

Designing Business Architecture and Application of E-Collaboration for Small and Medium Enterprises in Indonesia Using Service Oriented Architecture

¹Cindy Kristiya Himawan

¹President University, Jl. Ki Hajar Dewantara, Cikarang Baru, Bekasi

¹Fakultas Komputer

E-mail: ¹cindy.himawan@gmail.com

Abstract— As one of the factors supporting the nation's economy, the existence of Small and Medium Enterprises (SMEs) need attention and support, both in terms of guidance from the government, aid loans from banks and use of information technology. Given some limitations such as limited SMEs in marketing, interacting with other business and limitations in the procurement of information technology, it is necessary to have a platform for SMEs to conduct their business activities and interact with other SME or external parties, in an internet-based application called e-collaboration. By utilizing the concept of service-oriented architecture (Service Oriented Architecture), this paper resulted in the design of conceptual business architecture and technology architecture support. The author conducted research in the field to determine the condition of the SMEs and formulate appropriate business needs to define the business architecture. Business architecture defines the business component SMEs and collaborative business processes that occur in the environment of these SMEs. Business architecture is translated into a conceptual architecture for defining design technology that will be used to support the use of information technology shared services to run business collaboration. The design of e-collaboration application that is able to define all components produced in small business and accommodate the needs of the overall business processes for SMEs both the internal business processes and business collaboration process with external parties. To support the business collaboration with external parties, we need to define the service contract and service level agreement which include the procedure and process standarization to exchange the data. For validation, the author perform an inspection of the functionality owned by the e-collaboration applications which will be made into a a service evaluation matrix and traceability matrix to match if the design has been constructed in accordance with business needs. In addition, a simple prototype will be built to ensure the resulting design can be implemented in accordance with business needs.

Keywords-SME; service; SOA; e-collaboration;

One of the success factors in SMEs is how to disseminate the products or services produced. In addition, SMEs should be connected and work together with SMEs or other businesses, so as to mutually utilize the services and share information. However, SMEs have several limitations to socialize and communicate well. As a result, not many users or businesses are aware of the existence of SMEs. Solution that is needed is the existence of a collaborative forum for SMEs to be able to socialize as well as the products or services can interact with SMEs and other businesses. Within this collaboration is also expected to help the government to conduct monitoring developments and providing intensive coaching to SMEs. In addition to the recording of transactions clear SMEs will facilitate SMEs to make loans to the banks.

Along with the growth of information technology, SMEs should also be able to take advantage of the use of Information Communication and Technology (ICT) to get the information, doing business digitally and connect with other business parties with ease. Currently we have the concept of e-business and e-commerce, which allows the organization to carry out internet based business processes both with customers and vendors. But the reality shows that SMEs did not have the ability to both skill and funds to conduct or exploit ICT in their organization, so that the development of ICT is not having impact to the SMEs. In addition, the concept of e-business and e-commerce was not able to accommodate the business needs of SMEs which are dynamic and flexible, also not able to collaborate with government and banks.

Information technology solutions often have problems where the software has redundant functions but can not be combined in a flexible and less efficient due to the lack of consistency between functionality and business processes used hence ultimately result in higher costs in both the process of implementation and maintenance processes and development. The concept of service orientation is to define the business processes within the organization as a service component in the software to ensure that information technology solutions built capable of covering the entire organization's business processes without the redundancy of software functionality also makes it easy to be connected with other software with more flexibility. Furthermore, this concept is used in the definition of information technology architecture models,

I. INTRODUCTION

known as Service Oriented Architecture (SOA) which will be discussed in the next chapter.

Service Oriented Architecture (SOA)

With the dynamic movement of the market, the company is also required to have a dynamic business processes in order to meet market needs. Thus, information technology used in perusahaanpun required to be changed dynamically and quickly to support the business processes of the company. Meeting the needs of the market by the company can be defined as a service provided to consumers. Similarly, in information technology, came the term service as an information technology services provided to support the company's business processes. Gartner defines a service as a software component that is free and clear (loosely coupled) that can interact with other service dynamically using standard Internet technology. While IBM defines a service as a software module in a self-contained and can be used repeatedly, and does not depend on the applications and platforms that run. In sum, the service mapping relationship of business and information technology components that are used to run the activities of the business.

IBM defines SOA as an architectural approach that is driven from the information technology business needs, so as to support the integration of business as connected services and activities or business services that can be used repeatedly. While technically, the SOA can be defined as a form of technology architecture that adheres to the principles of service-orientation (based services) and with its realization in the form of web services technologies, SOA provides potential support for the principles of service-orientation through business processes and automation in a company [1]. Organization of the World Wide Web Consortium defines SOA as a series of components (services) that may be called and have published descriptions and can be found by others who want to use it. In summary, SOA is an architecture for building enterprise solutions based on service, which is supported by the process or functional and information.

SOA offers a flexible service components, loosely coupled (low dependency) and the ease to be reused, so the development of service-based applications by providing added value to the company. SOA implementations can provide benefits to the business with the ability to service that is not only able to perform computational calculations, but also can represent and provide solutions for functional processes and business problems. An example is the ability to access a service that is spread for incorporation into business processes that represent the company's business process flow activities in a more effective and computerized.

SOA-based applications is the development of n-tier where the service is above the layer component that is responsible for providing specific functionality and manage the need for service quality [2]. The following figure shows that the SOA has several layers:

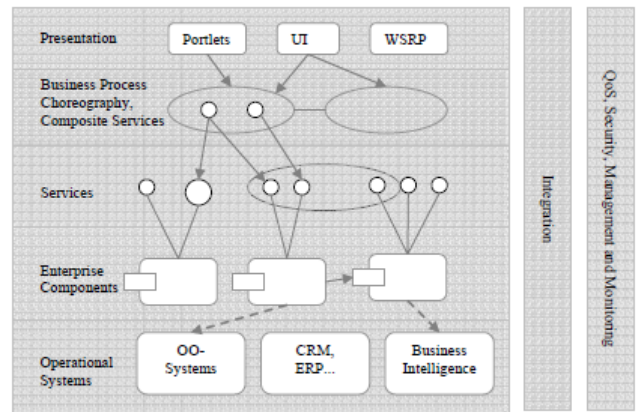


Figure Error! No text of specified style in document.-1 SOA Layer Application

- **Operational Systems Layer:** This layer includes enterprise applications such as ERP and CRM applications or Business Intelligence applications. This application provides a foundation for service where each application will have a structure and a specific database as well as access to other systems.
- **Enterprise Components Layer:** This layer is a special component that aims to provide the functionality and the specific requirements for each service. These components include implementation services for business assets and other important things such as manageability, availability and balance processing service
- **Service Layer:** This layer includes the actual service that can be discovered and invoked by other applications to provide specific business functions at the company. Service can be realized and built in interface component in the form of company service description published on the Internet.
- **Business Process Composition Layer:** Service can be combined into a single application through service orchestration or coreography, which support specific use cases and business processes.
- **Presentation Layer:** This layer provides the interface for user services and applications. Although this layer is not the main focus of the SOA, because the purpose of the use of service on the specific need of the user interface teknologi such as portlets and web services

Web service is one of the technologies used in the SOA. Web services are software designed to support the operation between different applications to interact with each other through XML-based messaging standards [1]. Web services use standard Internet technology to exchange messages and data, so the technology is suitable for the development of applications that can be accessed on the environment consisting of different types of platforms.

II. RESEARCH METHODOLOGY

The design architecture of e-business and collaboration applications to small and medium enterprises in Indonesia by using a service oriented architecture in this study completed using the system development life cycle methodology, the model adopted Framework for the Application of Systems Thinking (FAST) and prototyping, which will be described as follows:

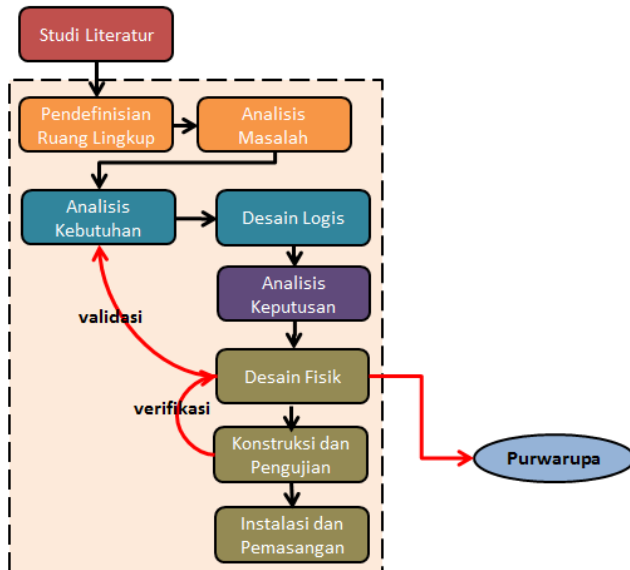


Figure Error! No text of specified style in document.-2 Research Methodology

Business architecture modeling is done by using business process models to describe the process flow that occurs in SMEs. Afterward service-oriented modeling will be done to perform analysis and design techniques oriented to the service. Modeling will provide a clear description of the elements of the SOA layers and provides an environment in which these elements will be visualized and subsequently used in the service-oriented architecture applications. Basically, the process of service-oriented modeling consists of three main stages, namely [1]:

- Service identification is the process of defining service conducted through the decomposition of business areas with good approaches from top to bottom or bottom to top.
- Service classification to merge the whole service that has been identified in a hierarchy, which will reflect the granularity, area usage, composition and coating service.
- Service realization involves the sharing service to their stated objectives, such as is used for the integration of business functions or to provide specific functions such as security and control. This service will then be linked with modules, components and applications that will use it.

Furthermore, service-oriented modeling mapped into modeling using UML, so that later this modeling can be used

as a basis for software development without limitation any programming language and platform that will be used. Stages indicated as shown below [3]:

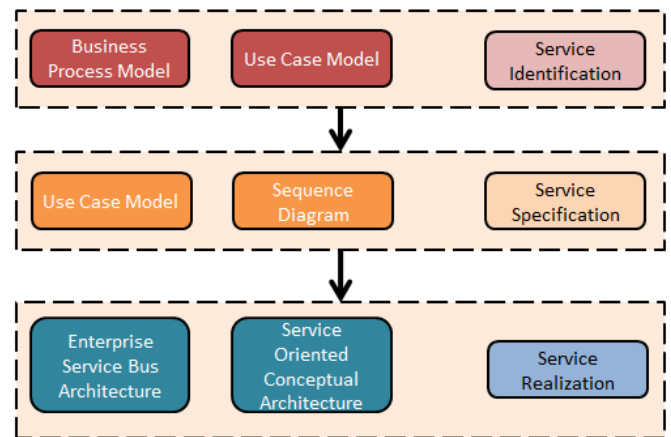


Figure Error! No text of specified style in document.-3 Steps of Service Modelling and UML

III. NEEDS ANALYSIS

The author analyzes the needs of SMEs by way of discussions with several parties from the departments of Industry and Commerce as well as several owners of SMEs. During the discussion, the authors put forward the idea to create an e-collaboration application that can be used to support the business processes of SMEs and collaboration among SMEs. The first thing discussed was the problem of limited SMEs in using ICT to support business processes, it is reinforced by the statement that although currently on the market already, there are several software that can be used, for example, to record revenue and expenditure, but because the majority of SMEs do not have specialized skills in the field of computers, the software is still considered to be too complex and difficult to operate. In addition, the software generally requires the cost of ownership of software and hardware required is quite high and expensive to install such software. In fact, along with the development of SMEs, it is natural when SMEs start recording business processes have a neat and orderly so that business processes can become more efficient and effective. Writers get feedback from SMEs on what business process is a key requirement that needs to be entered on the application of e-collaboration. In addition, this application also needs to be established in general so that all business processes of SMEs can run integrated on this application. The application must also be open-source where SMEs do not require a fee for purchasing this app and the web that can be accessed without the need for sophisticated hardware, because it requires only the Internet as a primary requirement.

The second thing is the collaboration of SMEs, which is now bridged by the government in the presence of Indonesian SMEs and SME websites Tower in Jakarta. However this is still lacking because not all SMEs in Indonesia are listed on the site, and even most of the SMEs are not aware of any such sites. There needs to be more intense socialization from the

government to monitor the SME. Application of e-collaboration can be used as a means of data collection where the latter once registered SMEs, SMEs can make sales to consumers through this application and also connect with other SMEs to run a business collaboration. This application also enables SMEs to perform the exchange of business information or other information that is valuable knowledge for SMEs among others.

Another thing about the difficulties the government to collect data directly SMEs had resolved as described in the previous issue. With the registration of their decision on this application, then the government can easily monitor the presence and growth of SMEs. In addition, other parties such as the Bank and the cooperative was able to have more references in conducting consideration lending to SMEs.

IV. DESIGN RESULT

Business value chain is one method to describe the process of what is necessary for a business to provide added value to the product or service provided. In this application, the goal to achieve a goal that is depicted on the right. Furthermore, the process can be divided into primary activities in which the process must be done to achieve the main objective, while the activity is a supporting activity undertaken to support the primary activities. Here is a depiction of the business value chain in this application:

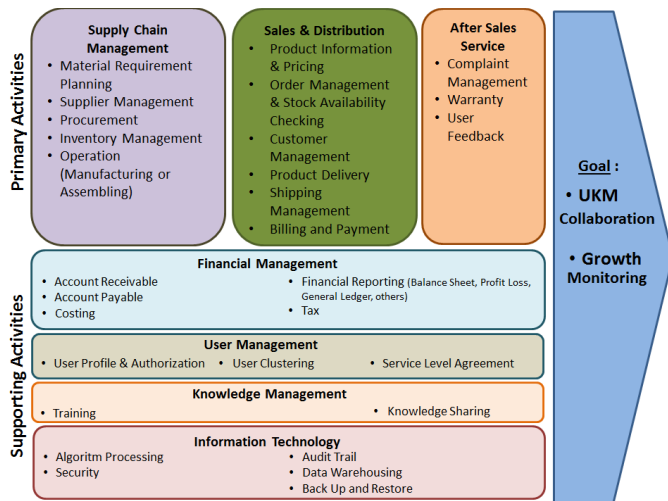


Figure Error! No text of specified style in document.-4 Business Value Chain

In the main activity (primary activities), summarizes the activities of the order to cash those in which consumers placed orders for products or services, up to the order fulfillment process, distribution of goods, payment and process complaints against the product or service problems. Later on supporting activities (supporting activities), there began a process of calculation and preparation of financial statements, the management of users, the implementation of training and exchange of information as well as some activities such as application management and back-up audit trail. These activities can be divided into several large modules that will be

used in the translation of business processes and application design in detail.

Business process models is one way to describe the overall business process flow that occurs in a company. Broadly speaking, a summary of the application process is shown in the following figure:

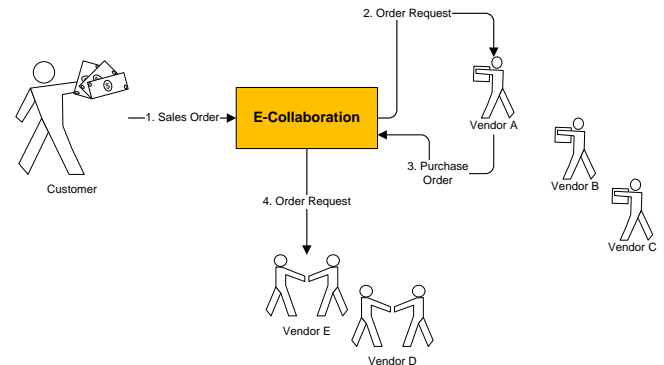


Figure Error! No text of specified style in document.-5 Ringkasan Proses Aplikasi

Furthermore, each of the activities of the process flow will be described as follows:

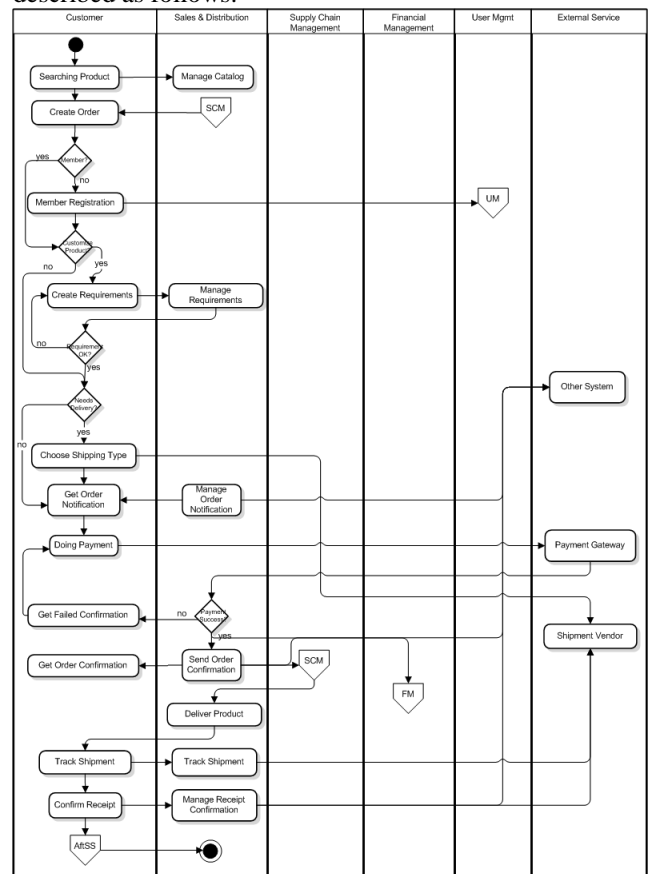


Figure Error! No text of specified style in document.-6 Business Process Model

From each BPM will then be described in the form of a business use case that will be used to identify the service.

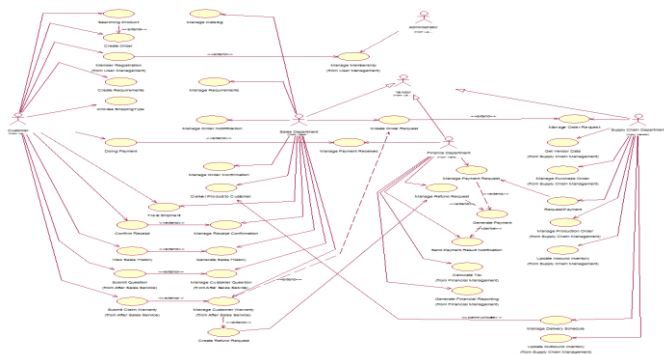


Figure Error! No text of specified style in document.-7 Business Use Case

Then each business use case will be described in more detail in the sequence diagrams and class diagrams, sequence diagrams which will show the flow of operations to be performed on each use case, while the class diagram will be used to show the relationship between each class held by use case. Examples are as follows:

No	Service	Type	Operation
1.	Searching Product	Private Service	getProduct(); alternativeProduct();
2.	Manage Catalog	Private Service	createProduct(); updateProduct();
3.	Create Order	Private Service	createOrder(); updateOrder(); confirmOrder();
4.	Manage Membership	Private Service	confirmMember(); updateDataMember();
5.	Choose Shipping Type	Private Service	chooseShippingType();
6.	Inbound Get Shipping type	Web Service Consumer	getShippingType();
7.	Outbound Get Shipping type	Web Service Provider	requestShippingType();

Hence, Entity Diagram used to describe the entity or table that will be made on this application.

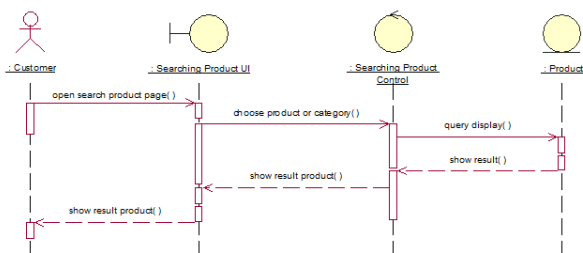


Figure Error! No text of specified style in document.-8 Sequence Diagram

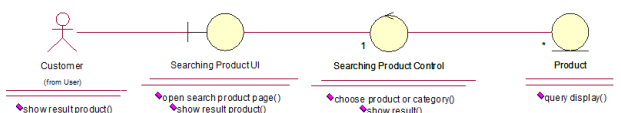


Figure Error! No text of specified style in document.-9 Class Diagram

After creating the use case, then we can determine what services are needed in the application of this e-collaboration. Based on the business process that has been defined previously, the author distinguishes the type of service:

- Private Service: a service that is only used by internal applications and do not have a relationship with other applications
- Web Service Consumer: an internal service that requires or call the service from another application in accordance with the needs of the business process
- Web Service Provider: an external service is needed or called by an internal service

Here are some of the services that were identified:

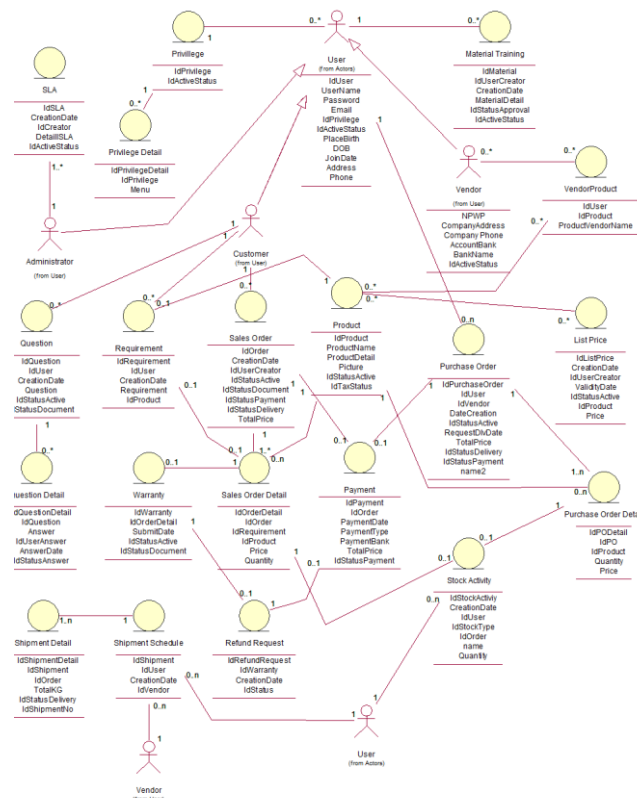


Figure Error! No text of specified style in document.-10 Entity Diagram

Tabel 1 Tabel Service List

No	Service	Type	Operation
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With the need to connect to an external service of the necessary existence of the Enterprise Service Bus (ESB) that serves to

make the exchange of messages between a service with other services, but also to transform the message. ESB can be seen as the foundation of SOA, which also covered the security, policies, accounting and reliability on SOA [4]. Here is the ESB architecture produced :

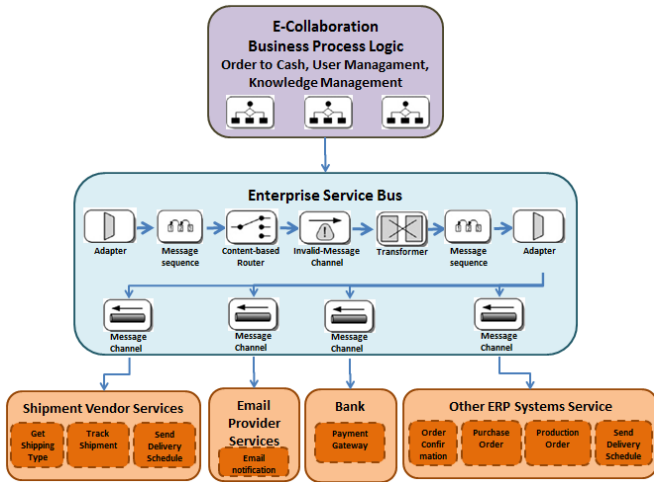


Figure Error! No text of specified style in document.-11 ESB Architecture

Finally, the overall service that has been identified will be incorporated into the conceptual architecture of SOA is described as follows:

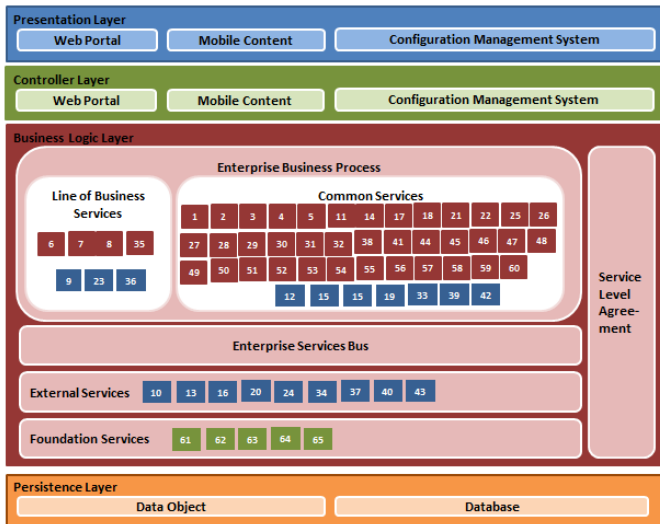


Figure Error! No text of specified style in document.-12 Conceptual Architecture

- Presentation layer is a layer interface that will be associated with the user directly.
- Controller layer is the layer where the function logic is executed in accordance with the business processes defined at the business logic layer to the presentation layer is then displayed.
- Business Logic Layer is the layer where the services of a defined business enterprise business processes and then classified according to their purposes. In the group of

common services are the services that the service standard of any kind owned by SME business processes, such as product search, booking orders and so on. While the line-of-business groups are the services which only certain SME business processes, such as process shipment will only be owned by a group of SME businesses that sell products, while for the group that sells services will not have this service. This is to distinguish the service which will be a necessity to run during the process and services which may be passed in accordance with the requirements. Enterprise Bus will contain accordance with the ESB architecture design. The numbers listed service tailored to a table listing service. In addition it is necessary to service level agreement (SLA) that defines an agreement with other parties regarding the quality of service with regard to performance and job security. SLA will usually defined along with others that will be connected, but in this paper, has not been specifically other party so that the SLA can not be defined.

- Persistence layer is the layer that will be associated with the processing of the data base.

V. VALIDATION

The author uses the service evaluation matrix developed by Rosen and a team that contains several criteria to measure design service on the application. The author then connect the following criteria with the goal to be achieved in this research. Criteria in points 1 to 4 show how the service can help SMEs designed to have powerful applications that support business processes of SMEs. Criteria in points 5 to 10 show how the service is designed to support SMEs to efficiently dealing with others. Criteria in points 11 to 14 show how the service can be built independently designed and developed with flexible.

The results show that at points 1 to 4, the design of service has a value of 3 Yes of 4 questions (75%), which shows the design of these services can help SMEs to have a reliable application. Then in points 5 to 10, a draft service has a value of 6 questions 5 Yes (83.3%), which shows the design of this service has the ability to efficiently provide service to run business processes both internally and relate to the service of others . Later in points 11 to 14, a draft service has a value of 3 Yes 4 questions (75%), which shows the design of service has the flexibility to be built and developed in the future. It can be concluded that the design of services produced in this study had to meet the goals set.

Furthermore, the authors do a comparison between the needs of SMEs with functionality that is owned by the application of e-collaboration. In the inspection process, the expert judgment of the author involves several parties associated with SMEs. As these parties are representatives of the Ministry of Industry, Commerce West Java, business consultants and representatives of SMEs companion Regional IT Center Bandung which is an association of SMEs in the IT field in Bandung. Inspection process is done by conducting interviews with SMEs and the results demonstrate the need for

application functionality generated. The results of the validation process are obtained and then poured into a traceability matrix in which it was found that the design meets the functionality requirements.

SUMMARY

Referring to the results of the analysis and design and design validation process, the following are the conclusions from this study:

- The design of the architecture and the application of e-business collaboration in SMEs by using service oriented architecture (SOA) can be generated by using the stage of research design described in chapter
- The results of the design has been validated by using the service and meet hipopenelitan evaluation matrix is generated design can be developed into e-collaboration applications that can support SMEs to run business processes that are reliable, efficient and flexible
- The results of the design functionality of the application has met the needs of SMEs as outlined in the traceability matrix that is obtained from the inspection of some expert judgment

Some suggestions are given for the development of this study is as follows:

- In this study the author builds the design of e-collaboration applications that can be used by all SMEs in general, but related to the breadth of the definition of SMEs in Indonesia, the author sees a chance of some small businesses in Indonesia such as grocery stores or street vendors who can not currently using this application, although it has not been proven whether these micro-businesses requiring iT assistance. It required further research where appropriate IT applications to micro-enterprises.
- Due to time constraints the study, the design of this author does not involve the government and the Bank to understand their needs in detail, particularly with respect to policy, for example to process Bank loan assistance and support from the government. For that the design can then be included input from the government and the Bank so as to attract SMEs to be involved in this application.
- The design of the business architecture in this study does not include the component models and the organization's business strategy because it involves a more detailed discussion of the policies of the government and all parties will be relevant, should be in the process of realization, the two components must be there.
- The design of this research is an early stage that has not been developed in the form of application programming. The author hopes this scheme can be further developed into an application in the appropriate programming environments.

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