

Design of Management Information System for Employee Performance Appraisal Using Service Oriented Architecture (SOA) Method

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Abstract. Information Technology and Information Systems are able to assist the performance appraisal process and assist decision-making by the management of an organization. Bank BTN Bogor Branch Office itself has carried out the performance appraisal process for employees every quarter, semester and annually every year. The performance appraisal process uses the key performance indicator method using several indicators, where the assessment is carried out by superiors to subordinates after a performance target has been set by the Central Bank BTN Office. The performance appraisal process takes quite a long time because the accountant has to collect every performance appraisal result from each work unit. In addition, the ongoing system has another weakness, namely that it cannot be monitored via the dashboard in real time by the Management division which aims to assist in decision making in finding top talent. This study designed a Management Information System for employee performance appraisal at Bank BTN Bogor Branch Office which is designed for 2 levels of management, namely middle level management and bottom level management. The design of this SIM includes 3 stages, namely the data collection method, the Rapid Application Development (RAD) system development method and the Service Oriented Architecture (SOA) method. The application of SOA is used so that communication between systems can run smoothly without being hindered by different platforms. The results of the SIM design in the form of a mockup that functions as an assessment system and monitoring media for employee performance with several features in it both mobile and website. Then there are several additional features in designing a mobile-based information system, namely employee performance which aims to see top talent candidate employees.

1. Introduction

In the current era of the digital 4.0 industry, Information Technology and Information Systems are able to change the human perspective in completing a job. One of the conveniences with the presence of technology is that it is able to assist the performance appraisal process and assist decision making by the management of an organization or company.



PT. Bank Tabungan Negara (Persero) Bogor Branch Office is one of the state-owned corporation engaged in the banking sector through housing finance and industrial activities by distributing mortgages and loans. Bank BTN Bogor Branch Office itself has carried out the performance appraisal process for employees every quarter, semester and annually every year. The performance appraisal process uses the key performance indicator method by using several indicators as a two-way measurement benchmark, where the assessment is carried out by superiors to subordinates after the performance targets have been set by the Central Bank BTN Office. On-going employee performance appraisal uses a semi-manual program, namely the Performance Management System (individual) and the Annual Performance Target Planning (PSKT) for Branch Office performance. The performance appraisal process takes quite a long time because the accountant has to collect every performance appraisal result from each work unit. Furthermore, the ongoing system has another weakness, namely that it cannot be monitored via the dashboard in real time by the Management division which aims to assist in decision making in finding top talent among employees.

There are many studies related to information system management, one of which is research on surveillance in the campus environment. This study aims to produce a website-based information system that supports integrated management of supervision in higher education[1]. Subsequent research discusses the design of a management information system for project management which aims to make it easier for consultants to assist their clients and design the application process for intensive programs [2]. Subsequent research explains that the data management information system provides accurate and real-time information to assist the decision-making process for managers and planning effectively and control the operations of an organization [3]. The research on the dashboard to display KPI achievements. This study produces a management information system that is able to present important information through a media dashboard, such as employee operational information, a dashboard for tactical and strategy for managers [4]. The next research discusses the Service Oriented Architecture. This research resulted in a service modeling paradigm by adopting the Basic Model Interface and developing a set of web API services to demonstrate this functionality [5]. Furthermore, research that discusses the integration of services in electric companies. This research produces a service modeling that can integrate several services at once [6].

From the problems mentioned above, the management requires an information system capable of monitoring employee performance efficiently and effectively, one of which is a management information system that will be designed based on web and mobile. However, SIM requires communication with other information systems in the Bank BTN KC Bogor ERP for data collecting data. The integration will be designed using Service Oriented Architecture (SOA) technology and the NuSOAP library. This SOA design aims to distribute data from ERP without being hindered by differences in platforms, differences in databases, differences in programming languages and differences in server locations. Based on the background above, there are 3 objectives in this research including the following :

- a. To design a Management Information System that is able to assist the Management of Bank BTN Bogor Branch Offices in employee performance appraisal and monitoring of KPI achievement in real time.
- b. To design a Management Information System so that the Management of Bank BTN Bogor Branch Office can make decisions in finding top talent among employees.
- c. To design a Management Information system that is integrated with the ERP Bank BTN Bogor Branch Office using the Service Oriented Architecture (SOA) method.

2. Background Theory

2.1. Management Information System

Management Information Systems are information systems that provide support for organizations represented by managers in a management level or in a particular field [7].

Management Information System is an information system that is poured through reports and visualization of information to be distributed to managers or superiors. Examples are sales analysis, employee performance and financing reporting systems [8]. Therefore, the type of management information system has a management level in the following Figure 1 [9] :

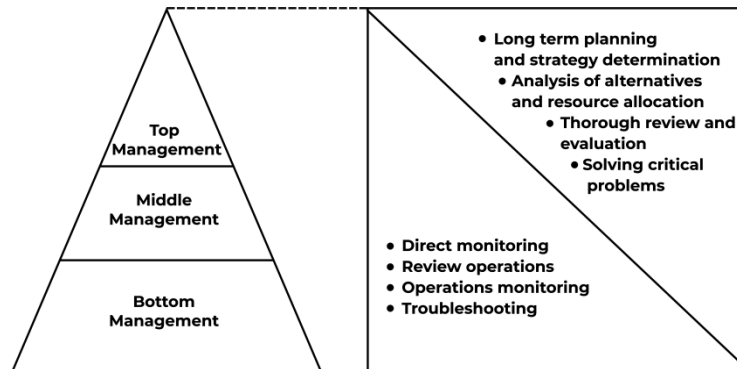


Figure 1. Type of Information and Management Activities

In the Figure 1, there is an explanation of the level of management, including the following:

- Top level management is the executive who is in charge of strategic planning, policy and decision making.
- Middle level management is the management who is in charge of preparing tactical planning.
- Lower level management is the management in charge of planning and monitoring business process operations.
- Operators are tasked with processing all forms of transactions and answering all forms of requests.

2.2. Performance Appraisal

Performance appraisal is an evaluation of the performance of employees at a company or organization by comparing the results of the achievement with the targets to be achieved through the employee performance appraisal instrument and displaying the quality of work in the organization [10].

2.3. Key Performance Indicator

Key Performance Indicator is one type of performance measurement used by management in an organization to create reports, measure and manage performance. In other words, KPI is an indicator that presents the performance results in a process that has been done [11].

2.4. Dashboard

Dashboard is a form of visualization of information presented in the form of tables, charts, reports, visual indicators that aim to monitor organization performance on a single screen. Visual displays must present the best possible information, so that the human eye can see quickly and the human brain can understand it correctly [12].

2.5 Service Oriented Architecture (SOA)

Service Oriented Architecture is a collection of several services that communicate with each other and coordinate several activities involving data through one or more services that have been converted into business service[13]. By using this service business, every function of each connected service can be used by anyone without changing the components of a system if a service is changed. SOA also works by converting a software into a reusable service so that the service can be used without being interrupted by changes in business processes[14]. In SOA there are also several components can be seen in Figure 2.

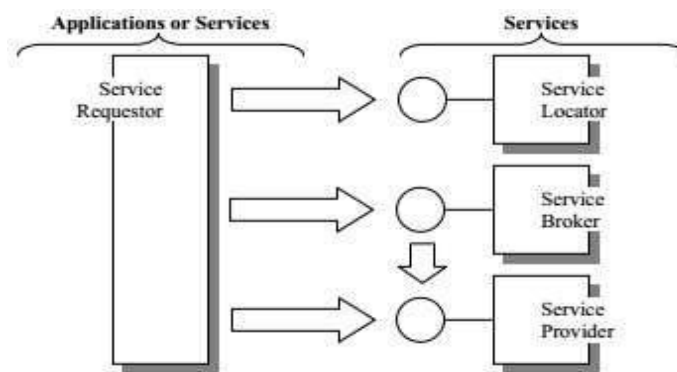


Figure 2. SOA components

In Figure, there are several explanations as follows:

- Service: services in SOA must be loose-coupling, meaning that the service does not depend on differences in platforms, programming languages or server locations.
- Loose-coupling: serves to maintain communication between services in case of changes in the system when there is a change in service.
- Service provider: entity in software whose job is to run software specifications.
- Clients: entities in the software that make requests to service.
- Service locator: Registry on the type of service provider and functions in finding the service location and service provider interface.
- Service broker: A type of service provider that is able to answer requests from service to one or more service providers.

2.6 Rapid Application Development (RAD)

Rapid Application Development (RAD) is one type of object-oriented system development method that includes development methods and software [16]. RAD aims to shorten the time in a traditional system development life cycle between planning and implementing an information system (See Figure 3).

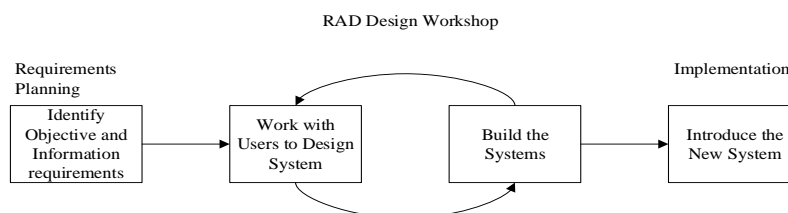


Figure 3. Rapid Application Development Model

In RAD there are 3 phases or stages, namely [10]:

- a. Requirements planning
Stages of data collection where users and analysts discuss the objectives of the information system to be built by identifying information needs. This stage focuses on meeting the two parties, especially the involvement of users from various levels of the organization in order to meet user needs properly.
- b. Design workshop
At this stage, it focuses on designing the system to be built and making some improvements if needed (there are design deficiencies) between the user and the system analyst. Users play an important role because they actively participate in providing input to each design process.
- c. Implementation
The last stage where after a discussion between the user and the system analyst and the design of the information system to be built. So, next is the process of building information systems by programmers.

2.7 Unified Modeling Language (UML)

Unified Modeling Language or commonly abbreviated as UML is a form of notation used in the design and development of information systems or software covering analysis and design to architecture in object-oriented programming [17].

UML which will be notated in the form of a diagram to represent the design of a system, namely:

- a. Usecase diagram
Usecase diagram is a modeling of the properties or functions of the information system to be designed. Usecase describes the interaction between actors and the system to be designed.
- b. Activity diagram
Activity diagram is an activity modeling that represents the work flow of a system or menu in an information system.
- c. Class diagram
Class diagram is a system structure from the translation of classes contained in an information system design. In a class, there are attributes and methods or operations.
 - Attributes are variables owned by a class.
 - Operations or methods are functions that belong to a class.

3. Methodology

The research methodology is depicted in a flow chart, the researcher uses the Rapid Application Development (RAD) system development method. The stages of this research are described as shown in Figure 4.

The principle of developing a research methodology is based on the development of information systems by Kendall (2008) which has been modified by the addition of modeling and service from the Service Oriented Architecture (SOA) method. For an explanation of the research methodology, it will be discussed in general below:

- a. Identification of Needs
The initial step taken was a process of observation and interviews to dig up any technical information from employee performance appraisals and identification of problems related to employee performance appraisals at Bank BTN, Bogor Branch Office.

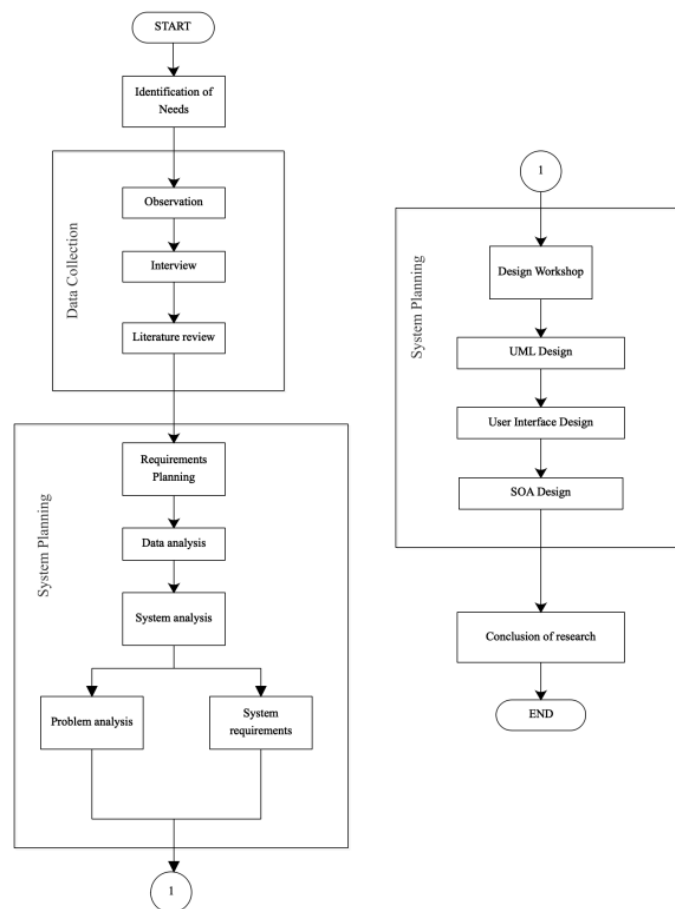


Figure 4. Research methodology

b. Data collection

Data collection aims to collect data made in designing a system. Researchers do the following 3 ways:

- Observation: researchers conducted observations for 2 weeks at Bank BTN Bogor Branch Office. The data obtained is a semi-manual system using Microsoft Excel for the employee performance appraisal process and making observations on existing business processes in the company.
- Interview: researchers conducted interviews with the Deputy Branch Manager in order to obtain more relevant information about the issues discussed in this study.
- Literature study: the last step to find supporting literature for this research.

c. System planning

The next stage is designing a system consisting of 2 subsystems, namely Requirements planning and Design Workshop. For general explanation as follows:

- Requirements planning: to describe the objectives of the information system which will be designed to identify information requirements that arise from the objectives that have been previously made.
- Design Workshop: this stage consists of 3 designs, namely UML design, then user interface design, and the third is Service Oriented Architecture (SOA) design.

d. Conclusion of Research Results

The final stage in this research is a mockup of an employee performance appraisal management information system and is expected to be a reference for Bank BTN to be able to implement this research.

4. Results and Discussions

4.1 Requirements Planning

Requirements Planning consists of 2 stages, namely data analysis and system analysis. For data analysis, researchers will discuss the user needs in system design in order to obtain the required data. While the system analysis is divided into 2 stages, namely problem analysis which will discuss the analysis of problems that exist in the system that is currently running at BTN KC Bogor while the system requirements focus on management level functionality.

a. Data analysis

Data analysis was carried out in order to get an overview of the user's needs in designing this management information system. User requirements in this process are as follows:

- Determine the object of the system to be built.
- Learning the KPI of Bank BTN Bogor Branch Office.
- Studying the organizational structure of Bank BTN Bogor Branch Office.
- Analysis of pre-existing outputs.
- Learning the running system.

b. System Analysis

Systems analysis is used to solve a problem by decomposing the system into its constituent components to find out how these components work and interact with each other.

- Problem Analysis

The problems that exist in the system that is currently running at Bank BTN Bogor Branch Office will be described in the form of an activity diagram in Figure 5.

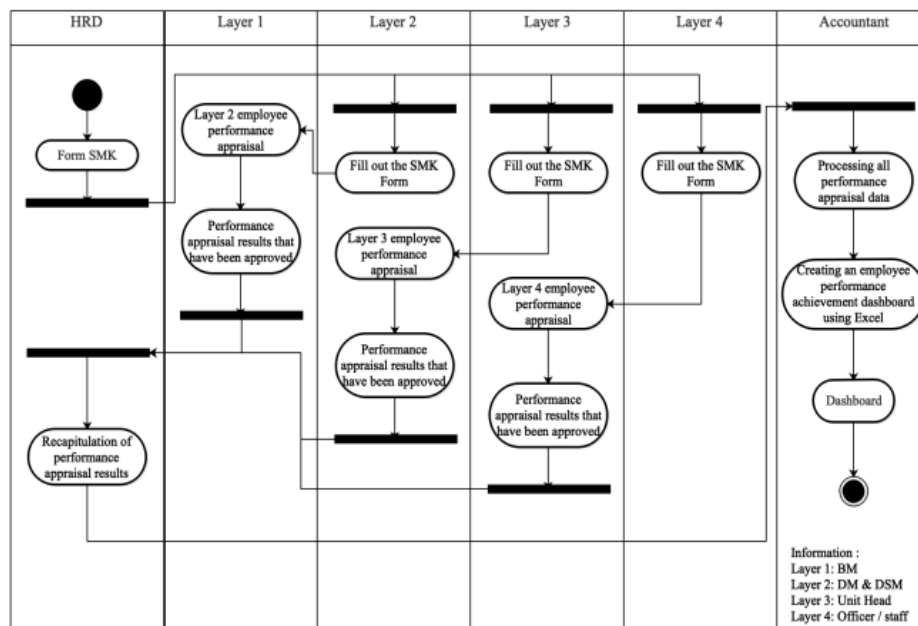


Figure 5. Activity diagram of the employee performance appraisal process

- System Requirements

The system requirements are the result of a system analysis that is currently running at Bank BTN Bogor Branch Office which then determines the functional requirements of the system to be built into the SIM functionality Table 1.

Table 1. Activity diagram of the employee performance appraisal process

No	Users	SIM Functionality	
		Main Functions	Additional Functions
Middle Level Management			
1	<i>Branch Manager</i>	Monitoring of KPI achievements and subordinate approval.	Making decisions in determining top talent
2	<i>Deputy Branch Manager</i>	Monitoring of KPI achievements and subordinate approval.	Making decisions in determining top talent
3	<i>Deputy Service Manager</i>	Monitoring of KPI achievements and subordinate approval.	Making decisions in determining top talent
Bottom Level Management			
4	<i>Priority Banking</i>	Monitoring of KPI achievements and employee PSKT approval in work units.	-
5	<i>BCLU Subsidi</i>	Monitoring of KPI achievements and employee PSKT approval in work units.	-
6	<i>BCLU Non Subsidi</i>	Monitoring of KPI achievements and employee PSKT approval in work units.	-
7	<i>BCSU</i>	Monitoring of KPI achievements and employee PSKT approval in work units.	-
8	<i>BCFU</i>	Monitoring of KPI achievements and employee PSKT approval in work units.	-
9	<i>Operation</i>	Monitoring of KPI achievements and employee PSKT approval in work units.	-
10	<i>Accounting & Reporting</i>	Monitoring of KPI achievements and employee PSKT approval in work units.	-
11	<i>CCRU</i>	Monitoring of KPI achievements and employee PSKT approval in work units.	-
12	<i>Teller Service</i>	Monitoring of KPI achievements and employee PSKT approval in work units.	-
13	<i>Customer Service</i>	Monitoring of KPI achievements and employee PSKT approval in work units.	-
14	<i>Loan Admin</i>	Monitoring of KPI achievements and employee PSKT approval in work units.	-
15	<i>General Administration</i>	Monitoring of KPI achievements and employee PSKT approval in work units.	-
16	<i>TP</i>	Monitoring of KPI achievements and employee PSKT approval in work units..	-
17	<i>Sub Branch Head</i>	Monitoring of KPI achievements and employee PSKT approval in work units.	Making decisions in determining top talent
18	<i>Cash Office Head</i>	Monitoring of KPI achievements and employee PSKT approval in work units.	Making decisions in determining top talent
19	<i>Officer</i>	Fill in KPI achievements on the PSKT form	

4.2 Design Workshop

The Design Workshop consists of 3 stages, namely the UML design consisting of 2 diagrams (usecase diagrams and class diagrams), the second is the design of the user interface (mock up), the third is the design of Service Oriented Architecture which consists of SOA modeling and service modeling.

a. Usecase diagram

Usecase diagrams are used to find out what functions are in the management information system design and who has access to use these functions (See Figure 6).

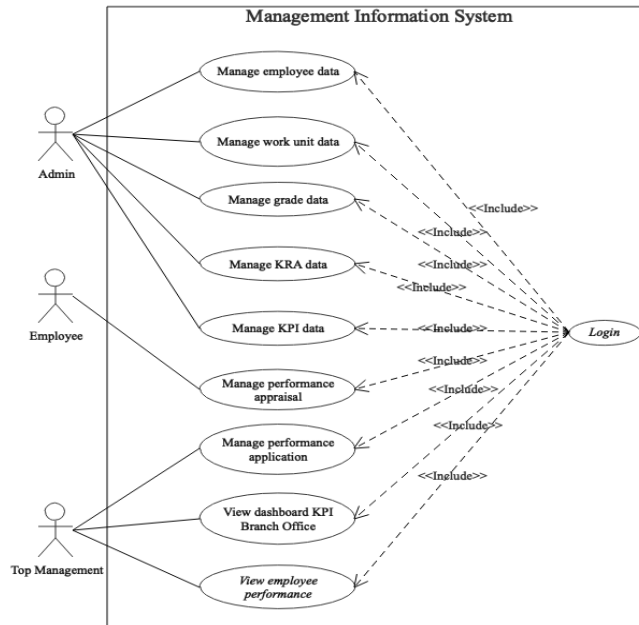


Figure 6. Usecase diagram

b. Class diagram

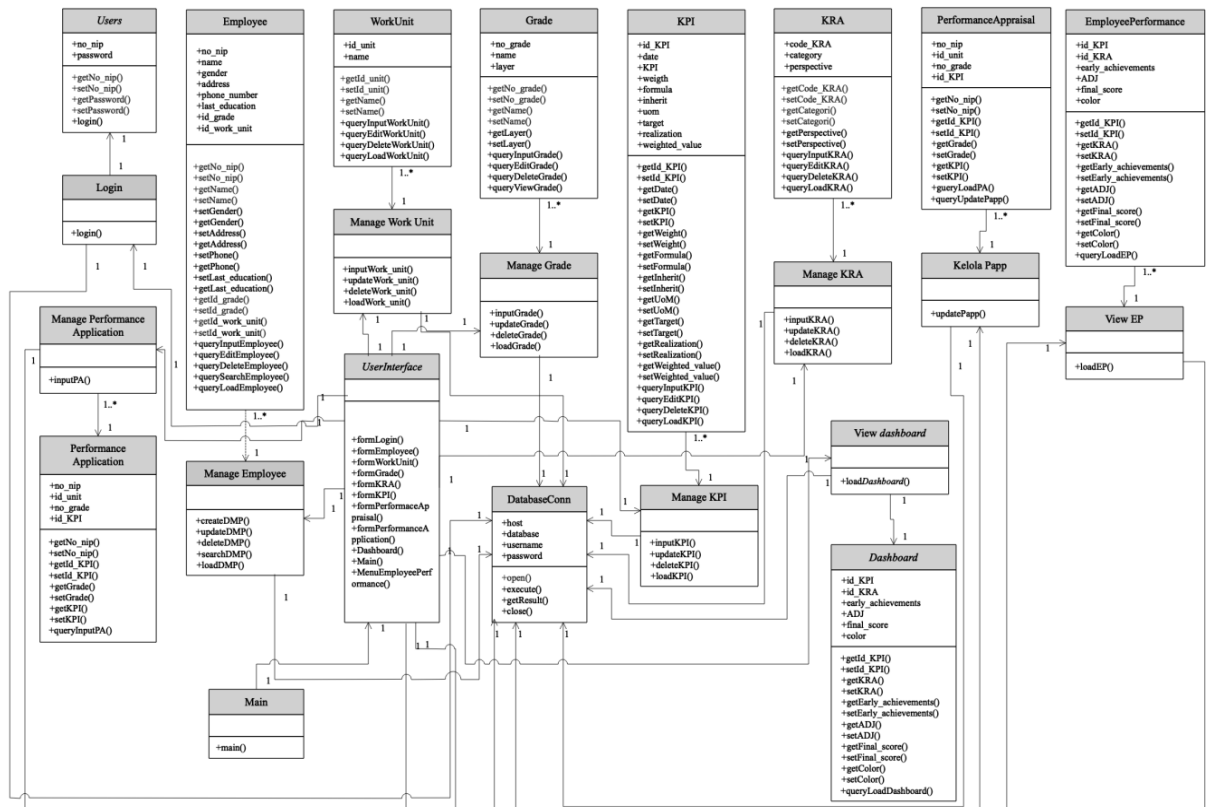


Figure 7. Class diagram

c. User Interface Design

User Interface design is built based on website and mobile (Android) using Adobe XD application. This UI design is based on the functional system that has been designed before. The following is the result of designing a user interface management information system for employee performance appraisal that researchers have created:

- Website design can be accessed by all users, namely Admin, employees and top management of Bank BTN Bogor Branch Office by writing the website address in the url in the browser. After the login page appears, the user can enter the ID number and password that was provided previously (See Figure 8).



Figure 8. Login page

- After the system validates the login, the system will display the dashboard page as below. The information management menu is provided on the sidebar which will appear when the user presses the word dashboard which is on the left of the page (See Figure 9).



Figure 9. Dashboard

- For admin, there are 5 main menus, namely managing employee data, managing work unit data, managing grade data, managing Key Result Area (KRA) data and the last menu managing Key Performance Indicator (KPI) data. For UI design, the researcher included one example, namely managing employee data as seen in Figure 10.



Figure 10. Manage Employee Data Page

- For employees, only the performance appraisal menu is available which aims at the employee performance appraisal process. In this menu, there is a table that must be filled in by each employee which will then be assessed by their respective superiors according to the work unit (See Figure 11).



Figure 11. Performance Appraisal page

- Top management who logs in through the website will provide a performance application menu that aims to approve the results of employee performance achievements. If there is an improvement, the top management as the superior can make changes to the data for further approval process (See Figure 12).



Figure 12. Performance Application page

- For managerial levels, namely Branch Managers, Deputy Branch Managers and Deputy Service Managers, they can monitor the achievement of employee performance through the mobile SIM application by inputting the provided ID number and password, after which the system will validate and direct to the main menu or dashboard (See Figure 13).

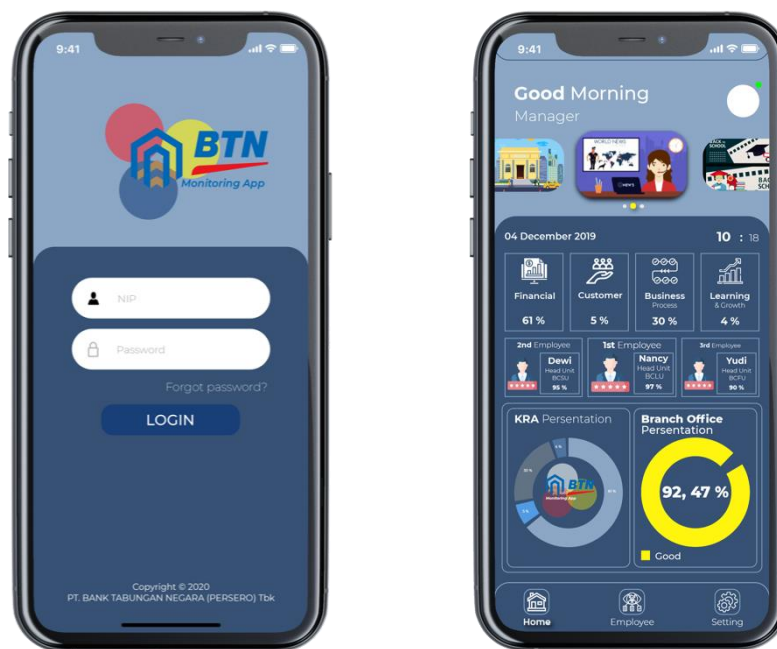


Figure 13. Login menu and dashboard menu

- The manager can also see details of performance achievement through the menu provided on the sidebar or by pressing the KRA percentage or KC percentage icon, this facility uses a drill down (See Figure 14).



Figure 14. Detailed menu of employee performance achievement

- Similar to the detailed performance achievement facility, the manager can monitor information based on each KRA, such as financial, customer, business process, and learning and growth. In the picture on the right, an employee performance facility is provided to see the achievements of each employee in order to make it easier to make decisions in choosing top talents for promotional activities and employee education (See Figure 15).



Figure 15. KRA (financial) Menu and Employee Performance Menu

d. Designing a Service Oriented Architecture (SOA)

Designing a Service Oriented Architecture (SOA) consists of 2 stages, namely SOA modeling and service modeling.

- SOA modeling aims to represent a system architecture using existing components. SOA uses the Enterprise Service Bus (ESB) for communication media between data. In this study, SOA is used as a bridge between the ERP Bank BTN Bogor Branch Office with the design of this employee performance appraisal management information system (See Figure 16).

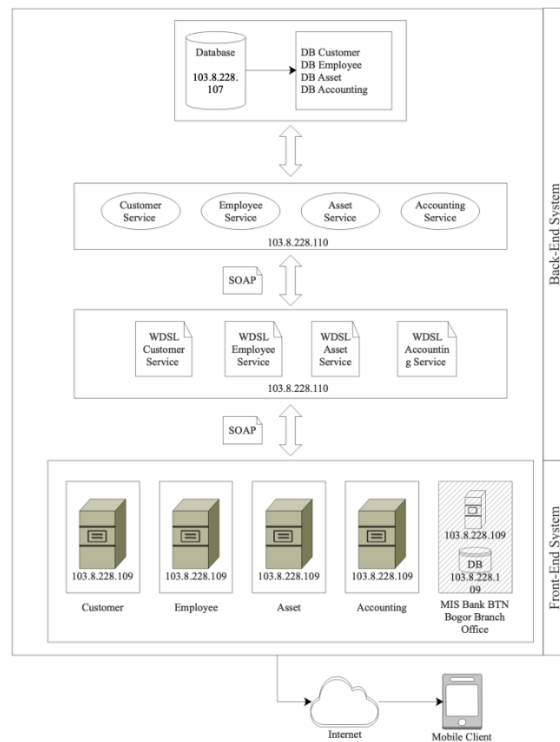


Figure 16. SOA Modeling

- Service modeling is used to model a service in a management information system so that it can communicate with other systems. Service modeling also serves to define the data to be sent on the requester. Most of the data returns in this function are arrays and strings (See Figure 17).

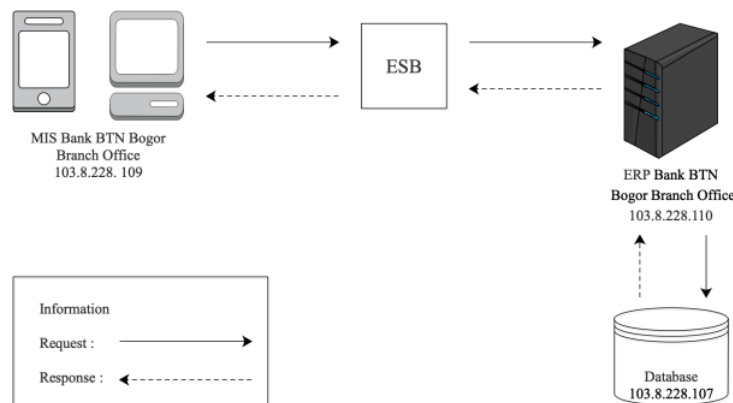


Figure 17. Modeling Service

5. Conclusions

Based on the results of the research that has been done, the researcher can present the following conclusions:

- The management of Bank BTN Bogor Branch Office can conduct employee performance appraisals and monitor KPI achievement using the design of the Management Information System for employee performance appraisals.

- b. The management of Bank BTN Bogor Branch Office can make decisions in finding top talent among employees using the design of the Management Information System for employee performance appraisals.
- c. Produce the form of Service Oriented Architecture (SOA) modeling and service modeling so that the Management Information system can be integrated with the ERP Bank BTN Bogor Branch Office.

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