Table 1.
4. Proposing the vision and mission of e-Government based on the results of mapping keywords and stakeholders as follows "Building e-Government as an Internet-based strategic infrastructure and sustainable and sovereign public participation to serve all stakeholders".

Table 1.

##### *Keywords and Stakeholders Mapping*

No	Kemkominfo	Stakeholders
1	Sovereign	Community
2	Independent	Government
3	Personality Based on Mutual Cooperation	Agency
4	National Security	
5	Advanced	
6	Balancing	
7	Democratic	
8	Quality of Life	
9	Prosperous	
10	Competitive	
11	National Interest	

Table 1. (Continued)  
Keywords and Stakeholders Mapping

No	Kemkominfo	Stakeholders
12	Personality In Culture	
13	Quality of Service	
14	Communications & Informatics	
15	Equitable Development	
16	National Broadband	
17	Internet	
18	Digital Broadcasting	
19	Equally	
20	Governance	
21	Culture of Ministry	
22	Mental Revolution	
23	Bureaucratic Reform	
24	Integrity	
25	Clean	
26	Effective & Efficient	

The e-Government application system for local government institutions is based on a functional approach to services from the governance system that must be provided by a Regional Government to the community, and administrative matters and other functions related to the Regional Government institutions, which are needed the implementation of regional governance systems. The functions of service, administrative and institutional are then grouped in Block Functions groups. With this approach, the governance function is then grouped into general basic function blocks (service, administration, management, development, finance, staffing) and other functions, especially those related to service and institutional functions.

In this section activities will be defined in the main functional area using a value chain consisting of business functions grouped into two, such as:

1. Primary Activities, which are all things that make the West Java Provincial Government fulfill its role in the value chain of government and build satisfaction with stakeholders as mentioned above as those who see and feel directly the influence of how well these activities are carried out.
2. Support Activities, which are all important activities to monitor, build, and support key activities at all times, not directly involved in major activities, but have the potential to increase effectiveness and efficiency so that indirectly can add value to the Provincial Government West Java.

We can link the list of activities above with stakeholders from West Java Province Government from the e-Government side as table 2.

Table 2.  
Matrix of Relationship between Activities with West Java Provincial Government

Activity	Stakeholders		
	Community	Government	Business Organization
Services	V	V	V
Adm & Management		V	V
Legislation		V	
Development		V	V
Finance		V	V
Staffing		V	V
Governance		V	V
Territorial	V	V	V
Community	V	V	V
Facilities & Infrastructures		V	V

Based on the functional framework of the governance system above, the West Java Provincial Government's value chain

management can be described as shown in Figure 8.

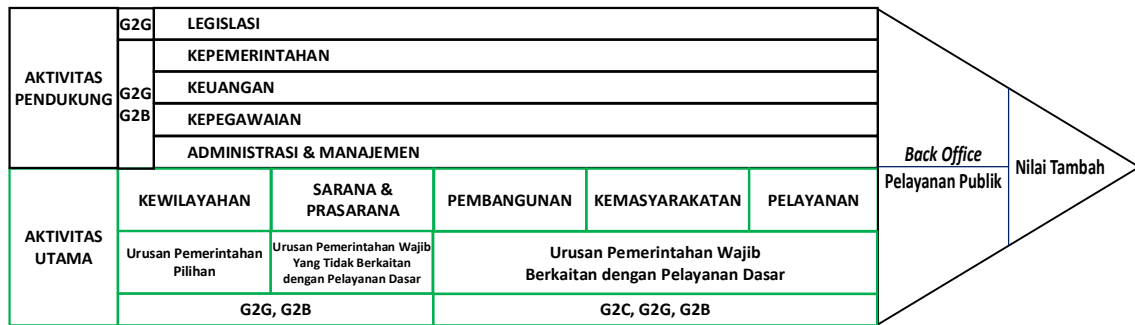


Figure 8.  
West Java Provincial Government's Value Chain Management

The e-Government Solution Concept Diagram that is suitable to be applied to the West Java Provincial Government based on the division of service functions, the nature

of the function, and the general function of the application system, can be seen in the Figure 9.

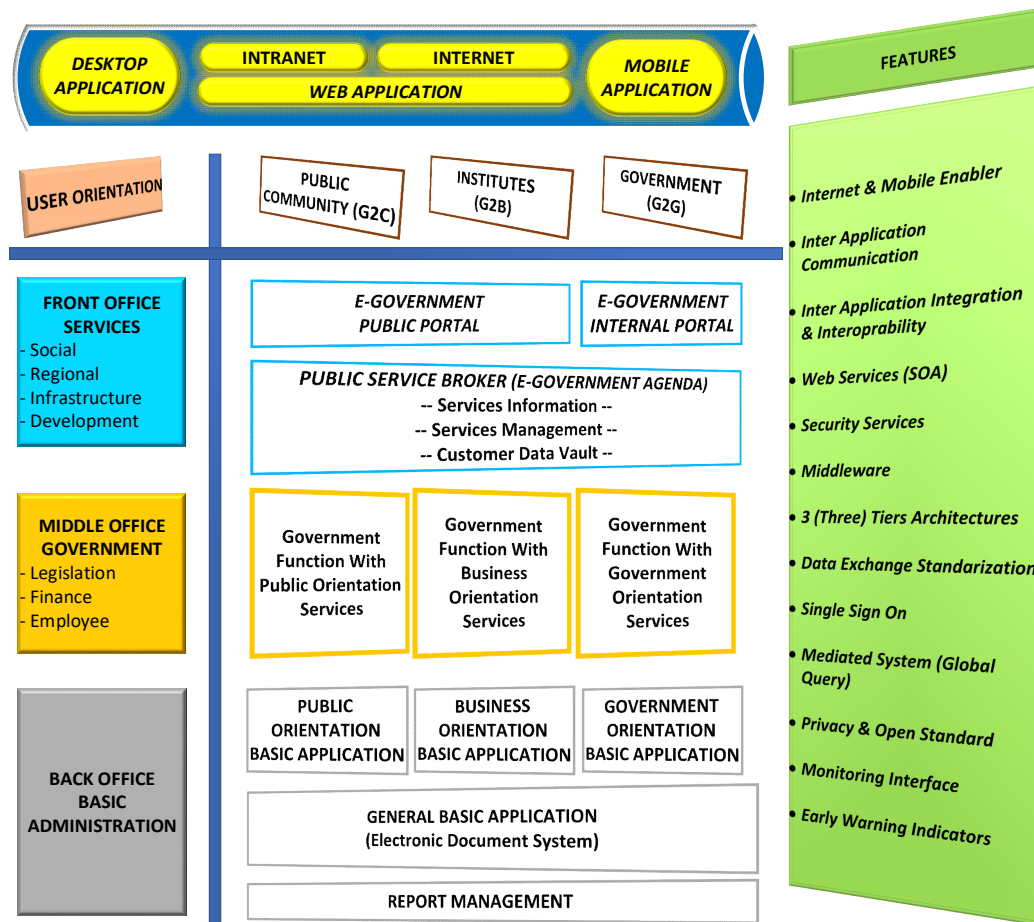


Figure 9. West Java Provincial Government's Solution Concept Diagram

*Integrated Business Model References Architecture*

This phase contains the business architecture that will be used to support the architecture vision, including organization catalog and business functions, business use case diagrams, and business reference models.

Organization Catalog and business functions to be compiled as a whole shall refer to UU number 23 the year 2014 about Regional Government, Regulation of the Minister of Domestic of Republic Indonesia Number 5

the year 2007 concerning about the Provincial Nomenclature Guidelines of Provincial Region & Districts/Town Region. In organizations catalog and business functions to be developed, it is necessary to agree upon a standard format to facilitate readings in terms of narration, classification, functional blocks, main task and function, and also integration with other regional apparatus. The following table 3 summarizes the format of the organization's catalog and business functions to be created.

Table 3.  
*Organization Catalog Format and Business Functions*

Nama Perangkat Daerah	<input type="text" value="[Nama Perangkat Daerah]"/>							
Narasi	<input type="text"/>							
Blok Fungsi	<input type="checkbox"/> Pelayanan <input type="checkbox"/> Administrasi & Manajemen <input type="checkbox"/> Legislasi <input type="checkbox"/> Pembangunan <input type="checkbox"/> Keuangan	<input type="checkbox"/> Kepegawaian <input type="checkbox"/> Pemerintahan <input type="checkbox"/> Kewilayahan <input type="checkbox"/> Kemasyarakatan <input type="checkbox"/> Sarana & Prasarana						
Jenis Layanan	<input type="checkbox"/> <i>Front Office</i> <input type="checkbox"/> <i>Middle Office</i> <input type="checkbox"/> <i>Back Office</i>	<input type="checkbox"/> <b>Urusan Pemerintahan Wajib</b> <input type="checkbox"/> <b>Urusan Pemerintahan Pilihan</b> <input type="checkbox"/> <b>Penunjang Urusan Pemerintahan</b>						
Objek Layanan	<input type="checkbox"/> <b>Government to Government (G2G)</b> <input type="checkbox"/> <b>Government to Business (G2B)</b> <input type="checkbox"/> <b>Government to Citizen (G2C)</b>							
PerGub / PerDa JaBar	<input type="text"/>							
Tugas Pokok	<input type="text"/>							
Fungsi	<input type="text"/>							
Integrasi	<table border="1"> <tr> <td><b>G2G</b></td> <td><input type="text"/></td> </tr> <tr> <td><b>G2B</b></td> <td><input type="text"/></td> </tr> <tr> <td><b>G2C</b></td> <td><input type="text"/></td> </tr> </table>		<b>G2G</b>	<input type="text"/>	<b>G2B</b>	<input type="text"/>	<b>G2C</b>	<input type="text"/>
<b>G2G</b>	<input type="text"/>							
<b>G2B</b>	<input type="text"/>							
<b>G2C</b>	<input type="text"/>							
Informasi Lain-Lain	<input type="text"/>							

Business Use Case Diagram is one of the business modeling used to present the functions provided by the whole organization, describing the business processes of an organization's business and the interaction of the process with all internal and external parties. This diagram answers the question "What does the business do and why should build the system?". This diagram is used during the modeling of business activities and organizes the system context to form the

foundation for the creation of use case diagrams. Business Use Case Diagram illustrates the purpose of an organization. This diagram does not distinguish between manual processes or computerized processes.

Before creating a business use case diagram, the first step to take is to determine the classification of actors involved in the design of e-Government architecture that will be implemented. Based on UU No. 23 the year

2014 about Regional Government mentioned that the Provincial Region Apparatus consists of regional secretariat, DPRD secretariat, inspectorate, the Departemen and the Agency. Based on the business actor classification, business worker, and business

use case above, the business use case diagram from Provincial Government e-Government can be described as follows:

1. Business Use Case Diagram from the Regional Secretariat, DPRD Secretariat, and Inspectorate, can be seen in Figure 10.

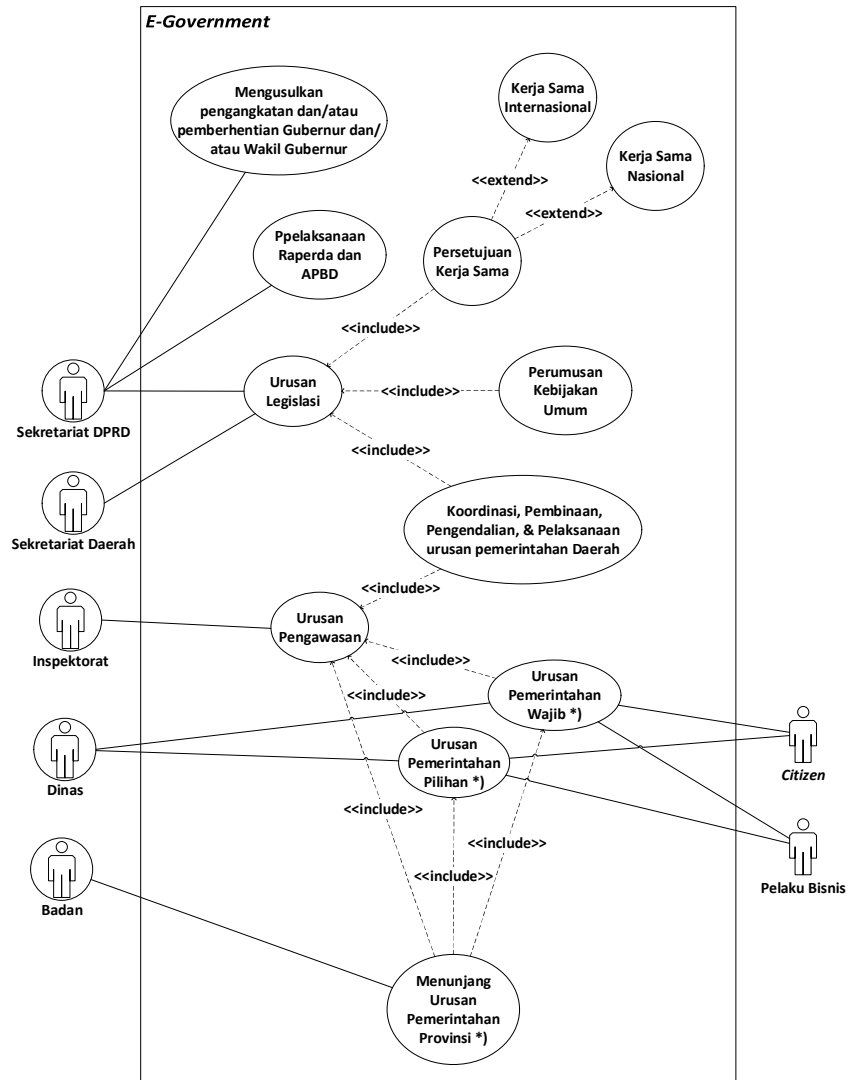


Figure 10. Use Case Diagram from the Regional Secretariat, DPRD Secretariat, and Inspectorate



2. Business Use Case Diagram from the Department, can be seen in Figure 11.

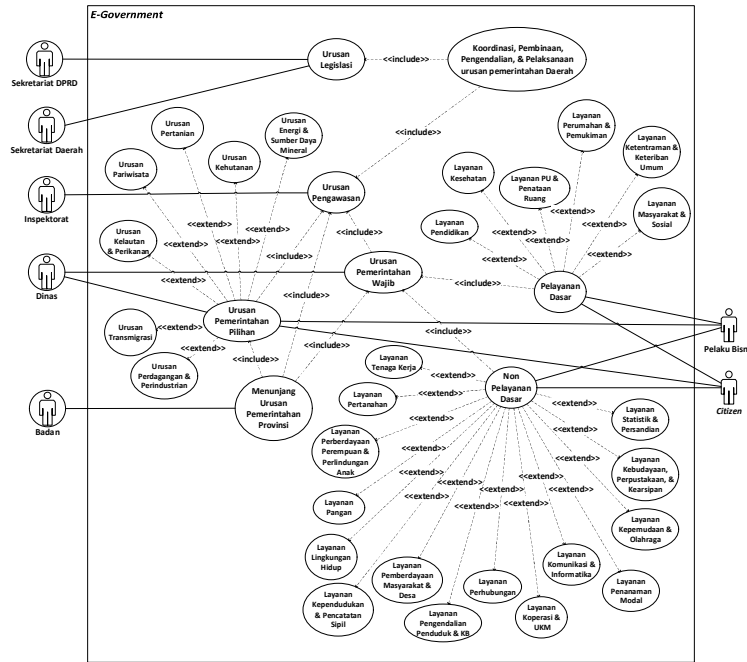


Figure 11. Business Use Case Diagram from the Department

3. Business Use Case Diagram of the Agency, can be seen in Figure 12.

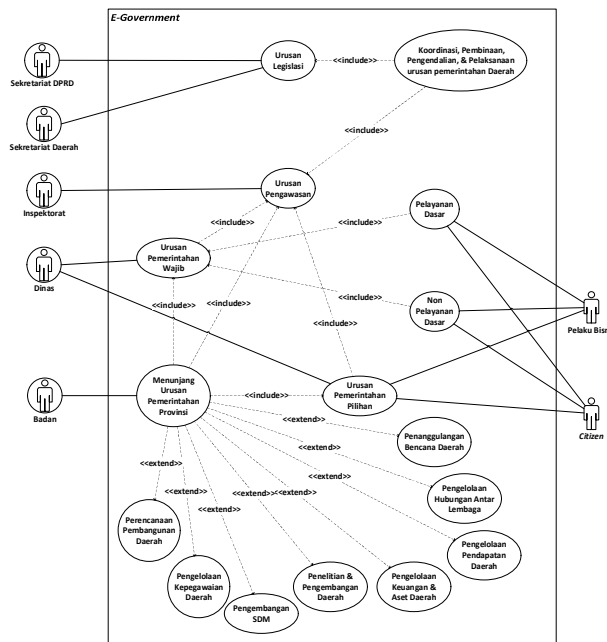


Figure 12. Business Use Case Diagram from the Agency

The Business Reference Model provides an organized hierarchical construction to illustrate the day-to-day operations of the Provincial Government regardless of the regional apparatus that run it. The function of creating a business reference model is to provide concepts that can assist the parties within the business and administrative

frameworks that require a flow of work among regional, business, community and related documents in the form of standardization of technology, both in the database and software using. Here below figure 13 which is the proposed Provincial Government Business Reference Model:

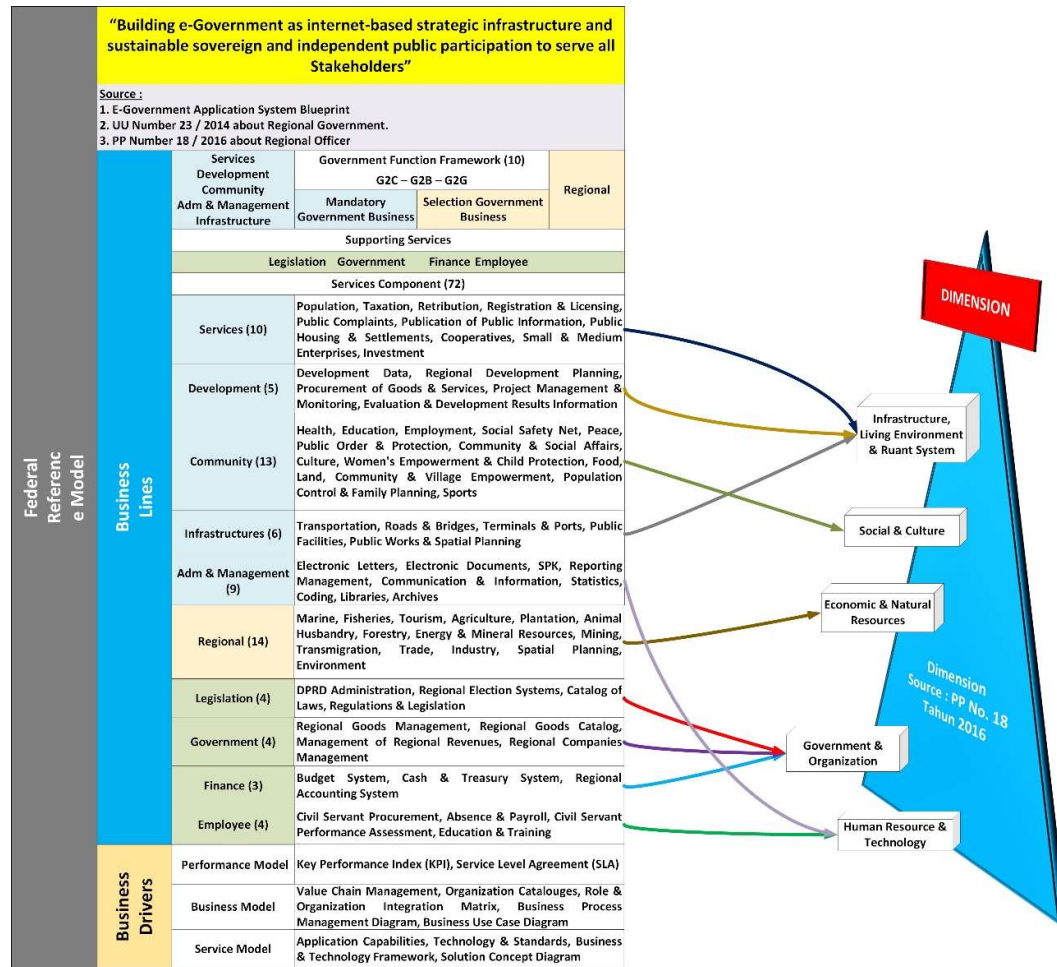


Figure 13. Proposed Provincial Government Business Reference Model (BRM)

#### Integrated Data Model References Architecture

In 1975, ANSI/SPARC describes database architecture to three levels, where this level is seen from the way users understand or know the data, namely internal / physical level, logical level and conceptual / external / view level (Connolly & Begg, 2010).

Based on explanations of data modeling, integration and interoperability architecture, service-oriented architecture, application model architecture, the proposed Data Reference Model to be implemented in Provincial Government is seen in figure 14.

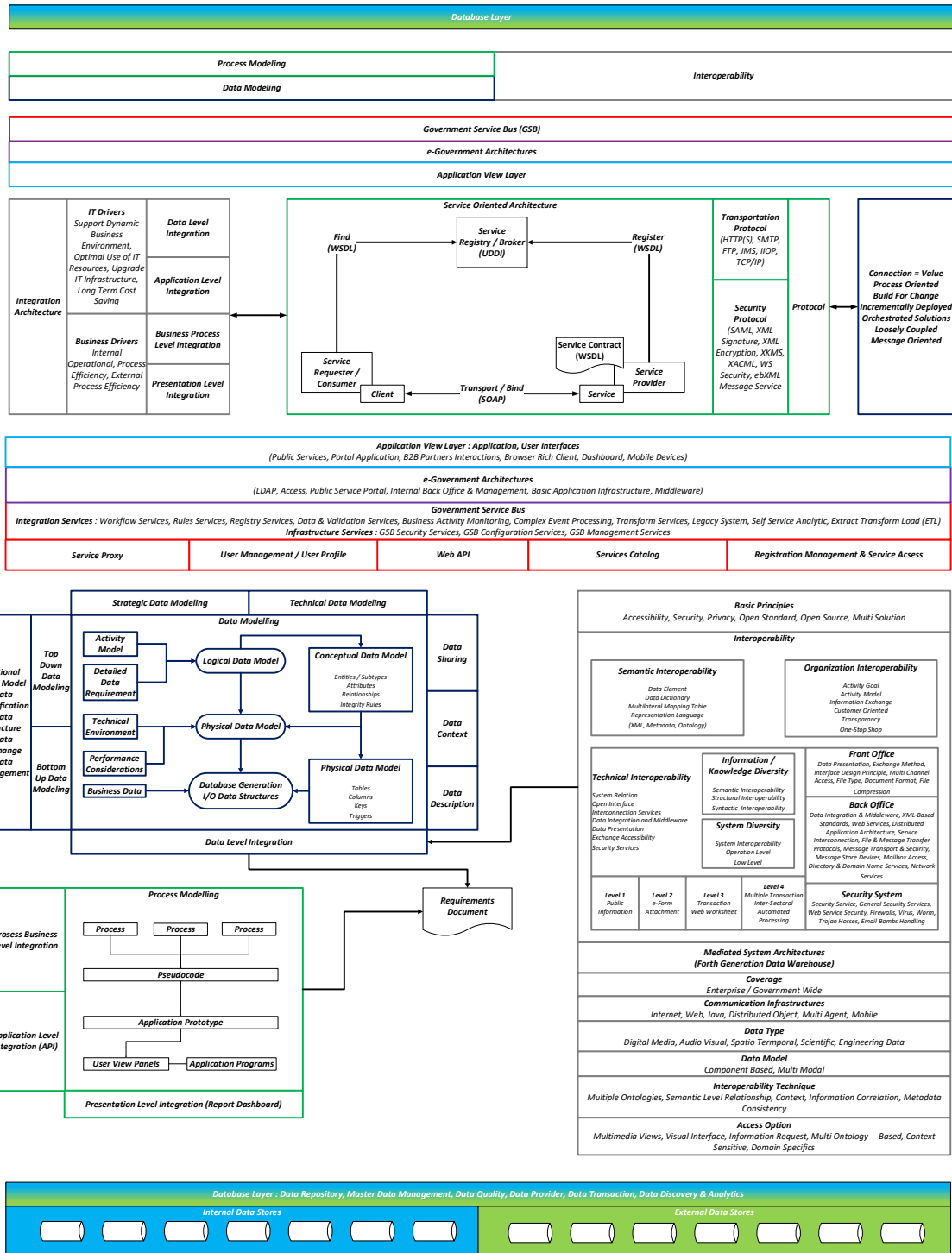


Figure 14. Proposed Provincial Government Data Reference Model (DRM)

SOA-based DRM is a data reference model that will be an added value in creating service-based application interfaces that will connect a variety of different applications

platform and database. Figure 14 above is the essence of the concept of data modeling, integration architecture and interoperability, service oriented architecture, application

model architecture, e-Government application system blueprint, one data of West Java development, Public Information Openness (Open Data) grouped into eight principles of data management that must be considered throughout the government:

1. Build and manage data architecture in overall perspective to be built and managed to enable standardization, modulation and data communication carried out by the government.
2. Removal of data redundancy, centralized data management to eliminate unnecessary duplication.
3. Compliance with data standards, after establishing data management standards and data standards
4. Define data ownership, make clear roles and responsibilities between departments of each unit to create data management departments
5. Unification of data input, data input must occur once, primary data must be stored in one place, and data replication must be minimized. If data replication occurs, it should be due to the function and availability of data to be able to follow data accuracy and coordination.
6. Improve understanding of data definitions, when defining data, using words that are widely used and using the term dictionary, allows users to easily understand their meaning and utilize data coherently.
7. Providing metadata information, information related to metadata or information related to standards must be managed & requested systemically
8. Perform data quality management based on total standardization information, to control the completeness of data standardization, improve data reliability, and improve the results. Data quality management must be carried out based on total standard information so as to create sustainable quality management including not only improving postal data management, but also eliminates

the causes of the degradation of the quality of previous data.

## 5. Conclusion

Based on the architecture vision, integrated business and data model reference results that have been discussed in finding and discussion section, the conclusions obtained from this research are proposed Business Reference Model (BRM) and Data Reference Model (DRM) based on Service Oriented Architecture for Provincial Government can be used as a standard framework in the preparation of E-Government architecture in provincial government based on Interoperability & Integration Architecture Modeling.

To complement the results of research that has been done, the suggestions given so that the integrated business and data model reference can be implemented optimally, among others it is necessary for the role of many parties for the realization of interoperability and integration of all information systems within e-Government, including non-technical factors such as sectoral ego which are the main issues that need to be avoided. Government institutions task is to serve the public needs to be improved so that all parties must have a paradigm that the data they have is in order to meet the needs of other government agencies and the entire Indonesian people, so the quality of public services will increase.

## References

- Ahmadjayadi, C. (2006). *Workshop Standarisasi Menuju Interoperabilitas e-Government*.
- Connolly, T., & Begg, C. (2010). *Database Systems: A Practical Approach to Design, Implementation, and Management. 5th Edition*. Pearson Education. America.
- D. C. M. Initiative and others undefined. (2008). *Dublin Core Metadata Element Set, version 1.1*. Pittsburgh.

- Diskominfo. (2011). *Cetak Biru Departemen Komunikasi & Informatika tentang Sistem Aplikasi E-Government Bagi Lembaga Pemerintah Daerah*. Jakarta.
- Falih, S., & Bintoro, W. (2010). *Revitalisasi Administrasi Negara, Reformasi Birokrasi dan E-Governance*. Yogyakarta: Graha Ilmu.
- Goldkuhl, G. (2008). *The Challenges of Interoperability in E-government: Towards a Conceptual Refinement*. The International Conference on Information System (ICIS). Paris
- Hasibuan, Z., Arifin., & Santoso, H. B. (2005). *Standardisasi Aplikasi E-Government untuk Instansi Pemerintah*. Prosiding Konferensi Nasional Teknologi Informasi dan Komunikasi Indonesia. ITB. Bandung
- Indrajit & Richardus, E. (2005). *E-Government in Action*. Andi Offset. Yogyakarta.
- Institute of Electrical and Electronics Engineers. (1990) *IEEE Standard Computer Dictionary: A Compilation of IEEE Standard Computer Glossaries*, New York.
- Instruksi Presiden RI nomor 3. (2003). *Kebijakan dan Strategi Nasional Pengembangan e-Government*. Jakarta.
- Manes, A. T. (2003). *Web Services: A Manager's Guide*. Addison-Wesley. Boston USA
- Peraturan Menteri Dalam Negeri Republik Indonesia Nomor 5. (2017). *Pedoman Nomenklatur Perangkat Daerah Provinsi & Daerah Kabupaten/Kota Yang Melaksanakan Fungsi Penunjang Penyelenggaraan Urusan Pemerintahan*. Jakarta.
- Peraturan Pemerintah Republik Indonesia Nomor 18. (2016). *Perangkat Daerah*. Jakarta.
- Setiawan, A & Iman, B. (2012). *Perencanaan Strategik Sistem Informasi pada Perusahaan Penerbitan dengan Metode Ward and Preppard: Studi Kasus pada Penerbit Rekyasa Sains Bandung*. Sekolah Bisnis dan Manajemen ITB: Manajemen Teknologi, 11(3), 308-325. Bandung.
- Setiawan, A & Yulianto, E. (2017). *Pemodelan Arsitektur Sistem Informasi Profil Risiko Menggunakan Framework TOGAF*. IAI: Seminar Nasional Sistem Informasi dan Teknologi (SISFOTEK), 1(1), 229-234, Padang.
- Samudra, W. (2009). *Kebijakan Publik Proses dan Analisis*. Jakarta.
- Scholl, H.J., & Klischewski, R. (2007). *E-Government Integration and Interoperability: Framing the Research Agenda*. *International Journal of Public Administration*, 30, 889–920
- Sheth, A. P. (1998). *Changing Focus on Interoperability in Information Systems: From Systems, Syntax, Structure to Semantics Interoperating Geographic Information Systems*. Kluwer.
- Sulehat & Taib. (2016). *E-Government Information Systems Interoperability in Developing Countries: The Case of Jordan*. *Journal of Business and Social Review in Emerging Economies*, 2(1), 39-49
- Undang-Undang nomor 23. (2014). *Pemerintahan Daerah*. Kementerian Sekretariat Negara RI. Jakarta.
- Undang-Undang Republik Indonesia Nomor 14. (2008). *Keterbukaan Informasi Publik*. Kementerian Sekretariat Negara RI. Jakarta.
- W3C Working Group. (2017). *Web Service Architecture*. <http://www.w3.org/TR/ws-arch>. (Accessed on 2017, March 14)
- Yaseen, Muhammed & Husain, Syed. NEA Team. (2013). *e-Government Program: Data Reference Model*. Saudi Arabia. <http://www.opengroup.org/subjectarea/enterprise/togaf>, TOGAF® - the Enterprise Architecture standard used by the world's leading organizations to improve business efficiency (Accessed on 2017, January 19)