(Check) SOA System Architechture

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SOA SYSTEM ARCHITECTURE FOR INTERCONECTED MODERN HIGHER EDUCATION IN INDONESIA

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Abstract

The transformation in education is expected to help people to have an effective and efficient learning without concerning of cost and time by using internet technologies. On the other hand, IT world levitates demand of talented employees. In current situation, modern higher education is considered inadequate to deal with the demands. Modern Education in Indonesia is encountering a complex situation for higher education. The complex ecosystem intended to deliver learning material and develop potential talent to become expertise. We proposed the SOA system architecture which create a new ecosystem based on SOA. It will give student and other stakeholders have interconnected learning systems. We proposed SOA system architecture and SOA system reference for interconnected modern higher education in Indonesia. Its purpose is being interconnection between students, lecturers/instructors, universities, financial institutions, fund institutions, and employers/industries. In the end, we should be able to create powerful tools that have seamlessly connected platform which offers a valuable service. This innovation will create a rich opportunity for enterprise and wider community which enhanced the new digital learning experience and delivers a strong talent management & recruits, knowledge engagement, skills & employability, and needs of affordable education.

Keywords: Service Oriented Architecture (SOA), E-Learning, Indonesia Higher Education, Interconnected Modern Education

1. Introduction

Nowadays, IT world demands rising high of talented employees and/or experts. This is an impact of digital technologies creating a huge demand for digital skills. It's enlarge competitions to enrich their knowledge or upgrade

their skills by learning from internet or education institutions. The conventional ways of delivering content was in the classroom, so student possible to have face-to-face interaction to their lecturer/instructor. Two classical common case from conventional education systems are rising cost of higher education and spending lots of time. It hampered the process of learning. Implementation of e-learning not only happened in educational institutions, but also in industrial who want to improve the ability of its employee. Plenty of big companies provide solutions for employees who are difficult to learn by leaving the job for a long time. The transformation in education world, e-learning is expected to help people to have effective and efficient learning without concerning of cost and time by using internet technologies, called web-based learning. It will make people (student/lecturer/instructor) easy to access contents/materials, brainstorm their ideas within fast discussion chat room, and created active students to gain their independency. E-learning environment has developed into solution for students. The existing e-learning in modern higher education was people, developing curriculum, using open source platform for LMS (Learning Management Systems), assets, and technology to deliver the learning material for students. In point of fact, modern higher education has been developing into LRS, mobile learning, social Learning that make fruitful and yet attractive students. According to [1], integration environments in learning with other enterprise application has many solutions. It makes enabling the management to measure the impact. The impact is effectiveness and overall cost of the learning initiatives. Based on [2], the university's business in an age of expansive change must shift from simply transferring knowledge to provide an access of the latest knowledge through digital platforms and developing and guiding potential skills. It can encourage student to research and urge the boundaries. So, we believe that the existing e-learning are not integrate to the dynamic of the globalization era. Most questions arise to colleges and universities is how to integrate the best educational programs with advanced technologies and new model of learning systems. It is believed to make an effective higher education around the world. Living in hypercompetitive worlds, necessity in system integration while the data must be shared among these systems, and it could support the enterprise processes [3]. The complex integration between universities, financial institutions, industries (employers and scholarships), instructors and students represents an adequate the enthusiasm in modern higher education development. Emphasized to all above, applying Service Oriented Architecture (SOA) to modern higher education supports better learning systems. The purpose of this paper introduces, analyses, and proposing new architecture of integrating modern higher education in Indonesia based on SOA. The main reason why using SOA is because of the capability in shared services, flexibility, and interoperability.

2. Related Work

In the past 15 years, technology was becoming the most rapidly growing in every area, including in education. According to [4], single entity is not related with educational technology, however there is a diverse array of technological devices and technology, and also based on activities and practices. According to [4], the system of modern education can be interpreted as the use of digital technology education includes working with most of the computing devices connected to the internet and called educational technology. Related to [5], LMS could helped tutors/teacher to improve and add new materials. Another platform from large-scale online learning experience of multi user systems must drags to the famous MOOC (Massive Open Online Course) terms. Based on [6], today, MOOCs has implemented using both centralized platforms and services, and also decentralized networks based on aggregations of blog sites and social media feeds. It have been designed to facilitate some of components, such as: (a). university curricula;(b). academic scholarship ;(c).community outreach;(d). professional development, and (e).corporate training applications. In conjunction with experiential learning, research of social platform is growing tremendously. According to [7], the platform in social media is a web-based technology. It will enable the development, deployment and management of social media solutions and services. It provides the ability to create social media websites and services with complete social media network functionality. Mobile Learning by [8] is its ability to learn in mobile, and not necessarily from the classroom. The media and devices in mobile learning are varied and updated. Mobile learning (M-Learning) provides the ability to personalize for student learning and make student passionate. M-Learning emerges as a solution to the challenges faced by education's world in order to provide convenience for lecturers and students. They can surely accessible everywhere and anywhere on many devices such as notebooks, laptop, mobile/tablets, iPad and so on. One of the causes of M-learning is acceptable by [9]. Other thing that make learning can be fun is developing learning game. It is a domain which is the use of game elements in that initially has no links to game-related elements [10]. According to [11], gamification will help you to sort the hours needed. Besides that, Indonesia's Central Agency of Statistics (BPS)

revealed the number of unemployment per August 2017 amounted 7.04 million people and drove Indonesia's ranked to 77th in Global Talent Competitiveness Index. The acknowledge Indonesia is left behind of the Technological Readiness (ranked 80/137) [12]. In order to seal the skill gap, industries need to change the recruitment systems. Recruiters need to consider the candidates who learn and study from alternative education systems to acquire talents in talent pools. Jumping into the development of technology architecture in modern higher education, [7] is recommended by using service orientated architecture (SOA) approach based on cloud computing. It said that technology architecture, data architecture and application architecture are the three main pillars of architecture developments. Moreover by [13], sharing services and cloud computing are creating a synergy and openness to the environment. The aim of SOA is creating effective and efficient environment for students to access digital information to their long-terms goals. The advantage of using SOA has explained in [12].

3. Research Methodology

Research methodology in this study using systematic literature review, document literature, and also interview with some of users in Information Technology, Education Management, and Education Technology. The stages in this study is described in figure 1 below:
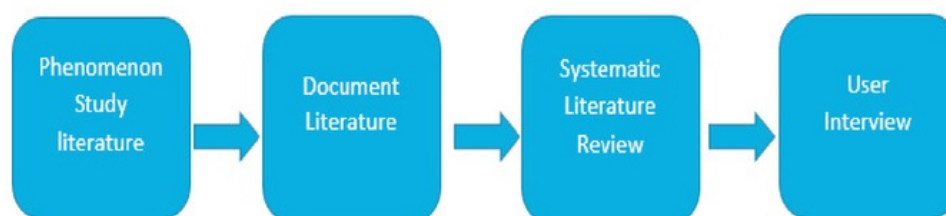

Figure 1: Stages of Research Methodology

4. Results and Discussion

The interconnected in modern higher education that needs to be encompassed by the new architecture. Student management system, teacher management, and faculty administration. The content creation that can be plugged into a system which is curriculum, research & scientific, digital library, publisher, and courseware. Student need to discover before they are choosing a course and start which include enrolment & admission, student financing for getting student loan & scholarship and if they have the plan to study aboard. LMS platform has been used in many education institutions. Modelling and designing the new complexity in interconnected modern higher education system requires intern and alternative paradigm in system architecture based on SOA. It will need to comply in the modern education that involved of some of components in the systems. It will need to be focused on services, over the properties of components, and also need to be focused on interoperability. Besides that, it will support of the cross-platform functionality to comply with diversity between components. It needs to be flexible, distributed and loosely coupled which is can deal with the overwhelming complexity of these systems. The services can become interconnected with each other, empowering greater connectivity and others platform, thus improving the potential of the architecture in modern higher education. The structure and makeup of engineered systems complexity is fundamentally different to that of our traditional integration education & learning systems. Because of the homogeneous, well-bounded, monolithic and relatively static. In this study, we proposed SOA system architecture for interconnected modern higher education. It is used to integrate diversity components using a service bus. The solution framework to integrating and design a scalable reference architecture to interconnected modern higher education using Service-oriented architecture (SOA). It is an approach for distributed systems architecture for support and deliver seamless cross-platform integration. Imagine if we will construct a new web application that allows a student in university to pay different online course from the institution and another online course provider. Relate to it, the development of subsystem to dealing with the payment can spend years to construct some functions as a student management system and then another subsystem for dealing with the payments. Interconnected Modern Higher Education as a concept refers to providing access to and managing of resources in a collaborative way where information technology will aim to

connect different systems, devices and stakeholders. This will bring together entities to create connected educational ecosystems, enabling speed and efficiency among different users. In order for this to happen, the real challenge is the need to integrate and provide accurate information based on highly acquired connected data. Nor should any latency issues exist between these sources, either without delay in aggregate information. The faster and transparent the process, the better the service is provided. From the perspective of business architecture, there needs to be a seamlessly connected platform that will offer valuable services to different stakeholders, enabling them to fully utilize the benefits of such a system. From a technical perspective, to get the above business architecture in place of some technical entities must be united. These segregations on operational aspects to unite these entities will form the building blocks of connected educational ecosystems. The main principle behind interconnected modern higher education concept, and what makes it different from other education architecture frameworks, is the fact that it works across layers, thus removing siloes entirely. We proposed SOA system architecture that described in figure 2 below:
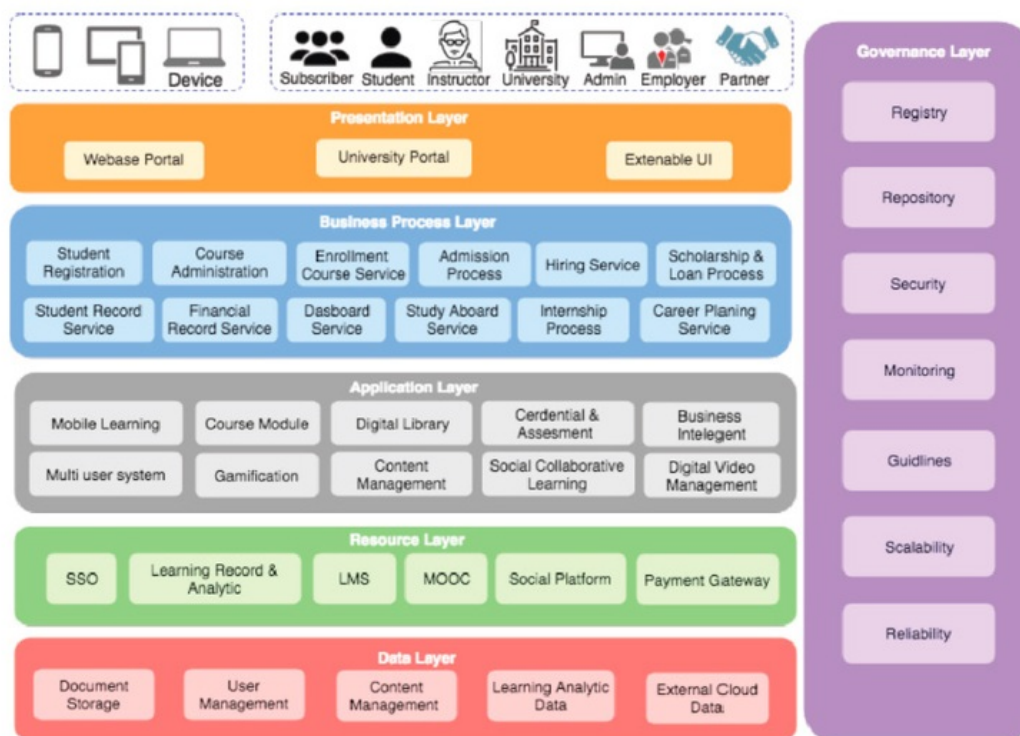

Figure 2. SOA System Architecture Proposed (Source: Processed data by team)

The SOA System Architecture in figure 2 above consists of 6 layers. Presentation Layer – It should be transparent of how the services are supported, must address accessibility issues and should make use of a wide range of delivery devices. The interaction both synchronous and asynchronous should be supported [14]. Business Processes Layer – compose and choreograph services and to coordinate business processes to accommodating customer requirements. We also report our experiences of applying the Business Process layer to guide the design and development of SOA solutions [15]. Application Layer –This provision could be via the creation of new IT services or the adoption of generic IT services more broadly available. Resource Layer – Some applications that are specifically developed and provide by 3rd party, application created by a vendor (company or individual). This application connects with another service to either provide enhanced features or access profile information. Provider service know the internal logic of the component, is comprised of any number of digital vendors that support the functionality of our architecture. Data Layer - A data-centric SOA allows for accommodate new and existing IT investments to support business requirements. It will support the transition between applications and business processes. Governance Layer –It will

ensure that the services and SOA solutions within an organization are related with the defined policies, guidelines, and standards. It will provide the desired business value. The Governance Layer will be adapted to [16]. We proposed the SOA System Reference with adoption the system architecture that has been proposed for e-learning in SOA environment by [17]. Regarding to it, there is a SOA implementation for smart education system based on content oriented that has been done by[18]. In this study, we proposed SOA System Reference in figure 3 below. It is inspired from some components need to be integrated and taken into consideration when building a modern, interconnected modern higher education reference architecture, that component is:
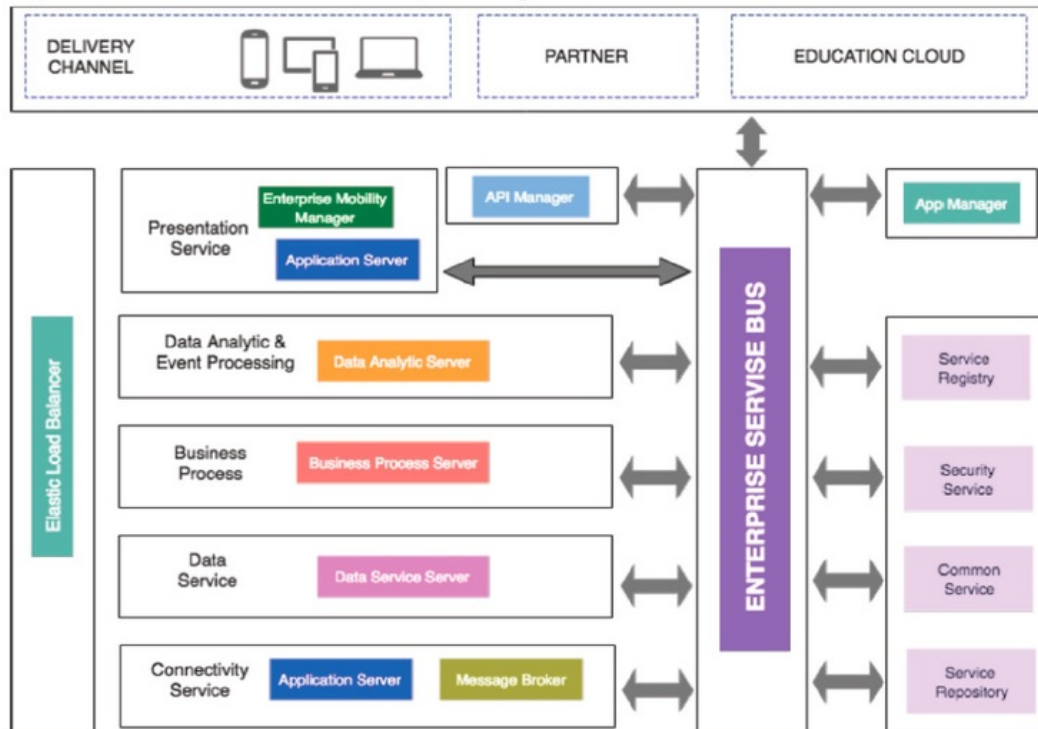

Figure 3: SOA System Reference Proposed (Source: Processed data by team)

According to figure 3 above, a very important aspect when creating a interconnected higher education system is to digitize the content and make it available as a service. When data has been exposed as the service makes it more reusable and allows the system to easily connect with them. Sometimes content is available in digital formats, such as digital libraries, immersive content, information, course information, and other content residing in the content repository and documents stored in digital storage. Thus, this content must be visualized and available as a service via a data bus. Another important element is enterprise service bus pattern that is widely used to separate the complexity of the integration of the business services layer. The link between them is mediated by Enterprise Service Bus (ESB) which according to the concept is not a product, but best practice to implementing service-oriented architecture [4]. Besides that, according to[19], we should prepare the need and requirement of the system before implementation. We should analyze before we choose the choice, because it is possible to combining the choice. This complexity, can support multiple protocols, message formats, and messaging patterns with middleware integration, so application and service developers can concentrate on their core requirements that are specific to the business domain. This study is inspired from services modelling based on SOA and BPM by [20].

CONCLUSION

With this new architecture, we give the new digital experience for students and all stakeholders, an experience it hopes they will endorse to their friends and peers and provides a complete product stack that fits content exchange,

multipoint integration, user authorization & authentication and education context info outcomes data. It is a very powerful platform that can be used to build an interconnected modern higher education ecosystem. The technology already transformed the modern education. From students, educators, are now looking for a new learning experience that faster, more efficient, and effective ways of offering as well as accessing information. Thus, the creation of an interconnected modern higher education ecosystem has become an important way forward for players in the education space. A connected education framework will alliance university can optimally support research projects, curriculum advancement, and effective learning environments. Education Institutions as a data company, tracking students continuously in order to improve learning and truly understand the need of individual and help them to achieve full potential. And the same time education institutions as a data company can link and send quality data students to employers and to make sure provide the right talent. Students have the opportunity today to improve their educational experiences by making use of the digital resources available today. This is true learning that makes people performers, and teams that make people drivers of innovation happens when people are with people.

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