Applying TOGAF for e-government implementation based on service oriented architecture methodology towards good government governance

A Hodijah*, S Sundari and A C Nugraha
Computer and Informatics Engineering, Bandung State Polytechnic (Polban), Bandung, Indonesia

*Corresponding author’s e-mail: adehodijah@jtk.polban.ac.id

Abstract. As a Local Government Agencies who perform public services, General Government Office already has utilized Reporting Information System of Local Government Implementation (E-LPPD). However, E-LPPD has upgrade limitation for the integration processes that cannot accommodate General Government Offices’ needs in order to achieve Good Government Governance (GGG), while success stories of the ultimate goal of e-government implementation requires good governance practices. Currently, citizen demand public services as private sector do, which needs service innovation by utilizing the legacy system as a service based e-government implementation, while Service Oriented Architecture (SOA) to redefine a business processes as a set of IT enabled services and Enterprise Architecture from the Open Group Architecture Framework (TOGAF) as a comprehensive approach in redefining business processes as service innovation towards GGG. This paper takes a case study on Performance Evaluation of Local Government Implementation (EKPPD) system on General Government Office. The results show that TOGAF will guide the development of integrated business processes of EKPPD system that fits good governance practices to attain GGG with SOA methodology as technical approach.

1. Introduction
Presidential Directive No. 6/2001 states that all Indonesian government levels have to use information and communication technology (ICT) as a prerequisite for achieving good governance [1]. GGG principles are also required as a precondition for successful e-government application [2]. The Indonesian e-Government Ranking (PeGI) was selected to represent e-government achievement, while Indonesian Governance Index (IGI) was selected to represent GGG [2].

![Figure 1. Correlation between e-government achievement and GGG based on PeGI and IGI assessment [2] to increase public services for stakeholders [3-5].](image-url)
Developing e-Government system becomes the main consideration to increase public service [6] as seen in Figure 1. One of evaluation on the local government implementation performance that is routinely conducted by the government (Ministry of Internal Affairs), is EKPPD [7]. Performance measurement steps are done based on Desk Evaluation [8]:

- Provision of services for Performance Data Collection from each local government agency;
- Provision of services for data processing based on Performance Measurement Methodology using Performance Achievement Index (ICK) originating from the LPPD template;
- Provision of services to conduct internal coordination in the Verification / Validation of Performance data of each SKPD and to conduct external coordination on the process of Data Confirmation of LPPD's results with Timda.

EKPPD is conducted as an effort to improve performance based on good governance principles. Currently, the General Government Office has already utilized E-LPPD. But, there are problems that often experienced by government implementation related to EKPPD as follows [9]:

- Media usage to collect / transmit data from supporting data sources (village, district, and related SKPD) varies depending on the data processing tools availability;
- Data provided to the assessment team is inaccurate (data not up to date), which merely fulfills the reporting formalities;
- Employee sustainability as staff guarding in data collection often changes.

The three problems above are generally the main causal factors that making LPPD which will be collected to the General Government office takes a long time. So, the government apparatus (SKPD) will always be busy to meet the delivery schedule of the LPPD. Therefore, e-government is needed to improve service in LPPD data management.

There is a lot of literature on the benefits of Enterprise Architecture (EA), [10] provides strong indications for the value of EA on Information Technology (IT) projects as the basis for the development of model planning, implementation, and control system and information technology. EA framework used in this paper is the Open Group Architecture Framework (TOGAF) which is consisted of four architecture domains, namely, the business architecture, the data architecture, the application architecture, and the technology architecture [11]. Business architecture describes business processes which is appropriate with the purpose of organization, data architecture describes data usage within business processes, application architecture design application which supports business processes, technique architecture describes how the interaction of application is and application will be supported by hardware and software infrastructure [12].

2. Methods
Shifting the perspective of product-based to service-based in both the public and the government sectors makes service innovation very important, so Information Technology (IT) has a significant role in making it happen. In the perspective of Cardoso related to Service Engineering, services are categorized into three contexts: (1) business service, in this context service refers to the general definition of service as a business activity provided by service provider for service consumer in order to create value to the customer; (2) electronic service or commonly referred to as e-service, service is used to indicate all services that utilize computer network, in which service is seen as part of a business service that uses IT during the service encounter; (3) software service, is a type of e-service accessible via a web-based protocol program by a customer [13]. Web services can act as a component of e-service. Technically, SOA's distributed capabilities are defined as software services [14].

This paper applies the TOGAF with Service Engineering Simple Approach as a high-level framework as seen in Figure 2. The proposed framework uses an iterative approach in each cycle in order to develop business, data, application, and technology architectures. The process must be repeated in baseline analysis, target analysis and gap analysis of e-government implementation to conform the GGG achievement.
Figure 2. Organization structures of EA in e-government implementation towards GGG using Service Engineering Simple Approach framework and SOMA methodology [15]

TOGAF is used as an improvement of EKPPD system development that will get description of enterprise architecture in General Government office to optimize IT services by integrating all IT components comprehensively. (1) In the first is Architecture Vision phase identifies the key business requirements to be taken account during the development of Business Architecture, Information System Architecture, and Technology Architecture, the issue compliance with the strategy to achieve GGG by using GGG indicators from [2], in which technology management activities must be aligned with the business objectives. (2) The second is Business Architecture, Information System Architecture, and Technology Architecture, the issue compliance with the requirements management of e-government implementation towards GGG achievement using SOA methodologies. SOA represents a distributed computing approach that considers resources of the application as a service that can be found on the network. Then, existing resources can be reused (reusable) on a larger scale and distinguish between functions and processes to allow redefinition of business processes while still using existing functions (loosely coupled) [16]. The availability of these resources is expected to be re-used in EKPPD activities throughout Indonesia according to the business process of governance in that area.

There are many methodologies created by companies and practitioners in building service-oriented systems, one of which is Service Oriented Modelling and Architecture (SOMA) developed by IBM. SOMA is a modelling and designing technique that provides steps how target business processes can be achieved by defining and building IT solutions based on services [15].

3. Results and Discussion
To improve the performance of EKPPD by applying good governance principles as service innovation, the e-government implementation should be able: (1) to improve the completeness of supporting data from performance measurement indicators; (2) to increase collection time of Key Performance Indicator (Indikator Kinerja Kunci / IKK); (3) to increase LPPD production time; (4) to increase search time of
clarification documents; (5) to reduce the cost of conducting the desk evaluation. Here is the design for Architecture Vision, Business Architecture, Information System Architecture, and Technology Architecture of TOGAF as blue print to integrate business processes of EKPPD system that fits good governance practices to attain GGG with SOA methodology as technical approach.

3.1. Architecture Vision
The principles and indicators of GGG used in this paper as seen in Table 1.

| No. | Principles | Indicators |
|-----|------------|------------|
| P1  | Participation | - Frequency of IT application usage  
- Number of submissions / incoming requests |
| P2  | Fairness | - Access and account availability for each stakeholder |
| P3  | Accountability | - The availability of contact information from the government apparatus  
- Availability of submissions / requests report  
- Status availability for incoming submissions / requests |
| P4  | Transparency | - Number of channels to submit submissions / requests  
- Availability of explanation of the requests process / submission workflow |
| P5  | Efficiency and Effectiveness | - Comparison of time spent on the same activity  
- Time in response to submissions / requests  
- Time saved for each submissions / requests among stakeholders |

3.2. Business Architecture
Value chain of EKPPD consists of LPPD Preparation as seen in Figure 3 and LPPD Evaluation as seen in Figure 4. LPPD Preparation consists of 3 steps. First processing data source in each SKPD. Then delivered to the coordinator to check the completeness of performance data and supporting data. Finally, final IKK documents that have been approved by all SKPD are made in the LPPD document.

![Figure 3. Primary activities and supported activities of LPPD Preparation](image-url)
Evaluation is done by testing or performing confirmation of performance data (data sources) presented in the IKK template during desk evaluation. The LPPD evaluation consists of 3 steps. First, Timda requests General Government office to show the supporting documents of the performance data to be confirmed. If not sufficient for testing condition, then General Government office will ask SKPD to show more detailed supporting documents. Finally, General Government office as the coordinator will summarize the LPPD evaluation results based on the records and status provided by Timda, then reported to all parties involved (Assessment Team) as one of the evaluation points of LPPD evaluation in the following year. To know the needs of the application, then conduct gap analysis (see Table 2).

Table 2. Gap Analysis

| No. | Activity                          | Old System                                                                                                                                 |
|-----|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| A1  | Data Source Processing           | - General Government office distributes the IKK template to all SKPD through an email.  
                                  | - Performance the IKK data fulfillment to SKPD is done on the excel. Each performance data will be accompanied by supporting documents obtained from supporting data sources(village,district) through email or directly. |
| A2  | Validation / Verification of      | - General Government office do monitoring progress of supporting documents in real time for each performance data by checking directly email or hardcopy of the document. |
|     | Performance Data                 |                                                                                                                                              |
| A3  | Review of Supporting Document    | - File collection for each IKK does not have information system. General Government Office has to see file one by one based on the need for proving supporting documents. |
|     |                                  | - SKPD submits performance data of each IKK indicator along with supporting documents through direct file submission.                       |
| A4  | Reporting of Confirmation Results (desk evaluation) | - Information Submission from the assessor’s evaluation results of supporting documents for each performance data recorded by the General Government office.  |
| A5  | Reporting Performance            | - LPPD document published on http://www.cimahikota.go.id/  
                                  |
New system for each old system in Table 2 are obtained by analysing the performance measurement from Balanced Scorecard (BSC). The new system will be a requirements specification of EKPPD system in the form of a SOA services as seen in Table 3.

**Table 3. Goal Service Modeling**

| Principle | Goal [Activity] | KPI | Metric | Service |
|-----------|-----------------|-----|--------|---------|
| P1        | - Involvement of supporting data source in conducting the supporting doc. collection by online - Service availability to display the IKK template link | Increase the number of supporting data source using online data collection process - Improve the ease of performance data fulfillment and supporting doc. collection | - Number collection of supporting data conducted by online - Availability of performance data filling services along with supporting doc. collection | - Upload supporting documents - Get IKK template - Generate Clarify |
| P2        | - Account availability to access the application service | Increase the account availability | Availability of accounts for each user of the application | - Create account - Validate account |
| P3        | - A chain of responsibility (clear information) | Increasing public confidence in the apparatus | Availability of contact information from apparatus | - View apparatus contact information |
| P4        | - The administrative services can be accessed from various channels (web, mobile) - Administrative workflow information | Improve accessibility of administrative services with online submission - Increase visibility for stakeholder | Number of channels to collect, monitor, and publish performance data - Availability of workflow explanation | - Verification of supporting documents completeness - Generate &Publish LPPD - View Clarify - Monitoring IKK - Monitoring the collection, performance data publication |
| P5        | - Optimizing the resources usage by General Government office, SKPD, village, district | Reduce the time, cost, effort in the collection, monitoring, and publication | - Amount of time, cost, effort saved in the collection, monitoring, and publication of performance data | - Verify the completeness - Validate the collection - Print the documents - Manage users - Search supporting doc. |
3.3. Information System Architecture
According to the service requirements which is presented by using BSC analysis in Table 3, functional requirements of EKPPD system are modeled in use case diagram as seen in Figure 5.

![Figure 5. Use case diagram](image)

3.4. Technology Architecture
The following Technology architecture is modeled in the SOA Reference Architecture, in which the identification step starts from the business process layer up to the operational system layer. Users can obtain services over the web and mobile. Here’s SOA Reference Architecture as seen in Figure 6.

![Figure 6. SOA Reference Architecture](image)
4. Conclusion
This research proposes service-based e-government model in performance data collection from SKPD, implementation of performance data completeness monitoring, and publication of LPPD document as service innovation in General Government office. The main analysis of TOGAF (baseline analysis, target analysis and gap analysis) is used to develop Business Architecture, Information Systems Architecture (data, applications), and Technology Architectures with Service Engineering as a high-level framework in Architecture Vision to its e-government implementation. The result of the research is the services catalogue as the basis for making the prototype service built using SOMA methodology. We found 9 candidate services by using BSC analysis as goal service modelling to support GGG, in which the transparency principle through visibility and accessibility of reports and LPPD document publication, the accountability principle through information availability on the status of supporting document completeness from related SKPD, the public participation principle through the use of document-gathering status from online performance data, the efficiency/effectiveness principles through time, cost, effort savings in performance measurements during desk evaluation, the fairness principles through user account of application.

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