Business Process Management and Service Oriented Architecture Integration for Transactional Banking Application

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Abstract—To implement Service Oriented Architecture (SOA) in a banking company for transactional banking activity, this paper aims to overcome the problem of several related surrounding systems which has the same function in the different system by using Domain Driven Design. The paper proposes an approach to SOA using Web Services for service delivery in the area of transactional banking activities. Several systems will be connected to a BUS that will wait on and manage any request coming from other applications. To design the system then in this paper also will identify which application will consume the same function and analyze which function belongs to a certain domain. The paper finds that the implementation of an SOA system for transactional banking activities can be achieved by rapidly changing the habit of scaling up the system and application. This study shows that banking activity has a huge number of systems that should sync one and another to maintain the data integrity, availability, interoperability, and composability of the system.

Keywords-service delivery, banking technology, enterprise system implementation, service-oriented architecture, eBanking services

I. INTRODUCTION

As a company that runs a business in the banking industry, services are the most important thing to be offered to the customer. The relation between bank and customer is based on trust which is shaped through the services given by a company to the customer. The efforts undertaken by banks to improve their services through information technology have resulted in a significant improvement to deliver their services to the customer. Information technology is no longer a supporting system at some point of view because it already acts as an enabler of the banking business. Since the use of information technology has been scaling up to an advanced level, then banking has to catch up to create a fast and efficient system. The status quo of transactional banking is trying to facilitate customer's needs to perform a transaction through various channels such as customer service, ATM, and bank outlet. These would never happen if customers don't have CIF in the very first place. Customer onboard is being a pain for the overall company who runs on the banking industry, it takes about 20 – 30 minutes to get the customer registered caused of a bunch of forms that should be filled up by the customer. This is a must when bank is highly regulated and all those information from the customer are needed to comply with Anti-Money Laundry (AML) regulation. A customer has a purpose when onboard to a certain bank to get the transactional services provided by bank and even expect all of banking services can be performed without need to approach any of the bank outlet by the digital era right now. Unfortunately, most

bank still stands on their position because of scaling up the banking system is quite complicated caused by the system architecture and design is surrounded by many other system related to it.

There still a lot of practice in a bank that treats its system only to perform part a business process out of the whole business process in an activity. These are caused by the lack of managing the end to end process besides the scaling up the business functions. This issue can be addressed by Business Process Management (BPM) where finally drive this process through the use of Service Architecture (SOA). BPM is a best practice nowadays to revamp the process of activity become much more efficient and simple. Convert manual operation to automated operation will enhance productivity and time. BPM and SOA is a good pair where most of these are grouped in term of implementation. SOA is essentially sandwiched in between and becomes robust of realization of what has been theoretically mapped out in the BPM planning stages.

II. RELATED WORKS

Look over in the nineties where workflow is often used by organizations to manage their process, BPM considered as "the next step" framework to manage processes [1]. BPM is a methodology that facilitates an organization to organize, mana, analyze, and re-engineer the process performed within an organization [2]. A process needs to be modeled to obtain a highly efficient process for an activity. Business Process Modeling is a structural method that helps stakeholders to identify and analyze processes and figure out possible improvements in the process. In BPM, we need to define certain activities that are performed by several different groups. Because when designing the BPM, it should be able to overcome the questions of Why, What, Who, Where, and When. BPM can be utilized for some case bellows : (a).The dynamic process that requires regulatory compliance changes, such as a change in customer information management following changes in finance or privacy laws, (b).A complex business process that requires orchestration and coordination across multiple business units, divisions, functional departments, or working groups, (c).Measurable mission-critical processes that directly improve a crucial performance metric, (d).Business processes that require one or more legacy applications for their completion, and (e). Business processes with exceptions that are handled manually and/or require quick turnarounds. BPM best practice is formed in a lifecycle to get all the process managed still on the track of BPM boundaries
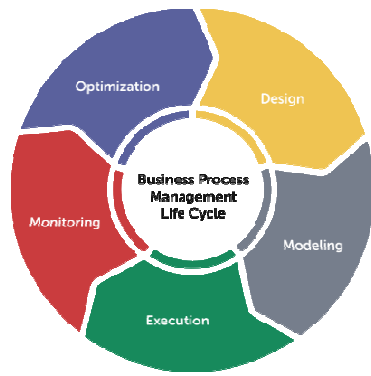
Fig. 1. The BPM Life Cycle [1]

1. Design

The basic foundation of BPM implementation is figuring out how the current process is running in the organization. This step is usually conducted by Business Analysts that review how do existing business rules are and the goal of the process design stage to gain an understanding of the business rules and ensure if the results are in alignment with the organizational goals.

2. Model

Modeling refers to identifying, defining, and making a representation of a new process to support the current business rules of various stakeholders. This step is crucial because the new process initiation will be defined and the execution will be based on this step. A new process should be able to overcome problems underneath the currents running process. The problem needs to be defined first before going to the solution, this design thinking method will be fit for this step.

3. Execute

A new process is not executed in the entire organization all at once. To prevent a big failure of implementation, then the execution can be done in a small group of users first and then open it to all users after all gap has been fulfilled and fixed. In the case of automated workflows, artificially throttle the process to minimize errors. The error could cause business processes hampered, then Implementation for a small group will be a good early-stage before changing it all to all users.

4. Monitor

Monitoring the latest process is important for further evaluation by establishing Key Performace Indicators (KPIs) and track metrics against them using reports and documentation. BPM is not only about designing a process but also the designed concept should be monitored continuously after the implementation. BPM will be performing a continuous improvement of the process, where the implementation results will be collected and evaluated.

5. Optimize

With an effective reporting system, an organization can effectively steer the operation toward optimization or process improvement. Business Process Optimization (BPO) is the redesign of the business processes to streamline and improve process efficiency and strengthen the alignment of individual business processes with a comprehensive strategy.

By the implementation of BPM as described above, the business will get several key benefits as follows

1. Improved Business Agility

2. Reduced Costs and Higher Revenues

3. Higher efficiency

4. Better visibility

5. Compliance, safety, and security.

Delivering business to the customer is something that needs to be addressed in the main topic of this paper. A company that gives service to the customer always consider how the services can be delivered as close as possible. To manage a large number of customers in banks, technology becomes something that important. By the time the business is scaling up, then the support system on the technological side becomes the main thing that also needs to follow the business movement. Every single activity is done by banks should be able to be recorded in the system. These things are crucial because bank is highly regulated as the Financial Services Authority manage all regulation related to banks. If a system was constructed on monolithic architecture, this will slow down the banks to deliver their services on time to market. To answer this problem than SOA raise as a solution to manage huge and complicated business services. A service-oriented architecture is a paradigm of an architecture in which application and software are managed and organized as a set of loosely coupled web services and give reliable business agility and flexibility [3]. SOA provides an efficient way to provide IT agility and simplifies integration. By the implementation of SOA, it will give a high return on investment, reduce costs, scalability, and reduce time to market delay. SOA principle can be defined under 8 broad categories they are reusability, sharing of formal contracts, loosely coupling, abstraction of internal logic, collaboration, autonomy, without situation information, and discoverability [4] (**Table I**).

TABLE I. SERVICE CHARACTERISTICS

Service Characteristics	Description
Reusability	The design will enable reusability of services inside SOA, services are able to be consumed by any other application or system to generate certain function on business needs
Sharing of Formal Contracts	The formal contract necessity that describes the services and contains necessary idioms to interact with other services for inter-compatibility
Loosely Coupling	Services do not strongly depend on each other makes SOA inter-operability
Abstraction of Internal logic	The internal logic is not shared with each other except for the formal contracts
Collaboration	Collaboration from one service to other services while each of them can have their own business logic, this will improve reusability
Autonomy	The logic constructed has a clear boundary between one and another where the services have its own control and capabilities without depending on other services
Without Situation Information	Services do not have any situation information in order to not interfere with loosely coupling property.
Discoverability	Services are wrapped up to its specification and enable the services user or services consumer to understand the specification and functionality

By the implementation of SOA, the IT team in bank will be easier to manage, develop, and maintain business expansion. SOA aims

at designing a distributed system paradigm to offer the solution of system integration, intercommunication, and interaction by compatibility and interoperability [5]. A basic concept of SOA is illustrated in Fig 2.
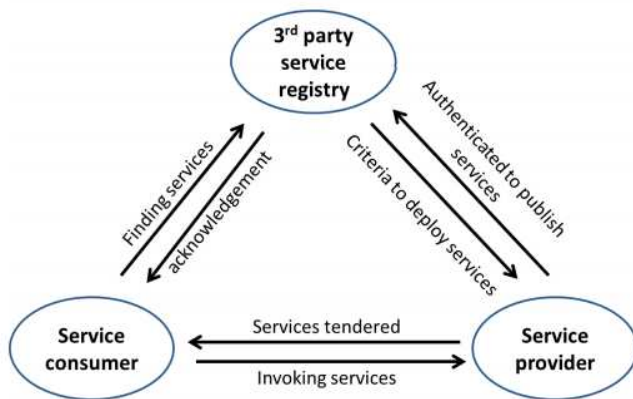

Fig. 2.   The Conceptual presentation of basic SOA **[5]**

Service consumers utilize service provided by the services provider. The 3rd service registry will provide standard criteria in where services provider can deploy and perform the services. SOA delivers service through web services which are an architectural style for building software applications that can be harmonized for reusability of existing IT infrastructures [6]. It makes SOA can be distributed broaden and can be consumed by any other system. The W3C consortium already imposed the standard of SOA using Simple Object Access Protocol (SOAP) and Web Service Description Language (WSDL) [3]. SOAP and WSDL are exposed using Extensible Markup Language (XML). XML has become the standard for exchanging and packaging messages for the services.

SOA is defined in several layers to organize the service and workflow for business which will be explained in the case of transactional banking services in the next section. To design SOA for account opening and transactional banking activities, we firstly would like to bring the existing process to be reorganized first in order to construct services based on a business process that has been managed by using Business Process Management (BPM).

III.   RESLTS AND DISCUSSION

Transactional banking is one of the core activities that must exist in banking services. The transactional activity that usually done is described as the following steps
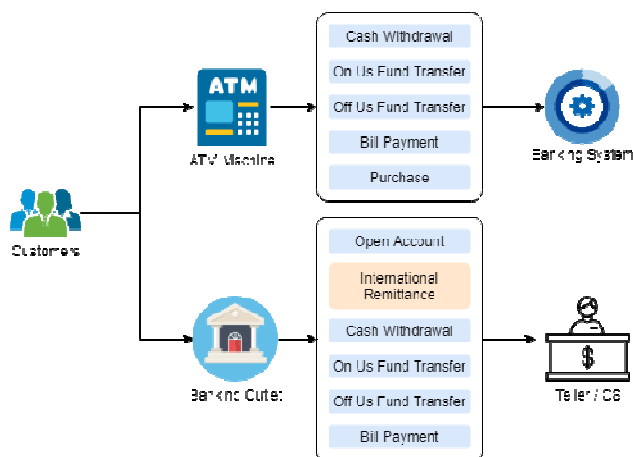

Fig. 3.   Previous Banking Process

The figure above shows that customers have two options for doing their transactional activity either through ATM Machine or Banking Outlet. Refer to the steps of how does BPM implement, firstly already identified the business rules of those activities above.

1. Banking Outlet is serving customers for several activities such as open account, international remittance, cash withdrawal, on us fund transfer, off us fund transfer, and bill payment.

2. Account opening will take around 30 minutes for the user to create the new CIF (Customer Identification File) and around 20 minutes for customer service to create a new account for an existing customer.

3. ATM Machine is provided to customers to facilitate customer transactional activities much more simple. ATM Machines are placed at some strategic place where customer can do their banking activities with no need to approach branch outlets directly.

A deeper analysis of how to account opening process is going on is illustrated in the figure below
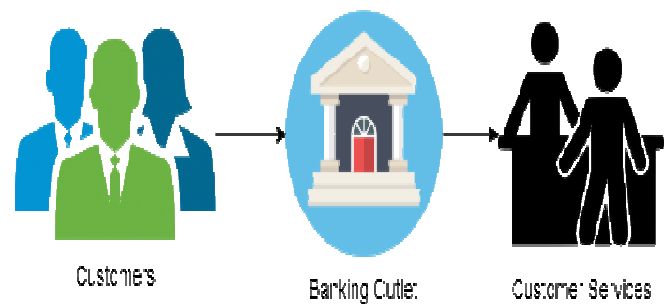

Fig. 4.   Account opening illustration

The account opening process is a pain for customers where they need to spend 30 minutes just for the account opening process out of waiting for the queues. The step by step process is as follow

1. The customer goes to a branch office
2. Customer wait for the queue
3. Customer approach customer services and fill up account opening form
4. Customer services ask for documents and verify the customer's data to the Department of Population and Civil Registration and Anti Money Laundry.
5. Customer services input the filled form from the customer to the banking system. This process takes almost 20 minutes because there are a lot of fields that have to be input into the system.
6. Customer services prepare bank passbook as proof of account ownership.
7. Customer account created

From the existing business goals from the figure above, there are some identification of business process that can be enhanced to perform the activities much more efficient

1. Customers need to go to the branch office to perform account opening and transactions where they need to spare their time. The account opening process is crucial to the bank because it is slowing down the number of acquisitions.

2. Although the bank has provided ATM Machine for customers' transactions, the customer still needs to spare their time when ATM Machine is not available to the customer location.

Those identification defined above become the baseline in the making representation of a new process. The banking activities are actually could be wrapped up in a more portable way in the form of a mobile platform. Then the representation of a new process is as follows.

On Us Fund Transfer
Off Us Fund Transfer
Bill Payment
Purchase
Open Account
International Remittance

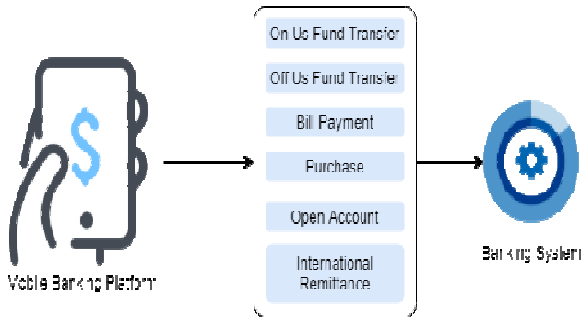Mobile Banking Platform

Banking System

Fig. 5. Representation of a new process

The figure above shows that the transactional activities will be carried on Mobile Banking and so do the account opening process. The account opening process will be much simpler and faster as described below

1. Customer install Mobile Banking Platform

2. Customer will fill up form through a mobile platform

3. The system will check and verify either the customer data is valid to the Department of Population and Civil Registration and never listed in the Anti Money Laundry system.

4. The system will perform anti-fake verification with liveness detection to make sure the person who performs the account opening is the owner of filled data. The system will convert the face biometric and do face matching to the Department of Population and Civil Registration data.

5. When the verification is done, the customer account will be created automatically by the system and several document-protected customer credentials will be sent to the customer email.

6. Customer performs account activation from the mobile platform and signs in to their account.

7. After signing in to the account, then the customer can perform various transactional activities and other banking services which previously can only be performed from the branch office and ATM Machines.

The optimized business process above will be the baseline to design SOA for account opening and transactional banking activities which will be explained in the section below.

IV. TRANSACTIONAL BANKING SOA-BASED WITH BPM

Porting existing services into SOA is not something easy because there should be a lot of things to be considered since the existing services are being consumed by other services or applications. The technic of decomposing a function into a smaller piece of function will give the flexibility of the IT team to enhance productivity and supporting business necessity. Based on the BPM that has been analyzed and optimized before, then we can classify the domain function.

Analyzing from the BPM that has been modeled above, we can organize it into a layer for SOA [5].

Presentation layer

The presentation layer is what end-users interact with which in this case is the smartphone (iOS and Android). What comes powerful with this is customers no need to go to the branch office at all to do their account opening and there is no human verification since the system is interconnected with each other to external data for verification & validation. This mechanism complies with POJK No.POJK.03/12/2018 about Digital Banking Services.

Business Process Layer

In this layer is what business process will perform they are on us transfer, off us transfer, bill payment, purchase, international remittance, and account opening which is accessed through the presentation layer.

Business Services Layer

The business process is classified into a business services layer based on the domain of the business itself. We order the services into Domestic Fund Transfer Services, Payment & Purchase Services, Account Opening Management, and Reconcile & Settlement. Every transaction will be reconciled daily by Operational Division, because off us transaction involve 3rd party services.

Service Layer

In the service layer, there will be a huge collection of services that will be utilized based on business needs and functions. This is why service is reusable because they can share the function of service for another purpose of business. Services are decomposed and constructed as modular as possible. These services will communicate with each other through Enterprise Services Bus (ESB). Every messaging will be delivered through ESB and let ESB manage the communication of the related services.

Resources Layer

The resource layer contains all involved resources to perform certain services. Here is the matrix of how these resources are utilized

TABLE II. RESOURCE METRICS

Business Process	Resource
Open Account	1. Department of Population & Civil Registration 2. Anti-Money Laundry 3. Core Banking
Off Us Fund Transfer	1. Switcher 2. Core Banking
On Us Fund Transfer	Core Banking
Bill Payment	1. Core Banking 2. ePayment
Cash Withdrawal	1. Switcher 2. Legacy System 3. Core Banking

Technology Layer

In the technology layer, there will be some networking management, devices, servers, and another hardware security system where SOA is constructed on.
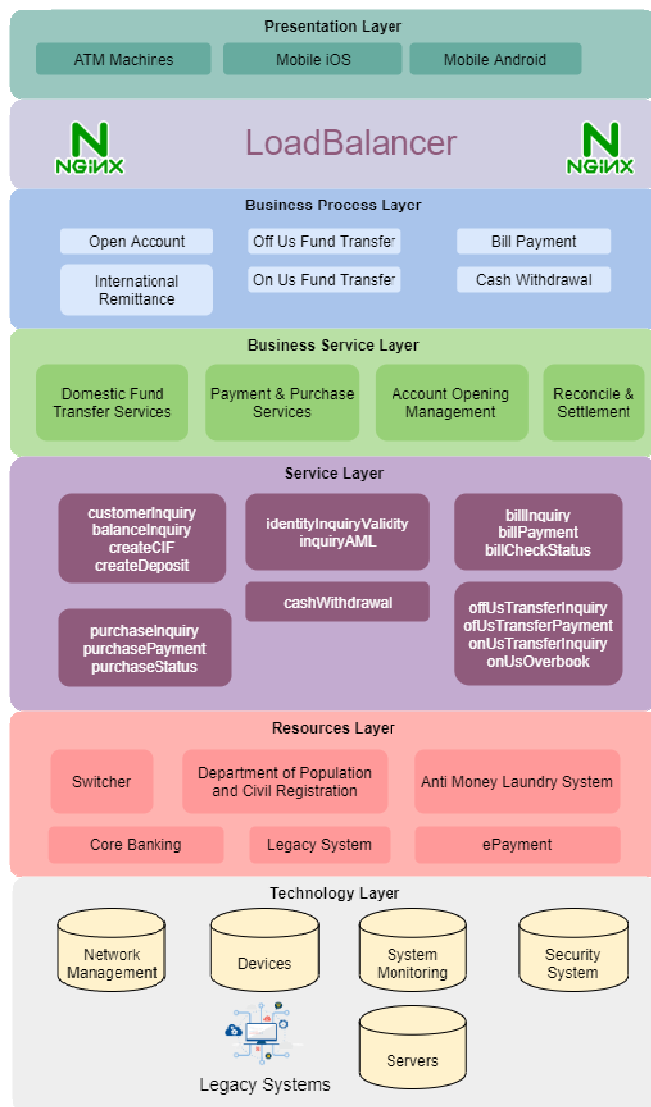

Fig. 6.   SOA Layer for Transactional Banking

V.   CONCLUSION AND FUTURE WORK

Financial services in 2020 delivered to the customer in various ways. Bank nowadays is not the only choice from customer to get their financial services, there are a lot of Financial Technology raised to the market right now. Banks need to adjust their business to catch up to the market. Along with the times, the bank would be left far behind if they don't create new innovation and manage the business well. Looking at the customer-centric paradigm, many companies drive their business through technology information. A technology-driven business will be easier to reach out to their customer directly on their hands. The harmonization among business and technology is something that cannot be separated, SOA is one of the good choices for a business to align its technology-driven business to broaden business coverage. In future

work, we would like to simplify the process cardless withdrawal that will utilize the Mobile Platform to generate authentication for ATM Machines.

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