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Design Project Management System Based on SOA Approach

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ABSTRACT - Application architecture and information technology systems in the company should be able to support the company's policy that leads to their alignment with the business objectives. The alignment of the implementation of information technology systems to the needs and goals of the organization will be able to be answered by taking into account the integration in the development, so that the gap of these two things can be minimized. As a company engaged in IT consulting, project management system is one form of application systems that support core business objective of the company: to produce high-quality software. Nevertheless, the project management system should be able to work together with other supporting information systems, so that the flow of information within the company can run effectively. To achieve these objectives, required the analysis and design of an integrated system, which can be achieved through a service-oriented architecture based system. which includes the stages of requirements and analysis, design and development, and the last is the IT operations. The final result expected is the design of the service-oriented architecture based project management system which built through top-down approach that focuses on improving the effectiveness of business process.

1. Introduction

As a company engaged in IT consulting, project management system is one form of application systems that support core business objective of the software-vendor company: to produce high-quality software. Nevertheless, the project management system should be able to work together with other supporting information systems, so that the flow of information within the company can run effectively.

Data and information of the project stored in separate systems which could make it difficult for the parties involved in the project to collaborate in the project management process, as well as managerial parties in the company.

The information system which implemented in fragmented design could lead to difficulties in terms of synergies and integration of information related to the software project being built by the company to its customers.

To overcome these problems, required the analysis and design of a project management system which can be integrated to supporting systems while implementing business processes



that have been run. System development approach that applies the principles of Service Oriented Architecture (SOA) is considered to be one of the solutions for the software-vendor company. With the SOA approach, business processes that have been implemented in the systems can be orchestrated from one system to another so that the flow of data and information can become more streamlined.

As in [1], Service Oriented Architecture is an approach in designing an application with the principle of reusing the components that already exists. SOA can act as an information technology architecture that can support a variety of applications to exchange data and participate in business processes.

With the basis of SOA in the development of the project management system, it is expected to obtain various benefits: the reusable service is established, application development become more efficient, as well as the increased collaboration between the developer of business unit application with the developer who developed the core business applications.

2. Related Works

A. Project Management

Project management is the application of knowledge, skills, tools, and techniques to project activities to meet project requirements [2]. As in [3], project management is the planning, organizing, directing, and controlling of company resources for a relatively short-term objective that has been established to complete specific goals and objectives.

Project management is defined by the PMBOK as the application of knowledge, skills, tools and techniques to project activities in order to meet stakeholder's needs and expectations from a project [4].

Project success has been defined to include the completion of: within the allocated time period, within the budgeted cost, at the proper performance or specification level, with acceptance by the customer/user, with minimum or mutually agreed upon scope changes, without disturbing the main work flow of the organization, and without changing the corporate culture [3].

B. Service-Oriented Architecture

SOA is an architectural style for building enterprise solutions based on services. More specifically, SOA is concerned with the independent construction of business-aligned services that can be combined into meaningful, higher-level business processes and solutions within the context of the enterprise [5].

As in [6], enterprise logic can be divided into two important halves: business logic and application logic. Each exists in a world of its own, and each represents a necessary part of contemporary organization structure. Business logic is a documented implementation of the business requirements that originate from an enterprises business areas. Business logic is generally structured into processes that express these requirements, along with any associated constraints, dependencies, and outside influences.

Application logic is an automated implementation of business logic organized into various technology solutions. Application logic expresses business process workflows through purchased or custom-developed systems within the confines of an organization's IT infrastructure, security constraints, technical capabilities, and vendor dependencies

3. Proposed Method

Framework on which to base this thesis starts from the observation of the background issues, especially related to project management system in a software-vendor company. Service lifecycle approach would be used during the process of this case study. Thus, it will achieve the objective of the case studies in the form of architectural design of service-oriented project management system.

A. Service Lifecycle Approach

The service lifecycle begins at inception (definition) and ends at its retirement (de-commissioning or repurposing). The service lifecycle enables service governance across its three stages: requirements and analysis, design and development, and IT operations. There are the three stages and the need for an enterprise service repository to enable service governance.

Requirements & analysis: business initially identifies and prioritizes the business needs.

Design & development: during the design phase, the business analysts work closely with the architect to hand off the business requirements. The architect is responsible for the high-level estimates, design, and handover to the development team.

IT operations: IT operations is responsible for deploying, monitoring, and providing tier 1 support for all applications supported by IT. The approach described above illustrated in Fig. 1.

B. Project Management Business Processes

As one of the early stages of requirements and analysis will be carried out business processes mapping that will be included in the system in this case is the business processes related to project management of software development.

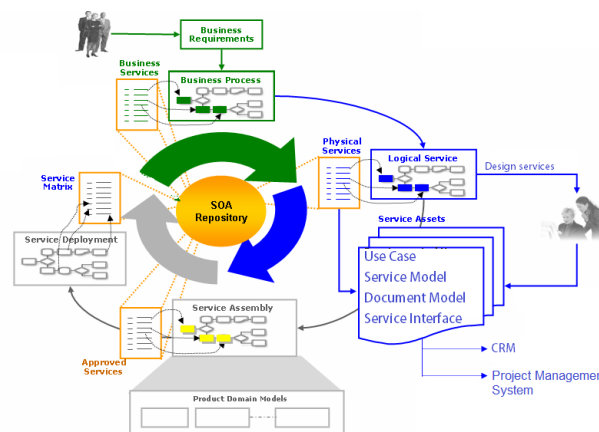


Fig. 1 Detailed Service Lifecycle Implementation [3]

1) Project Initiation

The project initiation phase is the 1st phase in the project management life cycle, as it involves starting up a new project. Project initiation is a procedure that must be done prior to a software development project is approved to work. The scope of this procedure include the determination of scope of work (software requirements) with customer, determination of the calculation of timeline and man-days, determination of a project cost up to the bid proposal to the customer and project initiation to project management department.

2) Project Management

Project management is a procedure that must be performed in managing a software development project according to standards of best practice so that the project is done it can

provide satisfaction and more value to customers and meet the criteria for a successful project to improve the company's image and profits for the company.

3) Project Execution

Project execution is a procedure that must be done in managing software development projects undertaken in the company to the customer. The objective of the execution phase is to perform the work planned and approved during planning phase by developing the product or service that the project was commissioned to deliver. The process of software development project execution has special complexity compared to other projects, it would require a separate procedure. Characteristics of software that is intangible and detail the needs of new software generally can be identified clearly at the execution stage that would require a procedure of software development that are adaptive in order to accommodate the needs of customers and minimize project failures.

4. Analysis Result

A. Requirements and Analysis

To map the key business processes in this case study, will be described in diagrams that will help shape the business process model in high-level. Fig. 2 shows a high-level business architecture illustrated in a value-chain diagram. The value chain describes the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers, and final disposal after use [7] [5].

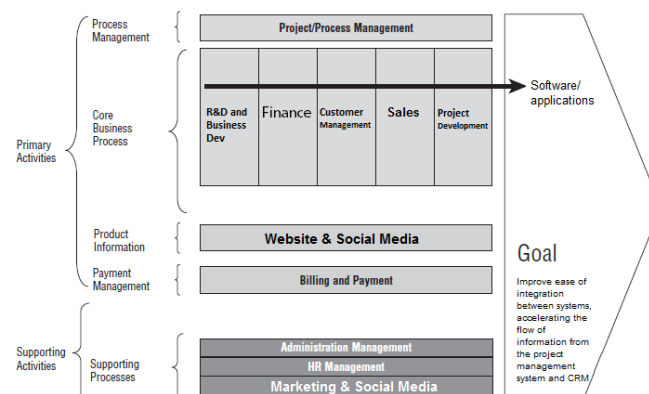


Fig. 2 Value-Chain Diagram

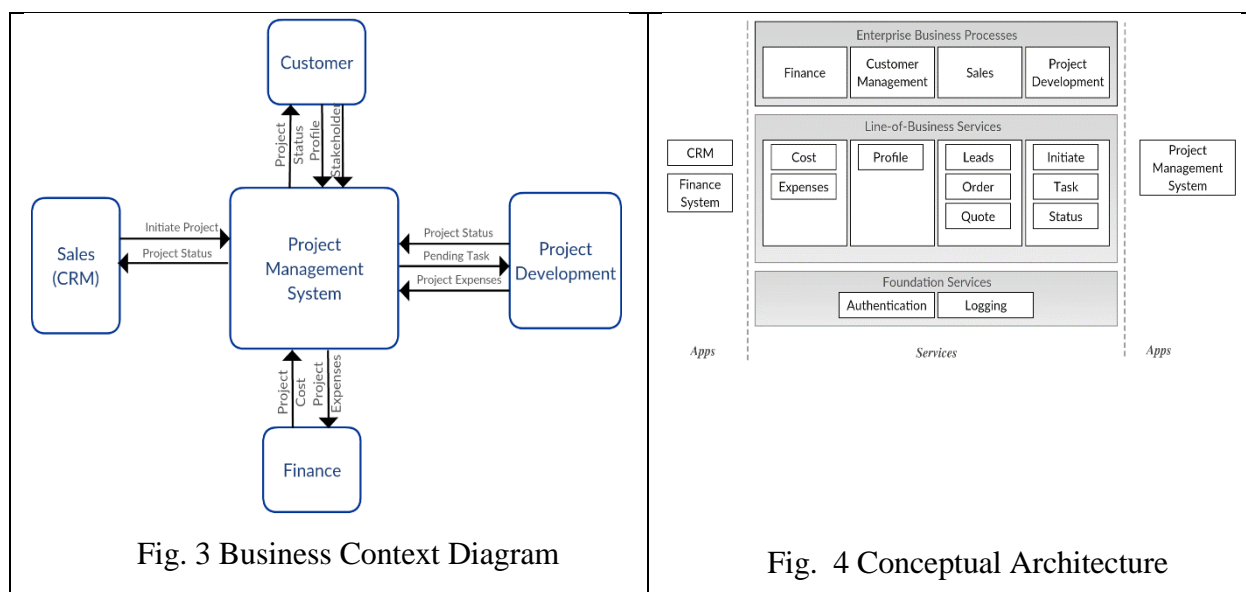
The main business processes and activities within the company are: Research and Development, Business Development, Finance, Customer Management, Sales and Project Development.

Two major business processes outlined in this study is related to Sales and Project Development, for both the business processes that directly relate to the application of project management and CRM systems, as well as the business processes that deliver value to the primary value chain in the company.

Business context diagram then can be depicted based on value-chain diagram above [5][8]. Business context diagram in Fig. 3 shows the four actors involved in the project management system, namely sales, project development, finance, and customer. Sales can initiate the project

and obtain information regarding the current status of the project. Customers can get involved in the business process with stakeholders to update the data profile, and obtain data regarding the status of the project that is being done. Project development team can be involved through activities such as updating the status of the project, updating project expenditures (project expenses), as well as get the data item of unfinished work (pending task). Finance team can be involved through activities such as filling value of the project (project cost) as well as get the total cost of project expenditures.

Fig. 3 illustrates the scope of the interaction between the system (application) that can be bridged through the services, as well as its association with key business processes in the company. On the left and right of the conceptual architecture, there are systems (applications) that can interact with each other, CRM (customer relationship management) system, finance system, and project management system.



At the bottom, there is a foundation service, service which supports the construction of the overall system, but does not implement business functionality.

B. Project Initiation

Business process model of project initiation deploys the activities in the beginning of a software development project in the company. At the end of the course of the process, after the Sales Department obtain confirmation of the project order from Customer, then the next activity is to initiate the project, which is done manually by communicating verbally or via a confirmation email to the Department of Project Management.

Sales Department will provide information and project documents to the project manager in the form of: customer data, stakeholders, project completion date, the value of the project (project valuation), budget (cost), and business requirement document.

Initiate project activity will be executed by utilizing the service, so that the project initiation process can be done automatically from the Sales Department (CRM application) to the Department of Project Management (Project Management System application). This can help avoid miscommunication between the department.

Based on the conceptual architecture diagram, services that can be used to initiate project activity are service projects which has initiate() operation, the operation to create a new project data in Project Management System.

C. Project Status

After starting the software development project, the process then continued with the implementation of business process monitoring and control over the course of the project development process. Process monitoring and control are run under the responsibility of the project manager to coordinate with the project team.

The project manager is assisted by the project team regularly provide status update regarding the progress of project, to the Sales Department, Customer, and directors (CEO).

Information update activity on the progress of project development in process monitoring and control can be executed through the service. Service that can be used in these activities is a service project that has updateProjectStatus() operation, which is an operation to update and get the status of project implementation in the Project Management System.

D. Project Expenses

The project manager will record expenses and control the use of cost so that it does not exceed the budget of the project cost which has been determined at the beginning of the project. Information update about the expenditure of the project is required to determine the amount of the costs incurred during the project development process, so that it can be monitored and controlled by project manager, finance department, as well as directors. Information update activity related to the project expenditure in monitoring and control can be executed through the service. Service that can be used in such activities is that finance service which has updateProjectExpenses() and viewProjectExpenses() operation. This is an operation to update and get the amount of the project cost in the Project Management System.

E. Design and Development

1) Service Model

From the stage of requirements and analysis, the services can be set up to handle the processes required. Services that formed include: projects, customer management, and finance management.

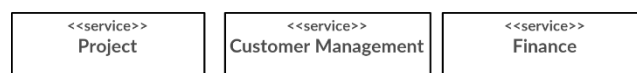


Fig. 5 Service Model

The function of the services in Fig. 5 are as follows. **Service “Project”**, it is used to handle activities that are in the process of the project, from the initiation of the project or create a project in the project management system. This service can also handle the process of updating the project progress status information, as well as view the status of the development of the project. **Service “Customer Management”**, is used to handle the processes associated with the customer, such as view customer profile and update customer profile. **Service “Finance”**, is used to handle the processes related to finance in a project, such as project expenses update, view project expenses, as well as view project cost.

2) Document Model

Based on processes and services that have been previously defined, can be determined the documents involved in the existing business processes. These documents can serve as input for the process as well as the output of the results of such processes, which passed through a service.

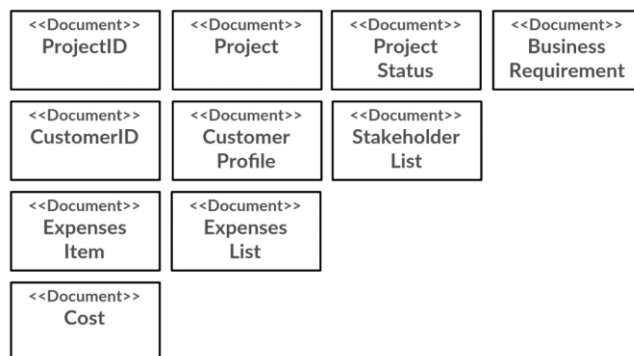


Fig. 6 Document Model

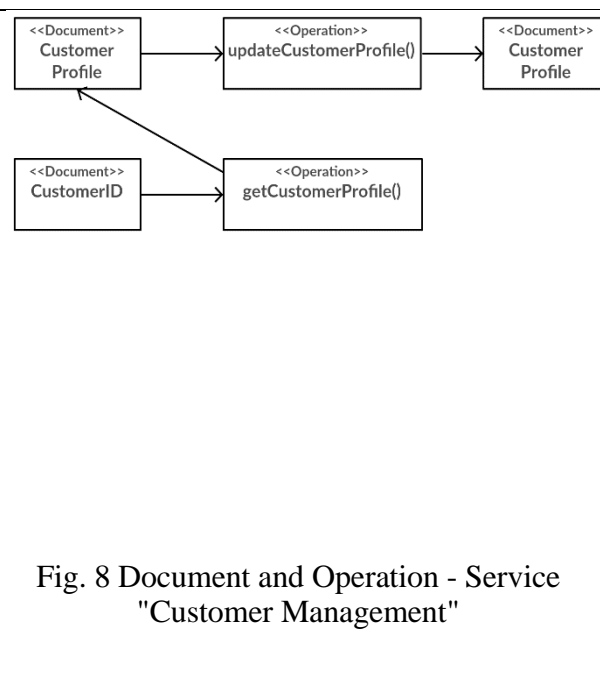
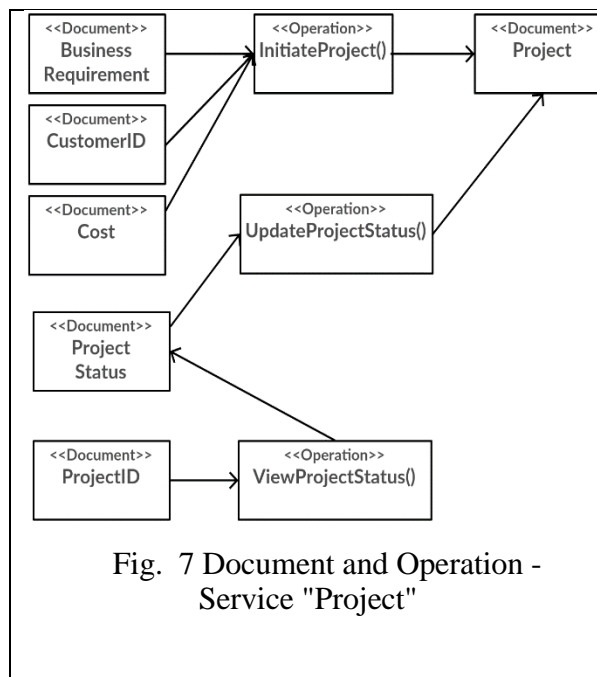
List of document in Fig. 6 is the required documents based on use case and sequence diagram. The document can be added in accordance with the addition of business processes. Document related to service “project” are : ProjectID (used as an input to obtain data Project), Project (the output of a service project), ProjectStatus and Business Requirement.

Document related to service “customer management” are : CustomerID (used as inputs to get CustomerProfile), CustomerProfile (the output of a customer management service to get Customer data), and CustomerList. Document related to service “finance”, are : ExpensesItem (used as an input to register the expenses of a project), ExpensesList (an output of the operation to get the expenses data), and Cost (the output of the total budget of the project cost).

3) Service Definition

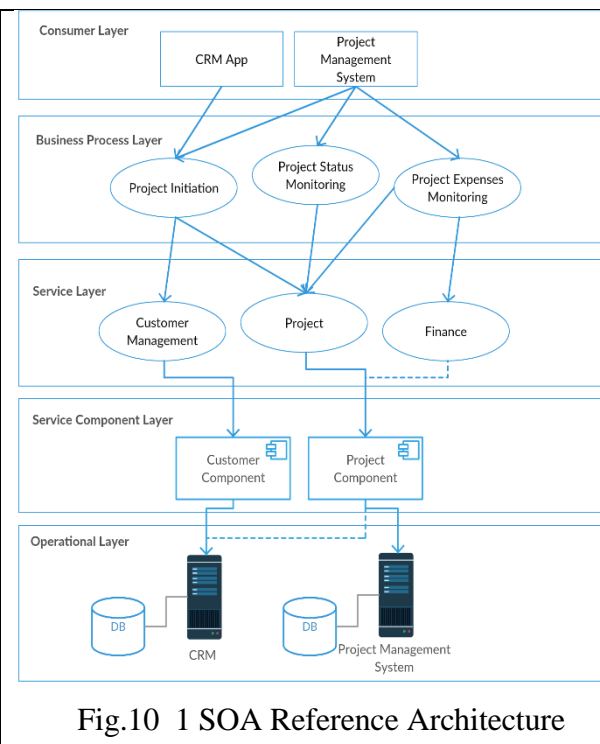
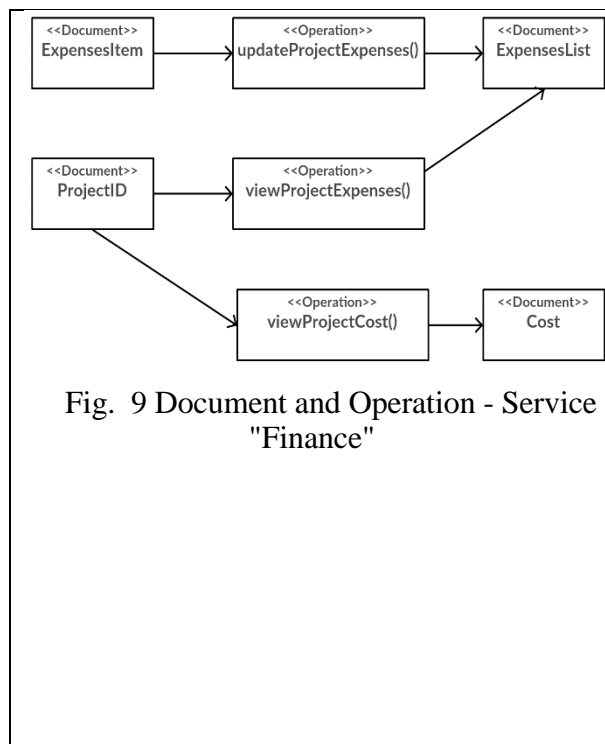
Based on the services and documents described above, the details of service’s operation can be described along with the document involved, either as an input or output.

Service “Project” . Fig 7 shows that “project” service has three operations, that is: initiateProject(), updateProjectStatus(), and viewProjectStatus(). initiateProject() operation, requires business requirement document, CustomerID, and cost as input to create a project data in project management system. After the operation of the service successfully executed, it will produce a new project data in the project management system. **Service “Customer Management”**. Fig. 8 illustrates that the customer management service has two operations, namely updateCustomerProfile(), and getCustomerProfile(). getCustomerProfile() operation requires CustomerID as input and will produce CustomerProfile as output. **Service “Finance”**. Fig. 9 provides an illustration of the finance service which has three operations, namely updateProjectExpenses(), viewProjectExpenses() and viewProjectCost(). updateProjectExpenses() operation requires an expenses item document as input. viewProjectExpenses() operation requires ProjectID document to obtain a list of project expenses in a project. Similarly viewProjectCost() operation requires ProjectID document to get the total cost of a project.



F. IT Operations

In the stage of IT Operations, the logical architecture design of services implementation and deployment will be using SOA Reference Architecture as shown in Fig. 10.



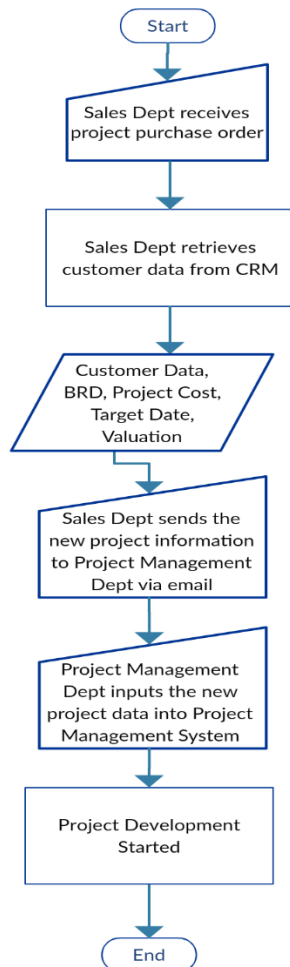
There are five main layer in the architecture. In the operational layer, there are applications and modules that are used as source of data: CRM and Project Management System. The data from these two applications are used as a component in a service component layer, namely the customer and project component. In the service layer, there are services that have been designed before: project, finance, and customer management service. These services are the result of top-down analysis based on existing business processes, in which business processes are placed as an object in the business process layer.

In the consumer layer, there are users who interact directly with services, in this case is CRM application and project management system. Consumer of SOA can be developed and added to the other applications in the future, without having to build from scratch again to obtain data which related to the project because they can use the services that has been built.

G. Comparison of Manual-Based Process and Service-Based Process

To see how the service-oriented architecture can improve the effectiveness of the course of business processes, it can be compared between manual business processes and business processes which runs through a service-oriented architecture based system.

Manual-Based Process



Service-Based Process

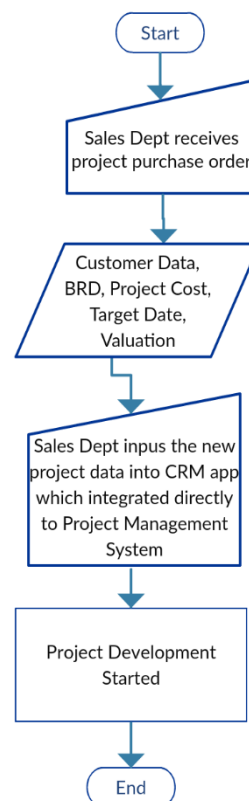


Fig. 11 . Project Initiation Process:Manual vs. Service

From the flow chart shown in Fig 11, manual-based process column, it appears that the project initiation process is done separately and not integrated between the CRM and Project Management System. The data transfer done from CRM to Project Management System which is bridged through the process of sending emails manually by the sales department.

But from the flow chart shown in Fig 11, service-based process column, it appears that the process of project initiation is done through an integrated CRM application interface directly with the Project Management System via an intermediary service. This can increase the effectiveness of project initiation process by reducing the stages which in manual process.

5. Conclusions

The architecture design of the SOA-based project management system successfully constructed based on project management business process in the company which has aligned with the business objectives. By using this architecture, the manual process can be cut which reduces the process time. Further, it can accelerate the flow information by integrating between the CRM application and project management systems. At last it can help to achieve the goal of project management business process in the company. Service lifecycle approach helps the process of designing a SOA-based project management system that can be developed into other business processes in the company. This project is built based on the current needs which relates directly to project management. Services has not been built all of department or mart in the company yet. In future, the development of all services bring the company grow continuously and more agile.

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