

REQUIREMENT DEFINITION USING SEAM APPROACH (CASE STUDY OF ACADEMIC INFORMATION SYSTEM DEVELOPMENT)

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ABSTRACT

Requirement elicitation is an important stage on a system development life cycle. Unclear requirement definition would impact the system quality generally. Some methods was introduced and implemented on requirement definition such as Joint Requirement Definition (JRD) or VORD which tempted to anticipate and fulfill all stakeholder expectations.

SEAM, has been successfully used as an approach to define the enterprise architecture and can implement on some level of hierarchical view of the problem domain. The systemic and systematic approach of SEAM can switch the view of system as a whole system as well as a composite system. This method can define elements of system stakeholders, the services they need and the collaboration among them.

This paper describes implementation of SEAM approach into requirement definition process of Academic Information System. The SEAM approach adoption divides into 5 stages from define segment view into define the business process, and result of adopted SEAM matrix. This paper does not emphasize how to breakdown the SEAM into software level, but stresses to find the required specification of the system. The results show that SEAM can use as an alternative approach to define the system requirements especially when the system involved many stakeholders.

KEYWORDS

SEAM, requirement definition, system specification, Academic Information System

1 INTRODUCTION

One of the important issues in system development is the approach to elicit the requirements. Some methods have used or developed, but it still not easy for the analyst to gather and modeling the requirement in the same

time. The unclear requirement can lead into useless system.

SEAM (Systemic Enterprise Architecture Methods), which is originally introduced as method to define enterprise architecture has grew up into some unlimited applicable field [2]. The fact that SEAM can address some objectives from business requirements into software development has inspired the idea to try the method to define the system requirement, which implement on developing Academic Information System at Telkom Polytechnics as a case study.

The goal of this research is to build the well-defined Academic Information System which can address all stake holders which has contribute and collaborate in academic environment.

2. Basic Concept of SEAM

SEAM (Systemic Enterprise Architecture Methods) is a *systemic* and *systematic* modeling method designed to model business and IT systems. A *system* is defined in SEAM as either a configuration of component entities with relationships between them – *system as composite* – or as one entity in which the component entities are abstracted – *system as a whole*. In a system as a whole, the observer can perceive emergent properties that are specific to the whole, but that may not be perceived in the analysis of the parts. In a system as a composite, the observer can visualize the system construction [1].

SEAM is a systemic approach because the user, companies, IT application, IT modules, and software components could be represented and modeled as systems. SEAM also makes explicit such system-related concepts as context, life cycle, and system boundary [1].

SEAM is a systematic method because it employs the same modeling principles and notations for all

systems regardless of their kind. The pictograms might change to show the difference in nature of the modeled system. However, the system specification does in a same way regardless of the nature of the system. For example, in all systems, properties represents with squares and actions with rounded rectangles [1].

The SEAM approach defines two hierarchies for its models: the functional and the organizational level hierarchies.

- *The functional hierarchy* is a set of system specifications, in which the system is modeled as a whole whereas its behavior can be modeled as a whole or as a composite (i.e. an action is decomposed into multiple actions).
- *The organizational hierarchy* can be interpreted as a set of system specifications that makes explicit the systems' construction (i.e. a system is decomposed into multiple systems). In general, modelers can specify as many functional and organizational levels as they need.

SEAM can address some objective such as business view (SEAM for Business), enterprise architecture (SEAM for Enterprise Architecture) and software development (SEAM for Software). SEAM is mainly applied in marketing and in business and IT alignment courses for computer science graduate students[4].

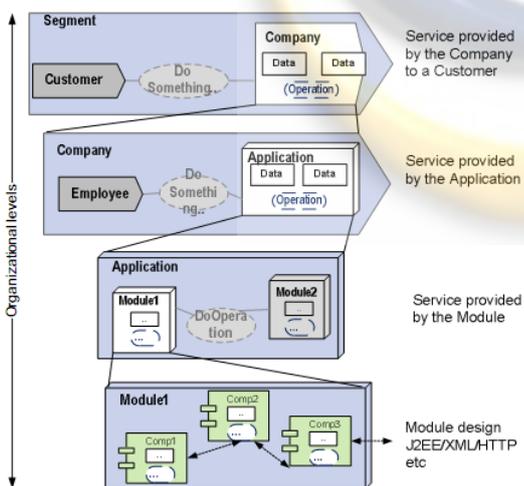


Figure 1. SEAM hierarchical approach to general system modeling [1].

The concept of system is central to the SEAM methods. In each one of the SEAM methods we consider only the systems relevant to its particular audience. In SEAM for Business, the model represented the collaboration among market

segments, value networks and companies. In SEAM for EA, the model can include people, IT systems and - possibly - software applications to these models. In SEAM for Software the model can expand into IT systems, software applications, software components and programming classes. Each system can be analyzed as a whole or as a composite. For example, a company can be modeled as a whole, showing its externally visible properties (e.g. service provided to its partners and to its customers, or its revenue), or as a composite (e.g. employees and IT systems within the company). Even if all methods are based on the same system modeling ontology, each one has specific heuristics depending on the application domain. For example in SEAM for Business and SEAM for EA its can explore outsourcing strategies. In SEAM for Software its can consider software distribution strategies [2].

Basic SEAM model represent the value that produce by process and interaction between supplier (which provide the service) and adopter (which need or use the service).

The main of SEAM modeling framework consist of this element [3]:

- Segment, represent the boundary of system that will be analyze.
- Value network, the boundary line of each segment, either it is composite segment or whole segment. The value network used to define the expected value created by each segment. There is three kind of value network:
 - value network represent a segment
 - value network represent a company/organization
 - value network represent a regulator.
- Regulator is something that controls the segment
- SAR, or Supplier Adopter Relationship, show the sharing property or process which connect the supplier and adopter.
- Belief-Goal model, show the belief (something that each segment belief need to exist), and goal (something that expected by each segment to deliver).
- Business process model, usually to show the business process in segment for explore the expected system features.

SEAM can be implemented by some stage as describe below:

- A. Analysis and design of service to customer
 1. Define the segment view.

The segment includes the supplier/adopter relationship that represents the service offered, the main supplier value network *SVNI* that provide the service, the adopter value network *AVNI* that benefits from the service and the regulators (*regulator1*, *regulator2*) that control this segment. A value network is a group of companies that collaborate for a common goal (e.g. providing a service). The model of *SVNI* represented the whole system, only the externally visible behavior is shown.

2. Build the belief-goal model. After build the general view, it can going deeper by develop second view that represents the beliefs and the goals of the companies. A goal describes a state to be reached or to be maintained during

a given time by a system (like a person or a company). A belief describes the knowledge of a system about itself or about its environment. Beliefs drive the definition of the goals. Belief-goal modeling is one of the specific theories which is the unique characteristic of SEAM method.

The belief-goal model is useful to identify the value that needs to be created. In the belief-goal model, some beliefs and goals can be annotated as being “to-be”. This means that they are expected as a result of the project[3].

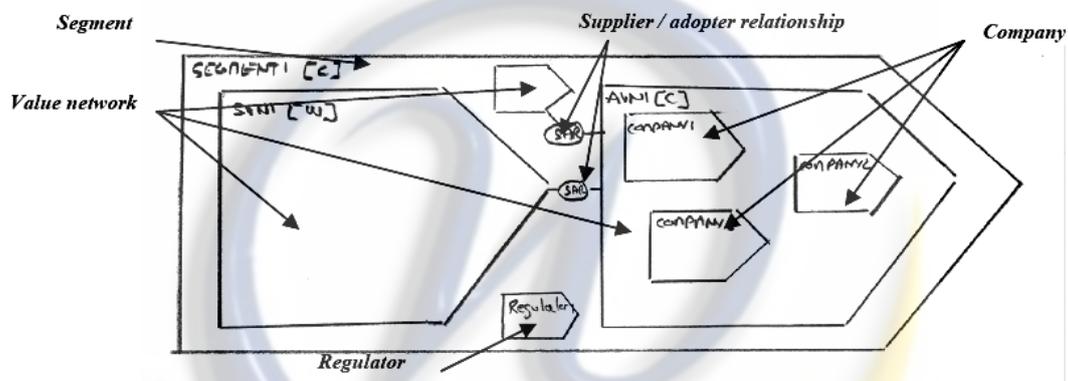


Figure 2. Basic SEAM Element model.

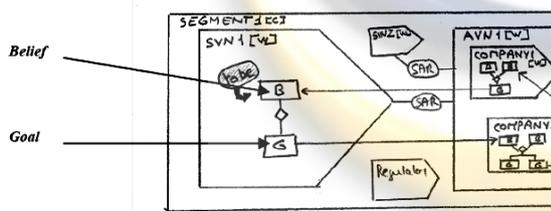


Figure 3. Belief-Goal Model

analysis result on a responsibility matrix.

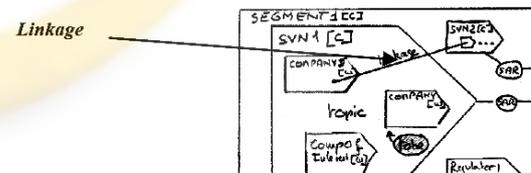


Figure 4. Linkage between each collaborated segment.

B. Analysis and Design of Company Responsibility and Partnership.

1. Analyze the role of supplier value network. It is considered the main supplier value network as a composite. The result of this analysis can draw into a table with line that show the linkage exists when a same company plays multiple roles in one or more segments or when two companies are closely related. It can do easily by put the

2. Define the features by analysis and design inter-company business process. The defined features then can plotted on a matrix to define the value that adopter perceive of the product or service delivered by the supplier value network. This matrix also can help to analyze the information flow from the adopter to supplier, which can show the value created by this information for the adopter side and for the regulator, as

well as the exchange of information / value between the supplier and the adopter sides.

C. Analysis and Design of Company Organization

At this step the model process then focused on the company of interest and functionality provided by its employees and its IT systems implementing the features described in the SAR.

3 REQUIREMENT DEFINITION USING SEAM

The aim of system requirement definition is to obtain the important features needed by the user or any stakeholders. There is some approach on requirement elicitation such as questioners, user interview, Joint Requirement Definition (JRD), or VORD. The key point on requirement definition is how we can identify the right person that will represent the principal needs of system. This person can exist anywhere in organization and one of big mistakes that usually happen in requirement definition is asking the wrong person.

To identify the right person, first we need to know the organization view and then need to know the role of each function in organization. SEAM provided the suitable framework for us to decompose the function and role in organization and then the relationship between them.

On the project of Academic Information System (AIS) development, we implement the approach of SEAM as a method for requirement definition. By following the stages, finally the result can represent systematic overview of AIS requirement. AIS is a system to support academic activity in a college. The main objective for AIS is to satisfy the lecturers and students, and as mediator for information exchange between them.

The specific conditions on this case, the institution that will use the system recruit many part-time lecturers to deliver their

course. The lecturers do not teach at one university/college, but in some different place. This situation arises some problems in scheduling and course material, because of high turnover of lecturer for each semester. The college needs to set up standard course material so it can deliver by any assigned lecturer.

The stages for requirement definition in AIS development using SEAM approach are [2]:

1. Define the segment view
2. Build the belief-goal model
3. Analyze the role of supplier value network
4. Define the features by analysis and design inter-company business process
5. Analysis and Design of Company Organization

3.1 Define The Segment View

Segment view will set up the project scope. On this case study we limited the scope on Academic administration services which include some basic process such as scheduling, learning process performance and examination process. Based on this assumption, the segment view consist 3 element of value network, which are: lecturers, administrative support and students. On this case, administrative support has a role as company, lecturers are the supplier and students are the adapter.

The element of this segment view as shown on Figure 5. To decompose the students segment, we define two element value networks, family and job seeker. This value networks are the main drive to improve student motivation during the academic process. For example, students will learn harder to make their study time shorter and make their family happy, and to fill the job seeker qualification. The company value network then expand into their composite element which consist of IT support segment, Student support and lecturer support. The lecturer, on this case, is a supplier who delivers the services, but the

services quality depends of quality of administrative support and IT support.

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3.2 Build The Belief-goal Model

To build belief-goal model, we need to identify the belief and its relation with the goal drive by the belief, for each element of segments. Belief-goal model will useful to discover the needs and expectations of each system.

For example, lecturers would have some beliefs which is the main orientation is to satisfy the students:

- student needs the competent lecturer
- student wants fixed schedule during the semester
- student needs well prepared course material
- student needs information about final examination result.

These beliefs come from constrains of college condition. High turnover of lecturer on each semester will make some of them are the new person on this environment, event the new person on the course that they must deliver.

As the result of these beliefs, the lecturers will have primary goal which is: deliver good quality course to the students. This is the main goal which can break down into several goals:

- well-organized schedule
- suitable course assignment
- good material preparation

The belief-goal identification for each segment then put together into one table as describe in Table 1.

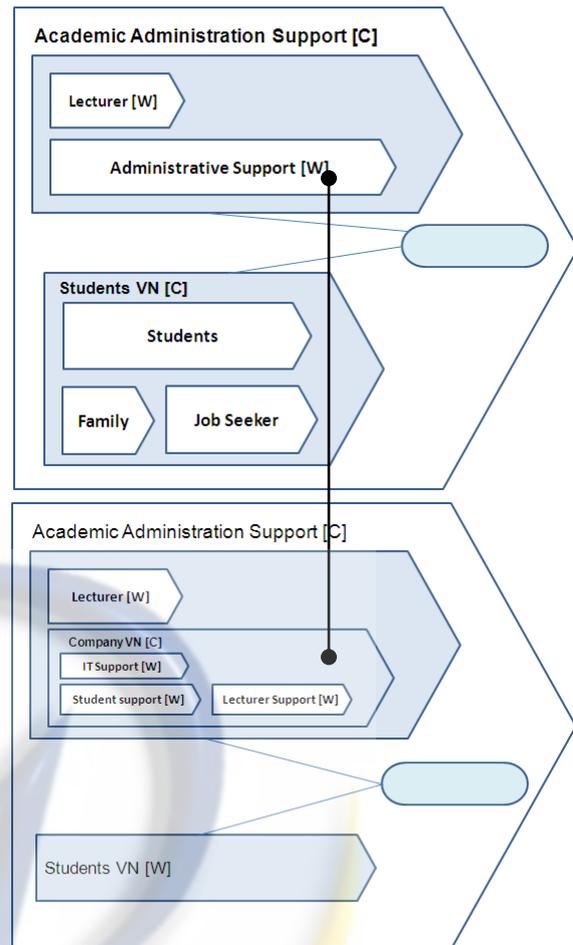


Figure 5. Segment View of AIS

Table 1. Belief-Goal Matrix.

Segments	Belief	M-goal	goal
Lecturer	students wants fixed schedule during the semester	deliver good quality course to the students	Well-organized schedule
	students need the competent lecturer		suitable course assignment
	students needs well prepared course material		good material preparation
	student needs information about final examination result in		Good examination process
Lecturer adm-	lecturer need schedule information	give the fast and accurate	deliver schedule early

support	early	schedule and course assignment		
	lecturer need course assignment early		inform the course assignment	
	lecturer needs class information early		inform the class assignment	
	lecturer needs time to arrange the best fit schedule		mediate the schedule negotiation	
student adm-support	students need time to prepare the course plan for next semester	provide the schedule and class information	inform the schedule and the lecturer	
	students need information about course available and the class that will be held		arrange the class	
	students needs to choose the best fit schedule for all the course they had planned to take in		anticipate d students class rearrangement	
	students need the information about recent academic result		provide the academic final result	inform academic final result
	students needs the information about their presence as it is one of prerequisite condition for participating in final examination		provide the student performance during the course	display and trace student presence recapitulation

3.3 Analyze The Role of Supplier Network

Based on the belief-goal matrix, then we put together on value network diagram. On this example, we put belief-goal of two elements and draw the connection line between the belief-goal that has strong correlation. On

this model, we define two sharing attributes on SAR between lecturer and company, which are assignment and schedule. Figure 6 show the belief-goal model for AIS case study. Define the features by analysis and design inter-company business process

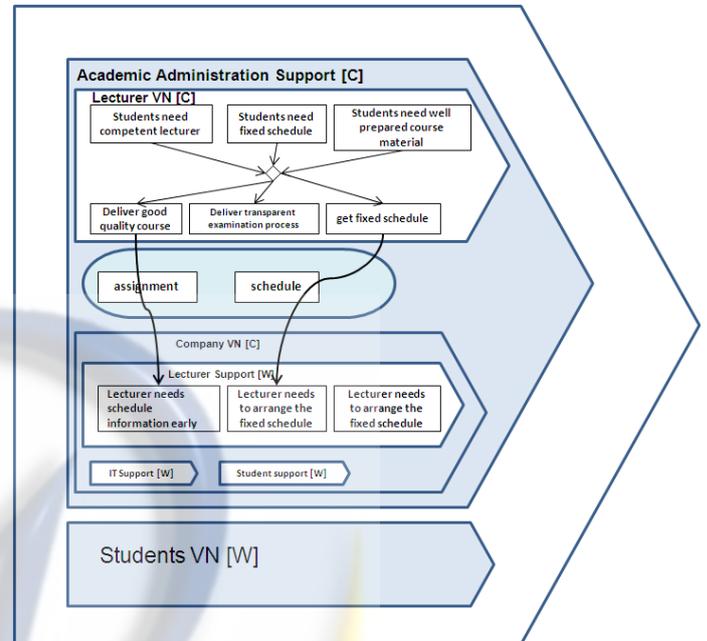


Figure 6. Mapping belief-goal model

3.4 Define The Features by Analysis and Design Inter-company Business Process

At this stage we define the values as result of goal. For example, the goal "suitable course assignment", will create value "qualified lecturer". The values will supported by some features such as "students performance daily report" and "data bank collection", which should available in administrative support side.

The matrix also connects the lecturer to students which expected the features such as "download course material" and "e-learning facility". Through the matrix we can see cross relation between features-values for three segment administrative support – lecturer and students. Each feature has a number such as f1, f2, .. and for value we give the number such as v1,v2,.. This matrix will help us find what features need to

support a value creation process. Figure 7 show the sample matrix for AIS case study

- e.
- f. ...

3.5 Analysis and Design of Company Organization

Based on the list of required features, we can find some business processes, such as:

- a. Scheduling
- b. Course Assignment
- c. Preparing Course Material
- d. Online Examination

For each business process, it would be better if we can show the role of each segment using standard modeling such as BPMN. Figure 8 show the example of business process modeling for scheduling process. On this diagram we can see the exchange message and collaboration activities between segment.

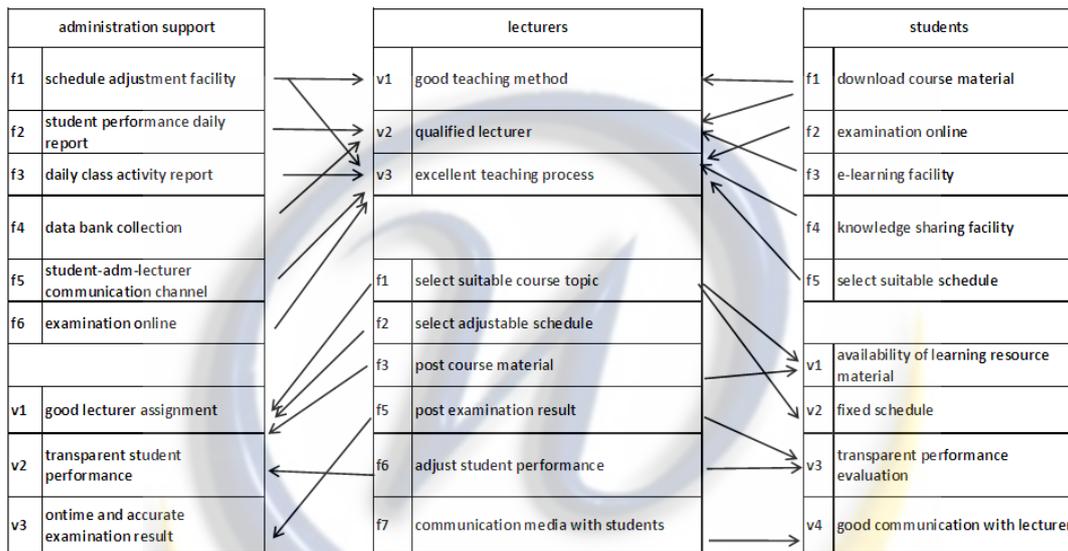


Figure 7. Example of Features-Values Mapping

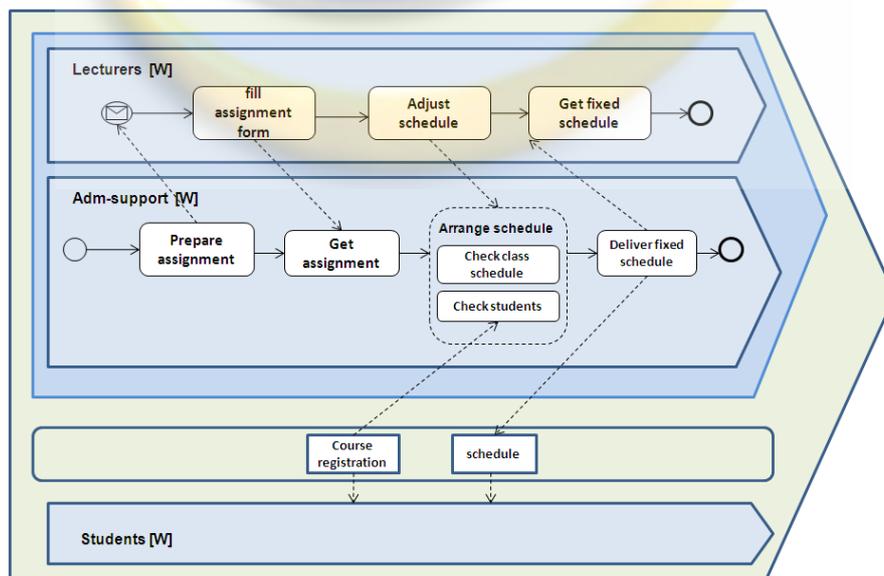


Figure 8. Business Process Modeling for Scheduling

3.6 Define The Requirement

Based on business process analysis and belief-goal model, then we define the requirement for AIS, limited on function administration support for students and lecturers, as follows:

- Scheduling: the system should allow lecturer and student pick suitable schedule, lecturer can adjust the schedule before course start.
- Assignment : the system should give information and can facilitate course assignment confirmation.
- Course material : the system can provide facility for upload and download course material.
- Communication : the system can provide responsive communication channel between students-administrative support-lecturer
- Online examination : the system should provide facility for online examination and the students can access the information about examination result quickly and accurate.
- Student and lecturer attendance : the system can provide information about students and lecturers daily attendance and create attendance recapitulation report.
- And many more....

The requirement we defined through SEAM approach show us that SEAM can help us define the requirement easier and more accurate with advantage on features-values mapping. The mapping techniques can help us to define the priority what value we should support first, and align the information value into business value or business strategy which exists in an organization.

4 CONCLUSION

The SEAM is a structured and systematic approach that can be used as a method to define the system architecture. This approach is a flexible approach so we can use it as a tools to define on many level of system artifact.

On this paper, we try to use SEAM approach to define the system requirement, and implement it on Academic Information System as case study. The result give us some lesson learned such as :

- a. With SEAM approach, we can switch to view the system as whole-component and we can choose the boundary of our analysis base on this method.
- b. SEAM approach allow us to define a the Belief-goal model which give us different approach to align the business requirement with system requirement.
- c. The belief-goal models, accompany with value definition can lead us to define better system features, because each features will mapping into expected value that has to created by the features. With this approach we can trace the trigger of each feature requested by the user and can verify the user good explanation about system requirements.

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