The Utilization of Big Data in Optimizing Tax Incomes at Jakarta Provincial Government

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Abstract. As the highest tax collection province in Indonesia, the DKI Jakarta province has the objective to promote optimization tax incomes and use. Current IT system is dominated with independent applications that make difficult to monitor and control the data. Jakarta government has taken IT initiative to optimize the potential of regional income and encourage the taxpayer compliance in fulfilling the obligation of payment of local taxes as well as the creation of integration of revenue collection amongst all related units. Jakarta governor has encouraged the use of recent IT technology to support faster data retrieval and effective decision-making process. The article proposes the conceptual SOA framework and supported with web GIS and Big Data application to promote data exchange amongst all units. The use of SOA is expected to deliver reliable services, module reusability, scalability and interoperability. The outcome of the article is expected to be used as a reference for all province in Indonesia in integrating data that spread in all districts/sub-districts and task-forces, and promote better decision making.

Keyword: DKI Jakarta province, Conceptual SOA framework, Web GIS, Big Data application, Data integration, Promote Better Decision Making.

1. Introduction

Jakarta, like other metropolitan cities around the world, adopts the concept of e-government to improve services, streamline bureaucracy, transparency, accountability that increase public participation in development, data-driven policies and other positive things. The governor of Jakarta has taken initiative to promote the use of IT in all working units especially in integrating revenue collection (1). This policy is aligned with the objective of e-government development in Indonesia as stated in presidential decree (Inpres) No. 3, year 2003, to develop e-governance system and to improve the quality of public services more effectively and efficiently (2). The development of e-government is conducted through structuring management systems and work processes in the government environment by optimizing the utilization of IT, especially in optimizing acquisition of local revenues.

Optimizing local revenues collection is not an easy task, local government should seek the source of potential financial resources, namely local taxes and charges (3). To increase the revenue of the region as a reflection of the implementation of the principle of autonomy as possible by utilising the availability of intelligent devices that can take advantages of many heterogeneous data every day (4). Although it sounds promising, however, there are some obstacles to apply tax optimization by utilizing the role of IT to this project.

The common problems such as the absence of model that can be used to optimize use of IT and comprehensive tax data retrieval that resides in multiple systems and applications that span in the units/districts. The needs of comprehensive data are required for all types of local taxes with the support of related units in the activities of local tax revenue collection and also the urgency of taking the right and quick decision. The study has several objectives such as: (1) to examine the IT role in local tax revenue contribution to the local income in Jakarta Province; (2) Big Data utilization in data analysis as one of essential tools for decision-making based on data; (3) integration of systems and data in
obtaining more valid tax data by using Enterprise Service Bus (ESB) (5); (4) geospatial utilization in modeling and predicting tax potentials spatially and non-spatially.

To support the achievement of a competent government, the Jakarta government has introduced the Government 3.0 initiative for promoting effective management and active response to address complex social phenomena by using collaborative maps and suggesting directions for desired collaboration (2). The project is strictly confidential and contains sensitive data. However, it still allows releasing limited data access to the public after assessing the benefits and risks associated with it (6). This article examines the use of middleware for data integration and GIS utilization in local tax revenue optimization as well as to optimize the decision-making process.

2. Literature Study

2.1. Utilization Geographical Information System (GIS) Web

The use of GIS web mapping as an effective tool is essential to integrate geographical data that supports various data formats (graphics, text, digital) from various sources, has become top priority for Jakarta government, where it allows the decision maker to view better data retrieval from task-force units (or known as SKPD). The GIS web enables to process and analyze data in more efficiently and effectively by using spatial aspect such as easy variable analysis, efficient data updating capability, especially with graph processing and capability to accommodate large data in volume.

There is a difference between websites that are mostly used as complaints and portals that provide recent update information based on visitor interests (2). GIS web comes out as a suitable platform that enable to map, analyze, manage data and enables cross-functional collaboration by using geodatabases, such as a database relation that contains spatial data and non-spatial data, with its capability to support large data storage and management of geographical information in standard database management systems. Web GIS also has advantages in storing uniform geographical data that allows users can easily edit the data simultaneously, with dynamic map features that can be accessed by all stakeholders in various sectors such as: local government, public safety, telecommunications, transportation, utility, military and security networks, decision making and monitoring (8).

2.2. Big Data

Big Data is defined as a system that enables to integrate structured, semi-structured and unstructured data. It has main characteristics such as (1) capability to process a high volume of data; (2) capability to process in a high-speed mode; (3) capability to read and integrate a different variety of data. The article examines the use of Apache Hadoop application to retrieve and integrate the various data format in multiple applications that installed in district and sub-district through SOA framework. With the Hadoop libraries, those data can be processed and displayed in GIS web (9).

Hadoop has two main components such as (10): (1) Hadoop File System (HDFS) that enables self-healing, high bandwidth clustered storage, reliable, redundant and distributed file system optimized for large files; (2) MapReduce, enables fault-tolerant distributed processing, programming model for processing sets of data mapping inputs to output. The use of Hadoop application is expected to integrate and process data in all task-force units (SKPD) (4).

2.3. GIS Utilization with Big Data

The article examines the use of government service platform, GIS web platform and supported with Big Data application. The service platform combines the use of Internet of Things (IoT) and cloud computing to facilitate and manage entire government affairs. It enables to support effective decision support mechanism and helping decision makers to respond faster with a high alert whenever the intervention initiative is required. A front-end graphical user interface (GUI) is established and combines with Big Data application enable to display the location-based information and other essential information through the use of smartphones. Common web service technology, such as SOAP and REST enables sharing of web maps using web service URLs and can interact with data and information products via the web. The geospatial application had features to support web application development and referred to as Geospatial Big Data (11), with the capability to allow users to share data and information product such as map service, and another public service. This service provides flexibility to allow multiple access capabilities for user interaction.
3. Methodology

3.1. SOA Theoretical Framework.

The article proposes an SOA conceptual framework in Big Data environment to assist in examining the current IT infrastructure. Different issues and experiences in modeling, development, and utilizing the SOA and techniques related to Big Data, are discussed with the involvement of major stakeholders in data processing (12). The SOA framework enables the analysis of IT team and links them with the use of Big Data to identify current conditions and relevant topics related to Big Data (13). It enables to define essential element data that are needed for data exchange and system integration plan that consists of data structures and formats, origin and content, create data standards for both related taskforce units either for the one that have information systems (IS) and other units that do not have access to IS; and also addressing the needs of other stakeholders as partner to Jakarta government.

Finalization and verification of data completeness are needed to ensure the validity and availability of data, easy data access and availability of information. The article uses observation and focus-group interviews techniques with the persons that involves in the essential business process. Figure 1 shows the use of middleware to serve the data exchange amongst taskforce units in GIS Web.
The data exchange is integrated so that the validity of data remains can be kept in the sector (data source) and reduces data duplication and promote data reusability. The flow of data can be more easily controlled and monitored so that measurable data exchange service can be done effectively. The use of Enterprise Service Bus (ESB) serves as middleware to organize media service and can monitor existing data services so that data services can be connected, reused and allows easy data access (14). The data exchange between stakeholders not only come from data between units of the Jakarta provincial government but also data from other government agencies and the banking sector in the financial transactions carried out, because of all financial payment transactions is cashless, for units that do not have an information system, the container database is provided.

The Big Data system is connected to the ESB that enables to manage a large amount of data. It is shown in Figure 2, and the results can be monitored in the dashboard in real-time mode (see Figure 3).

Figure 3. Big Data Dashboard.

The SOA theoretical framework enables to link all levels starting from the top to operational level. Figure 4 shows data integration in all units that enables the optimization of entire tax data retrieval into the ESB. The information can be summarised and mapped through GIS maps to serve both spatial and non-spatial data. The use of GIS map enables fast data analysis and fast data streaming in Big Data environment to support the effective decision-making process. Data from each stakeholder will continue to be integrated into the same basic data for the analysis process and can be analyze for certain trends. It enables to make complete profiling of each tax object such as the time registration of the tax object is made. The licensing process also enable to check whether the tax obligation has been fulfilled and analyze each tax object whether he/she has complied with the tax report. The integration with Waze application allows easy monitoring potential income location and suggest appropriate tax values.

Figure 4. The conceptual data integration with middleware for the utilization of GIS and Big Data.

Figure 4 shows the conceptual data integration of all task-force units in entire Jakarta districts. With the use of ESB and Big Data application enables to integrate all identification numbers (Ids) such as citizen
id (KTP), taxpayer id (NPWP), business licensing (SIUP, TDP, etc.), social security number, budgeting process in district and sub-district, etc.

3.2. Profile of DKI Jakarta Provincial Government

DKI Jakarta Provincial Government earns special administrative privilege for managing 5 cities and 1 district. In 2017, the Jakarta government managed more than 12 million taxpayers and expected to increase every year. In managing substantial taxpayer data, the Jakarta government has created an initiative to apply big data system and combined with SOA framework with objective to maximize the potential local incomes. The major incomes come from vehicle licenses and transfer fees (BBN-KB), fuel added taxes (PBB-KB), public utility (such as lighting tax, etc.), hotel and restaurant, entertainment, advertisement, parking, water and building/land (or known as PBB), and building acquisition duties (BPHTB). With more than IDR 70 trillion more come from taxation every year, the Jakarta government embraces aggressive IT initiatives to promote optimization in budget use.

3.3. Data Integration

The formulation of data integration involves: (1) uniformity of data structures (column names, data types and data codes); (2) data exchange method using (web service / FTP or email); (3) determining access rights and accessible data types; (4) data format used (code, date, number); (5) creating data exchange scenario by integrating architecture and describing the flow of data between information systems; (6) determine the SLA (Service Level Agreement) on the number of data services that can be served for a certain period of time; (7) web service testing; and (8) make documentation.

4. Discussion

The need for data analysis and accurate information systems has become the top priority for the Jakarta government. The conceptual SOA framework with web GIS and Big Data application enables to integrate and promote optimization of retrieving taxation revenues from all districts and task forces. The framework enables to make the scope of data integration based on functionality and benefits. After selecting the data associated with the taxation system, enables to proceed with setting up the priority of data and ready to be integrated and retrieved in applicable ICT parent plan. The SOA framework enables to conduct impact analysis, lowering the risks (eg. tax fraud), examine the policy execution and integration. The outcome of the SOA framework is expected to become a reference guide for conducting these activities and to optimize data retrieval from all parties to assist risk evaluation and management guided by the data. Currently, the SOA framework has been reviewed, and a pilot project with limited scope has been established in some districts such as West and East Jakarta to address vertical and horizontal integration. Several considerations has been noted in this pilot project such as: (1) current procedure needs to adapt and revise in order to comply with SOA framework; (2) necessary actions needs to be taken to address potential hamper and failures that may interrupt the implementation of Big Data; (3) reduce complexity in implementation. Intensive training and organisational change needs to be done to reduce the complexity in implementation; and (4) determining the appropriate time frame of implementation and implementation references.

5. Summary

Promoting optimization in tax retrieval is the top priority needs to be taken by Jakarta government. The conceptual SOA framework with GIS web and Big Data enables facilitating easy data integration and systems amongst relevant stakeholders and as a suggestion for the fulfillment of good information, data transfer needs, regional potential fulfillment, urban supervision and control, and policy application materials. The other benefits such as increasing revenue quickly with better data profiling and can correct the leakage or untapped potential incomes which can be used as the basis for recalculation of target revenues and prevent corruption (4). The use of GIS web enables easy integration to the spatial and non-spatial data, and provide new horizon to monitor and understand the data. It facilitates better data management in entire governmental affairs, so that the all levels from top management to local districts and sub-districts with no exception has the same reference data and maps. In the future, any strategic policy is expected to be taken based on the same data/information to promote good governance.
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