Regional income management information system with Enterprise Architecture Planning Approach (EAP): a case study in BPKPD Klungkung Regency

I B G A Darmita\textsuperscript{1,a}, G R Dantes\textsuperscript{1,b} and I M Candiasa\textsuperscript{1,c}

\textsuperscript{1}Faculty of Computer Science, Universitas Pendidikan Ganesha, Singaraja, Bali, Indonesia

Email: \textsuperscript{a}darmita@undiksha.ac.id, \textsuperscript{b}rasben.dantes@undiksha.ac.id, \textsuperscript{c}candiasa@undiksha.ac.id

Abstract. Financial and Revenue Management Agency (BPKPD) Klungkung is a type of agency that carries out financial support functions to assist the Regent of Klungkung in administering regional autonomy. Although the regional revenue is in considerable amount, BPKPD Klungkung has no guidance in developing a regional revenue management information system in Klungkung. Thus, a good, efficient, effective, and accountable local revenue management procedure becomes essential. One of the options is to employ information systems and information technology (SI/IT) through the implementation of applications in various organizational functions. Enterprise Architecture Planning (EAP) is a method or frame of reference in building an information architecture that focuses on business needs that consist of data architecture, applications, and technology as well as the implementation plan of architecture created to support business activities to achieve the organization objectives. The result of the research using EAP showed that data architecture methodology was first to be defined so as to produce 19 data entities, defining the application architecture and technology. Based on application portfolio, there were 6 key operational applications 2 strategic applications, 2 high potential applications, and 1 supporting application displayed. It was expected that the regional revenue of Klungkung will be optimized through the strategic information system planning using EAP.

1. Introduction

The use of Information Systems and Information Technology (SI/IT) is inevitable to obtain competitive advantage \cite{1}. Such change is mandatory for both government organizations and business organizations so as not to be crushed by their competitors. This condition is inseparable from the purposes of strategic information planning, that is to prepare an analysis management plan and planning a computer-based system development.

In reference to Law Number 32 of 2004, concerning regional governments, regional revenues come from receipts from equalization funds at the central and regional levels, but they can also originate from the regions themselves, namely the authentic local revenue (usually referred to as PAD, which stands for Pendapatan Asli Daerah) \cite{2}\cite{3}\cite{4}. By implementing information systems and information technology for regional revenue management, it is expected that the main tasks and functions of the Klungkung Financial and Revenue Management Agency (BPKPD) can be carried out efficiently, effectively and accountably \cite{5}\cite{6}\cite{7}. With the existence of strategic information system planning using...
Enterprise Architecture Planning (EAP), it is hoped that it can optimize regional income in the Klungkung Regency Government [8][9][10].

2. Literature Review
Research on EAP have been conducted previously. EAP was used on tourism information system in the Department of Culture and Tourism of Tana Toraja as one of the technical agencies in the Government of Tana Toraja. One of the main functions of this institute are to develop tourism to get economic and social benefits from tourism activities. An enterprise information system based on information technology should be planned to provide an overview of information systems to support business process services. EAP defined the business requirements and the architecture. From the research mentioned above, it has found that the application required in the information system is tourism website, financial application, human resources department (HRD) application, and Controlling and Evaluation application [11].

With the decreased economic activities in mining and oil industries and the fierce competition in heavy equipment industry, PT Trakindo Utama intended to restructure its company, particularly its information technology development that can fully support its business and improve its service to customers. The technology supporting those two matters needed strategic and thoughtful planning. Then, Enterprise Architecture Planning methodology was chosen to provide an enterprise-scale solution to those matters. The result of the planning includes data, application and technology architecture planning, and the technical aspects of its implementation. The research was expected to provide an alternative solution to PTTU in doing strategic planning appropriate and useful for the company in the future [3].

2.1. Information System Strategy Planning
The definition of information systems strategy planning is a process of identifying a computer-based application portfolio to implement good and harmonized corporate strategies as well as have the ability to create profits (competitive advantage) more than competitors [12]. According to [13] information system strategic planning may result in effective management, improved communication and relationships between business and IS organizations, aligned direction and priorities of IS and business priorities, increased competitive advantage and increase value for business: (a) planning the flow of information and processes, (b) efficiently and effectively allocating IS resources, (c) reducing the venture and costs needed during the system life cycle.

The purpose of information systems strategic planning is to provide a systematic process for the development of information systems based on the organization's strategic plan. Organizations can do Strategic Planning for Information System (SPIS) properly. Organizations must consider organizational aspects and technical aspects. The organizational aspect emphasizes the need for an integrated information system plan and is closely related to organizational goals. The technical aspect emphasizes the need for planning to for information systems architecture. [14]

2.2. Information System Strategy Planning with Methodology Enterprise Architecture Planning
Enterprise Architecture Planning (EAP) is an approach made by Steven H. Spewak aimed to build an enterprise architecture based on data driven and business driven[15][9]. Each Enterprise Planning is built through 4 layers, namely: the starting stage, the stage where we are at the moment, the stage of formulating a plan to achieve the vision of the future, the stage of how to plan to achieve it [16].

2.2.1. Layer 1 - Getting started
   a. Planning Initiation
      Planning initiation is the first step of the EAP Approach which determines the scope of enterprise planning objectives, explains the vision, mission and goals of an organization, strategic issues and proposes the vision of the Klungkung Regency revenue management information system and uses a planning methodology.
2.2.2. Layer 2 - Current Conditions
   a. Business Modeling
      In this case it will gather knowledge about businesses and information that will be used in carrying out business activities.
   b. Current Technology Systems (Current System & Technology)
      Define the existing application system so that technology platforms and systems become a reference in the migration for the long term.

2.2.3. Layer 3 - Future Plans
   a. Data Architecture
      This stage determines the main types of data that will be used in supporting business activities with the aim of identifying and defining enterprise requirements for data to support business functions.
   b. Application Architecture
      Determine the types of main applications that will be used in managing data and support rather than business functions.
   c. Technology Architecture
      It is an activity to define the technology platform needed to provide an environment for applications that will manage data and support business functions.

2.2.4. Layer 4 - Achievement Strategies
   a. Implementation / Migration Plans
      Define application for implementation plan or migration from current position to desired position in the future such as application implementation activities, schedule for implementation of cost and benefit analysis.

3. Discussion

3.1 Enterprise Architecture Planning of Financial and Revenue Management Agency (BPKPD) of Klungkung Regency

3.1.1. Business modeling with value chain analysis. The main business function of the BPKPD Klungkung is regional revenue management. In Michael Porter’s concept, regional revenue management is grouped into primary activities and supporting activities.

   The primary activities of BPKPD of Klungkung Regency were:
   a. Regional Income Data Collection: BPKPD collected the data on local tax objects and subjects to record Taxpayers by being registered by the officer or official through Official Assessment and Self-Assessment.
   b. Determination of Regional Revenue: BPKPD carried out the calculation and determination of regional tax office and issued a local tax assessment letter and a local levy assessment letter.
   c. Regional Revenue Data Processing: BPKPD created and maintained a register of taxpayers and issues an NPWP (Regional Taxpayer Identification Number) identification card.
   d. Local Revenue Billing: BPKPD calculated regional tax/levies tax assessments, underpaid tax/levies tax assessment letters, overpaid tax/levies tax assessment letters, underpaid tax assessments/levies underpayments additional, zero regional tax/levy assessment letter.
   e. Objection of Regional Revenues: BPKPD processed the corrections, cancellations, decreases in assessments, and eliminated or reduced administrative sanctions.
   f. Regional Revenue Research and Reporting: BPKPD conducted field research on local taxes, regional levies, and other regional revenues.

   There were 4 supporting activities conducted by BPKPD of Klungkung Regency, namely:
   a. Regulations regarding regional income
b. Staff Management: this activity concerned with the human resources management in carrying out tasks in accordance with their skills and expertise.

c. Financial management: this financial management was related to the programs and activities to be carried out in BPKPD Klungkung Regency.

d. Equipment: this is related to the management of the need for facilities and infrastructure needed at the BPKPD Klungkung.

3.1.2. Decomposition of Business Functions. In the activities resulting from the Value Chain analysis, the Klungkung Regency revenue management activity will be decomposed into several sub-functions. In ensuring the completeness of the decomposition the life cycle analysis of the resources used in the Business System Planning methodology is requirements, requirements, acquisition, stewardship (management), disposition (disposition).

3.2 Current Systems and Technology

3.2.1. Analysis of conditions and needs. A SWOT analysis was conducted to determine the conditions of the current enterprise environment [17]. The result of the analysis is as the following.

The strength of the Regional Financial Management and Revenue Agency is firstly, it manages regional revenues, secondly, it used Fiber Optics. Thirdly, electronic-based services (e-Government) was a mandatory. Fourth, the development of electronic-based regional revenue management system has a legal umbrella. Fifth, some of the employees had high formal education background.

There are four weaknesses in the current systems and technology. First, the resource had limited abilities in operating information system and information technology. Second, the regional revenue management received limited budget. Third, the use of information systems and information technology that supports the main tasks and functions of the Klungkung Regency Financial Management and Revenue Agency (BPKPD) remained not optimal. Fourth, the level of competence and welfare of officials were low.

The current systems and technology had three opportunities, namely the human resources (HR) were subject for optimal empowerment, there was a shift from conventional to electronic services (e-Government) in the work paradigm, and there was some increase in regional revenue potential being managed.

The threat consisted of there was an audit process regarding revenue based on e-audit, mutation of ASN (State Civil Apparatus) employees in the regional government environment that had not been well controlled, and public information that presents reports that are transparent and accountable.

3.3 Data Architecture Development

3.3.1. List of Data Entities. At this stage, the potential data entities used in supporting the business were identified. This process was done to observe the data requirements that exist from each of the business processes that have been defined. The business function involved 6 process namely Data Collection, Determination, Data Processing, Billing, Objection, and Research and Reporting. For the first business function, Data Collection, there were 7 data entities namely Team, Data Collection, Types of Revenue, Taxpayers, Sub districts, Sub-Districts, and Employees. The second business function consisted of six data entities namely SKPD, SKRD, SKPDKB, SKPDKBT, SKPDN, SKPDLB. The third business function, Data Processing, consisted of 1 data entity namely NPWPD Cards. For the fourth business function, there was one data entity namely Billing. The fifth business function, Objection, Objection Rejection, and Appeal. The sixth business function consisted of one data entity namely Research and Reporting.

3.3.2. Entity Relationship Diagram. In an entity, a data can be said to support when more than one area of function that does not stand alone, and also has a dependence relationship with other data entities.
The modeling was done by making Entity Relationship Diagrams (ERD) to describe the interrelationship between data entities in regional revenue management in Klungkung Regency.

3.3.3. Relationship of Business Functions with Data Entities. Data entities and business function were interdependence in data making, data processing and data using were aimed at the fulfillment of the objectives of business functions. This relationship was defined through a process matrix for entities data to be filled with the letters: "C" (create), "R" (Reference), "U" (update), and "D" (Delete).

3.4 Development of Application Architecture.
After the business function had been defined and data architecture had been made, the next step was to define the applications. The application candidates were inventoried regarding the future business function and business management. In the data management application, candidates were obtained from the analysis of the function matrix of data entities generated at the stage of making the previous data architecture. Other application candidates were obtained through Critical Success Factor analysis.

The following were the application candidates adapting the development of current IS/IT applications:
   a. Data Collection Application
      The Data Collection application was used to register new taxpayers (WP) and add tax objects.
   b. Application Designation
      The application of designation was used to determine the amount of regional taxes or fees set by the relevant official.
   c. Data Processing Application
      Data Processing Application was used to process data from the data collection, and the output of this application was the NPWPDP data card (Regional Taxpayer Identification Number).
   d. Billing Application
      The Billing Application was used for billing taxes and levies, while the output of this application was a warning letter, billing by force letter.
   e. Application Objection
      The Objection application was used if the taxpayer has objections to the tax assessment that has been set by issuing an Objection Decree or Objection Refusal Decree.
   f. Research and Reporting Applications
      Research and reporting applications were used to find out the realization of local taxes and levies.
   g. Dashboard Monitoring Application
      The Dashboard Monitoring application was used to monitor the number of taxpayers, tax reporting and realization.
   h. e-SPTPD Application
      The e-SPTPD application was used to report its sales turnover in a month (self-assessment) and to observe the tax assessments that have been set (Office Assessment).
   i. Map Information Mobile Digitization Application
      The Map Information Mobile Digitalization application was used to find the position of local tax objects.
   j. Application Systems and Procedures
      This application was used as a guideline for the implementation of regional revenue management.
   k. Website of the Regional Financial Management and Revenue Agency (BPKPD)
      This website was used as a medium for information and communication of the BPKPD regarding the management of regional income including information and rules relating to regional revenue management.
3.4.1. Application Portfolio. The application portfolio framework was used to complete the application determination process in relation to business functions. The flow of building this application portfolio was created using a framework based on the alignment between business strategy and information system strategic planning. The portfolio consisted of strategic application, high potential application, key operations, and supporters as explained below.

a. Strategic application refers to critical applications for the sustainability of future business strategies consisting of: Dashboard Monitoring Application, Mobile Information Map Digitalization Application.

b. High Potential application refers to supporting applications for future success consisting of e-SPTPD Application and BPKPD Website.

c. Key Operation applications refer to the applications that were featured or preferred by the organization to achieve the desired target, namely: Data Collection Application, Establishment Application, Data Processing Application, Billing Application, Objection Application, Research and Reporting Application.

d. Supporting application refers to a valuable application but less critical in determining success, namely: application of systems and procedures.

3.5 Components of Technology Architecture

The components of technology architecture are as follows.

a. Operating System:
The operating system that support communication networks, a number of software and applications for system development, can be used for multiple platforms, scalable (can be used on computers with small and large spare parts), compatible (can be used with existing equipment).

b. Hardware:
Optimizing existing hardware before buying new hardware, selected hardware must have a higher level of availability and support the next technology and not focused on a brand.

c. Network Communication:
Can be connected using wired and wireless network technology, provided with adequate bandwidth in supporting real-time services.

d. Application
In making an application made by a third party, it should be able to be modified according to the needs in the organization. When there is a development of a new application, it must pay attention to and be integrated with the information system that is already running. documentation must be made, and the source coding backed up.

e. Data Management:
Between data storage and application must be separate (client-server), In data storage must be centrally applied.

f. Security:
In accessing data, applications and networks are recorded (log), access to the system is granted in accordance with the access rights of each user.

3.6 Implementation Plan

The plan for the implementation of the Klungkung Regency revenue management information system in this case refers to the Enterprise Architecture Planning (EAP) model and juxtaposed with the current conditions, referring to the application portfolio with long-term, medium-term and short-term adjusted to the business needs of the Agency Klungkung Regency Financial Management and Regional Revenue (BPKPD).

The recommended software for building applications is MySql database server considering that a web-based application was easier in term of maintenance and deployment, could be simply accessed through browser, and suitable with the available computers. The web development employed Personal
Home Page (PHP), a server-side script programming language designed for web development. PHP integration with the database was simple and easy to implement due to its support for multiple databases (DBMS), free and most web hosting services support PHP.

A conceptual workstation needs was planned which functioned as the location concept and supported with data through applications. The conceptual enterprise network can be seen in Figure 1.

**Figure 1.** Conceptual Network Enterprise for BPKPD in Klungkung Regency.

Figure 1 illustrates the information related to the needs of data distribution and the necessary supporting technology. There would be 2 routers defining which channel to pass, namely the main gateway and the office gateway. The former functioned as a regulator of the internet path, while the later managed the existing computers. Switch or hub connected the computers located in each organizational unit. In addition, switches / hubs including fingerprints, CCTV, access points / hotspots, and printers could be utilized.

4. **Conclusion**

BPKPD of Klungkung Regency required an optimal information system to support business processes in managing the regional revenue. Enterprises Architecture Planning (EAP) as an Enterprise Architecture information system was considered capable of providing guidance on the development of Information Systems. The results provided the stages of defining current business models, systems and technology, data architecture, application architecture, technology architecture and implementation plans which are analyzed using value chain analysis, decomposition of business functions with a four-stage life cycle and McFarlan information system portfolio. In this paper, an information system strategic plan can be drawn up at the BPKPD of Klungkung Regency up to its portfolio stage. As a sum up, some of the conclusion are:

1. BPKPD of Klungkung Regency aimed at "The realization of the Regional Revenue Management Information System as a Means of Optimizing Effective, Efficient and Accountable Regional Revenue" on its IS/IT.

2. Decomposition of business processes using resource cycle analysis produced 19 data entities.
3. The application portfolio used to group segmentation proposed 11 applications to be built to support the tasks and functions of the BPKPD of Klungkung, namely: 6 Key Operational Applications, 2 Strategic Applications, 2 High Potential Applications, and 1 Supporting Application.

4. The entire system will be connected to the network connection and integrated with other systems within 3 years.

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