ENTERPRISE BUSINESS ARCHITECTURE IN HIGHER EDUCATION

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ABSTRACT

In this paper we discuss the concept of enterprise business architecture. We explain the concept and, based on a case study, discuss its relevance, operation, relationship with strategy and business models, and value for higher education. Enterprise business architecture contribute to clarify the complexity within an organization and form a useful starting point from which to develop functional, information, process and application architectures. In addition, an explicitly enterprise business architecture help to structure the responsibilities within higher education, and within the primary process as well as with regard to IT support. Enterprise business architecture contribute to an adequate IT strategies in order to manage the resources for critical business activities and how to manage the development and support for business efficiently.

Keywords: enterprise business architecture, enterprise architecture, business modeling, business strategies, business use case, business process.

1 INTRODUCTION

Business demand for technology capabilities continues to grow, propelled by recognition of the impact technology has on business strategies and outcomes. Technology trends from cloud computing to the “consumerization” of technology to “componentization” of packaged applications open new doors for businesses to find solutions to their strategic needs. In such an environment, IT can’t remain an order taker its relationship with business must evolve toward partnership, and enterprise architecture (EA) provides the glue for this partnership. EA goals in organization will be redefined to break out of its IT-Centric role to govern the interaction of all units and assets in an organization. It aims at creating value through effective collaboration and co-creation with business partners and customers [1].

As business rethinks or adds new strategic directions, how can EA ensure that business and IT work together on these transformations? As the technology landscape changes to make it easier for businesses to engage their customers and change their business models, how does EA provide the lens through which business and IT together evaluate these technologies? And to be effective at challenges like these, how should EA leaders market their relevance to business and IT priorities?

The purpose of this paper will show Higher Education (HE) how to develop and use business architectures to align IT and business strategies. In section 1, we discuss what is meant by the concept of enterprise business architecture (EBA), EBA is becomes essential in the existing complex business scenario as is attempts to create a blueprint of why and how business can be done in detail, the enterprise vision, strategy, processes, and strategy execution [2]. Second, we will present how can uses EBA to determine the extent of alignment of their IT and business strategies, and how can a model for EBA be developed in a HE case study.

2 ENTERPRISE ARCHITECTURE

There are myriad definitions of enterprise architecture (EA). The focus of enterprise architecture efforts is now shifting to become more holistic, thereby necessitating the use of comprehensive modeling tools to analyze and optimize the portfolio of business strategies, organizational structures, business processes/tasks and activities, information flows, applications, and technology infrastructure [3].

There are several good definitions of EA. EA are like blueprints, drawing or modeling [4]. EA seek align enterprise processes and structure with their supporting IT systems [5]. Author Doucet, Getze, Saha and Bernard [6] state the defining describing and deploying EA is a large and complex
undertaking that allows enterprise to: (1) understand business operations and uncover deeply embedded business rules, (2) elevate the role of information within the organization and treat it as a core asset, (3) understand gaps between information needs of the business and information provided by IT systems, (4) create synergies between available and stable technologies and emerging technologies, and (5) leverage technologies to discover and take the advantage of new business opportunities.

As indicated earlier, there are many different interpretations of the concept of EA. Though, most of the researchers and practitioners agree upon that EA consist of both a perspective of aligning enterprises business processes and of a technological perspective. High levels components of EA relationships business and IT strategies between business, data/information, application, and technologies/infrastructure. Level components in EA show in Figure 1.

**Figure 1. Components of Enterprise Architecture**

### 2.1 Enterprise Business Architecture

EBA defines the enterprise value streams and their relationship to all external entities and other enterprise value streams and the events that trigger instantiation [7]. EBA serves to improve operations and the alignment of technologies to business needs: focus on value to the organization and the customer, find synergies in generic processes, and provide the blueprint for business transformation [8].

EBA are composed of architecture, workflow and events. Architectures – Graphically portray the style and method of design and construction that comprises the elements of an enterprise and defines the purpose and interrelationships of those elements. Workflows – Graphically portray how inputs are transformed to outputs for the enterprise. Workflows illustrate the flow of control, delays, sequencing and which entity performs the activity. Events – Graphically portray when the enterprise must react in a pre-planned way.

<table>
<thead>
<tr>
<th>Modeling icon</th>
<th>Name</th>
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<tbody>
<tr>
<td>![Image]</td>
<td>Business Actor</td>
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<td>![Image]</td>
<td>Business Worker</td>
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So, we can define EBA as the structure of components EA related to business and the manner these components interrelate among themselves and other architecture to created value. In our study, we concentrate only on identifying an exhaustive list of business architectures element from HE requirement and defining their relationship. In the contexts of this paper description of EBA provides the high-level representation of the business strategies, intentions, functions, processes, information and assets critical to providing services to HE, and the like.

### 2.2 Business Modeling with UML

Business modeling is a technique to model business processes [9]. The benefits of business modeling is obtained a align technology with business goals, by modeling the relationships between business processes and their underlying data, organizations are better able to take advantage of their technology. The are many purpose of business modeling [10]; (1) to understand the structure and the dynamics of organization in the target organization, (2) to understand current problems in the target organization and identify improvement potentials, (3) to ensure that customers, end users, and developers have a common understanding of the target organization, and (4) to derive the system requirements needed to support the target organization.

In Business Modeling we document business processes using so called business use cases (UML approach). This assures a common understanding among all stakeholders of what business process needs to be supported in the HE. The business use cases are analyzed to understand how the business
should support the business processes in HE. The Table 1 below describes the business modeling notation and icons used in the Unified Modeling Language (UML). The business-specific icons help distinguish business elements from system elements in the visual models [11][12].

A wide variety of organization and business modeling are currently in use: there is no single standard for models in this domain. The conceptual domains that are covered differ from language to language. In many languages, the relations between domains are not clearly defined. Also, most languages are not really suitable to describe architectures: they provide concepts to model, e.g., detailed business processes, but not the high-level relationship. Some of the most popular languages are proprietary to specific software tools. Relevant languages in this category include:

a. The Business Process Modeling Notation (BPMN) is a standard for business process modeling, and provides a graphical notation for specifying business processes in a Business Process Diagram (BPD) [13], based on a flowcharting technique very similar to activity diagrams from UML.

b. IDEF originating from the US Ministry of Defense is a collection of 16 (unrelated) diagramming techniques, three of which are widely used: IDEF0 (function modeling), IDEF1/IDEF1x (information and data modelling) and IDEF3 (process description) [14].

2.3 Business Modeling in RUP

The Rational Unified Process (RUP) provides step-by-step guidance on the various activities of a IS development project [9][10]. Since as explained in this paper, business modeling is a technique that helps analyze the problem that the IT will solve, RUP includes business modeling guidelines [10] (see Figure 2).

One of the major advantages of using a modeling technique for business modeling that is similar to a technique for IS development is that you are speaking the same language [10]. It facilitates understanding how something described in the business domain might relate to something belonging in the system domain. It also simplifies describing the relationships between and among artifacts in business models and corresponding artifacts in system models.

Business modeling as defined by the RUP is aimed at providing a series of techniques and notation to enable the practitioner in describing and understanding business processes. In particular, the techniques are aimed at describing the business process in such a way that the impact on IS systems becomes clear. The business modeling workflow in the RUP (see Figure 3) can be used as a component in a business process re-engineering (BPR) effort [9], a component that concentrates on providing support for the development of the right IS in organization.

To support business modeling within the organization indispensable defining business scenarios that exists in organizations. A business modeling effort can have different scopes depending on context and need, Kruchten [10] list

Figure 2. Rational Unified Process Overview

Figure 3. A Workflow in Business Modeling [10]
six such scenarios below are organization chart, domain modeling, one business many system, generic business model, new business, and revamp.

In business modellng is essentially needed in identifying the purpose of developing enterprise information system based on the problem domain, the content of goals model is a list of the needs in developing system in various viewpoints, starting from organization general needs, candidates enrolled in the needs of organizational units.

3 EBA MODEL IN HIGHER EDUCATION

Structure of the business process model in HE most widely used in previous studies is uses a value chain diagram [15][16] as show in Figure 4 with the business areas at the highest level followed business domain and business function.

The value chain in Figure 4 identifier seven process, namely: organization management, human resources management, asset management and infrastructure, marketing, student management, studies management, and grants and research management.

![Figure 4. Business Process Model of Higher Education](image)

Organization management process; involves strategic planning, budgeting, both financial and managerial accounting, and revenue management.

Human resources management process; it consists of organization and position management, recruitment, personnel administration, time management, personnel development and training, compensation and benefit administration, and payroll accounting.

Asset management and infrastructure process; involves management of inventory, facility, vendor management, and procurement.

HE marketing process; the process involves all marketing activities and services required to recruit prospective students, and alumni services.

Student management process; encompasses recruitment, admission, registration, student record management, student receivables, student portal, and service like financial aids, and library services.

Studies management process; includes academic program development, class and examination planning, resources management and scheduling, academic advising and career placement, learning architecture and media services.

Grants and research management process; consists of planning and grants application, research and grants management, financial accounting and reimbursement for sponsored programs, reporting to sponsors, and closeout.

The EBA is the driving component behind the development of overall enterprise information architecture (EIA), enterprise application architecture (EAA), and enterprise technology architecture (ETA) for the HE. Various components of that architecture are normally defined by HE business leadership, and not by an information technology unit. Those components include the business strategies and intent, the “to be” business architecture, and the gap analysis to determine those steps or initiatives required to move the “as is” baseline to the target “to be” business architecture.

4 CASE STUDY

Many HE and research organizations spend the bulk of their IT budgets on maintaining existing infrastructure and integrating heterogeneous systems, leaving few resources for innovation. Tying disparate IT solutions help you improve student services, gain financial control, enhance operational visibility, improve strategic decision making, and reduce costs. The solutions support the following key business activities. However, how to development IT/IS that appropriate to the needs of HE business strategies? The EBA can be used to define properly the existing requirement business, and support the development of integrated systems strategies.

STMIK Mikroskil is a private university with three campuses, in Medan of North Sumatera, Indonesia. STMIK Mikroskil has a total number of 3,345 students studying in its campuses, and has a total number of 104 lecturers in working in 2010. The consensus among STMIK Mikroskil executives was that the university’s existing systems needed to be improved in line with rapid changes in the HE sector. There were also major concerns about being able to grow the university and become more global without integrated systems capability.

STMIK Mikroskil decided that it would review the systems for Student Administration, Finance, and Human Resources. The review team consisted of primarily director-level executives and higher-level managers. Their recommendation was
that STMIK Mikroskil replaces its legacy systems with common integrated systems. It was felt that the new system should at a minimum (1) seamlessly integrate STMIK Mikroskil Finance, HR and students functions, (2) be reliable and affordable and (3) have the flexibility to support STMIK Mikroskil unique business processes. The general models of the EBA in this case study will be discussed as follows in Figure 5.

The Enterprise Business Model presented in Figure 5 represents the “as is” business model of the Human Resources Management (HRM) at HE, independent of the organizations that perform the various functions defined in the model. The “as is” EBA identifies all the units in HE that currently perform some or all of each function defined in the model. The “as is” EBA also defines functions that are applicable to unit and that are provided substantially or wholly by an external provider for that unit. It also defines functions that are applicable to unit and that the unit makes available for other units organizations to use (cross unit). Examples of cross unit functions include: Payroll Services provided by the Department of HR.

The “to be” EBA once a business owner is found and the architecture component is completed. The “To Be” EBA should define the services to be delivered by HRM requirement, and how HE should be organized to effectively and efficiently deliver those services. This is will contain the gap analysis that defines the steps and initiatives that are needed to move the “as is” EBA to the “to be” EBA.

In Figure 6 is reserved and will be completed by the business owner of the “To Be” EBA once that architecture component is completed. Typically the gap analysis will identify a set of detailed steps or initiatives that must be accomplished to move the HE from the “as is” environment to the desired “to be” environment (see examples in Figure 7).

According to business modelling which has been explained before, the next step is modelling the software, modelling software can be started from conceptual model to implementing model. UML support in modeling software is pretty much; some of the functions are modeling software with use case diagram, sequence diagram, and deployment diagram.

One advantage of business modeling is its clear and concise way of showing dependencies
between business and system models [10][17]. Figure 8 shows this relationship.

![Figure 8](image1.png)

Figure 8. Relationship Business Modeling and System Model

In the case, we applied business process recruits applicants in Figure 7 for used model to next step in system modeling. To identify information-system use cases, begin with the business workers in the business object model. For each business worker, identify a candidate system actor. For each business use case the business actor participates in, create a candidate system use case, and analysis model. For examples, see Figure 9, Figure 10, and Figure 11.

![Figure 9](image2.png)

Figure 9. Business Object Model of Recruitment Applicants

Modeling business process in this paper, generally emphasis on how the implementation of the UML as one of techniques in modeling information system development. To produce business process model that synergizes with the needs of applications, therefore a method, which can guarantee the quality of application development which will have been done, is needed.

![Figure 10](image3.png)

Figure 10. Use Case Model of Students Registration

5 CONCLUSION AND DISCUSSION

In this paper, we have presented an approach for enterprise business architecture and business modeling in higher education. Enterprise business architecture helps to clarify the alignment between the business and IT strategies of an organization, in use case and the conceptual model are centered on the use of UML business use case diagram.

UML in modelling process business gives a clear and understandable view and it is possible to model based on the organisation comprehension. Modeling business proses is not only delivering a new business process model based on the application development needs, but also can be used as a basic to do evaluation to the existing business process in an organisation. The result of this evaluation, can deliver candidate need to generate new business process.
The enterprise business architecture model is complex especially for higher education environment because it has multiple perspectives, objectives and strategies. Using approach from enterprise business architecture issues [8] such as the linking between business model and business process model, we will produce a more requirement to support the development of systems.

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REFERENCES
