University Management System Engineering based on BAN PT Accreditation Criteria Two using SysML and Semantic Approach

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Abstract. Higher education organizations need to implement a management system. However, there has not been a study that designed the management system based on the latest BAN PT Accreditation Criteria, specifically criterion number 2. The design uses the Model Based System Engineering approach with SysML Language. Translation of accreditation standard sentences is done using the Semantic approach. Trough this research, obtained a design that can be applied at the University in order to maintain the quality of education.

1. Introduction

The Organization Management System is designed to help the organization achieve its objectives. These goals are determined and expressed through the vision, mission, goals and objectives of the organization. The management system explains how to achieve these goals. The management system describes the routine work patterns and working procedures for each entities in the system. The system has the meaning of a group of entities that work together to achieve one goal [1]. The system engineer designs so that there are entities and positive interactions are formed so that positive emergent properties occur.

In higher education, management systems can be expressed in terms of organizational governance. Higher Education Accreditation Standards issued by BAN PT regulates the minimum governance standards of higher education organizations. These requirement are listed in Accreditation 2 standard. There is some research discussing about implementation of BAN PT Accreditation; Comparing management system of BAN PT and ISO 9001 [2] [3] , Document Management System based on BAN PT [4], Information system design based on BAN PT [5] [6], Performance management system based on BAN PT [7] [8]. System management are part of strategic management in organization. Some research focus on modifying strategic aspect of organization [9] [10] [11]. Another research try to implement some management system and create the framework for them implementation [12] [13] [14] [15] [16] [17].

New higher education accreditation standards were issued in 2019. This makes some higher education actors need some kind of guidelines and references for the application of these standards. This research tries to give an initial outline of the standard implementation using the semantic approach and SysML modelling. Some previous research that focus on modelling practice could be a reference to establish this research [18] [19] [20] [21] [22], [23].

2. Resource and method

Table 1. Standard of management system **[24]**

Category	Element	Indicator	Best Score
1.Governance	C.2. Governance and Cooperation C.2.4. Key Performance Indicators C.2.4.a) Governance System	A. Completeness of the organizational structure and effectiveness of the organization.	The management unit has a formal document of organizational structure and work procedures that are equipped with tasks and functions, and has been running consistently and guarantees good governance and works effectively and efficiently
2.Attribute of Governance		B. The realization of good governance and the fulfilment of the five pillars of the civil service system, which include: 1) Credible, 2) Transparent, 3) Accountable, 4) Responsible, 5) Fair.	The management unit has good practices in implementing good governance that meets the 5 rules of good governance to ensure the implementation of quality study programs.
3.Leadership	C.2.4.b) Leadership and Managerial Ability	A. Commitment to perform leadership in leader of study program management units (UPPS : *Pengelola Program Studi*) Unit and leader of study programs	There is valid evidence commitment in running operational ,organizational, and public leadership
4.Detail of Leadership Function		B. UPPS leadership capabilities, including aspects: 1) planning, 2) organizing, 3) personnel placement, 4) implementation, 5) control and supervision, and 6) reporting that is the basis of follow-up.	Management unit leaders are able to: 1) performing 6 management functions effectively and efficiently, 2) anticipate and resolve problems in unexpected situations, 3) innovating to produce added value

Based on these standards some of the main documents that need to be established are Job description documents. However, this standard generally covers the management system of the faculty. The faculty management system must have the clarity and attributes as stated in the Study Program Accreditation standard document. In addition, it is also expected that the faculty has achievements that exceed these standards and can be internationally oriented. It is necessary to search for international level Government University standards and exceed the Accreditation standards.

The management system has several components. Some of these components are the Organizational Structure, Job description, information systems, work procedures, and others. The system is a group of entities that work together to achieve a goal. So in an organizational system, all visible and known entities need to be designed to achieve a certain goal.

## 3. Result and discussion

Table 2. Semantic analysis to standard

Category	Process	Entity	Interaction Between Element	System state
1.Governance	Running the Governance System	1. Formal documents organizational structure 2. Work Procedures 3. Instructions for tasks and functions	-	Operate Well, Effectively, and Efficiently
2.Attribute of Governance	1. Implement governance practice 2. Establishing high Quality Study Programs	Best Practice	-	1) Credible, 2) Transparent, 3) Accountable, 4) Responsible, 5) Fairness
3.Leadership	1. Organizational Operational Leaders 2. Public leadership	Proof of the leadership practice	-	
4.Detail of Leadership Function	1) planning, 2) organizing, 3) personnel placement, 4) implementation, 5) control and supervision, and 6) reporting that is the basis of follow-up Anticipate problems, solve problems, innovate		-	Value-added Effective, efficient

The assessment indicators in point one indicate the need for organizations to have work guidelines for each individual in the organization. When referring to POAC management principles: Planning, Organizing, Actuating, Controlling. Then this indicator encourages clarity in the Organizing phase. The planning and controlling phases have been discussed in other indicators related to strategic management. This indicator provides a concern in terms of organizing. If the sentence is reviewed semantically, then some entities that need to exist are

1. Formal documents of organizational structure
2. Work procedures
3. Instructions for the tasks and functions

To meet these requirements there needs to be an Organizational Structure that makes work arrangements for each position. In addition to the organizational structure, job descriptions are also needed to provide instructions in the implementation of tasks and functions. So at least the two documents, organizational structure and work procedures (SOTK), need to be supplemented by a job description. The system design using SysML language can be seen in Figure 1.

The second indicator discusses how the governance system should work. The administration must proceed with the principles of Credible, Transparent, Accountable, Responsible and Fair. In other words, the organizational structure, work procedures, and job description are designed so that a credible, transparent, accountable, responsible, and fair work process is created. How do you realize this concept in the formal documents of the organizational structure, work procedures, and task instructions? Several approaches can be taken to achieve this. One approach that can be done is to use QFD or quality function deployment.
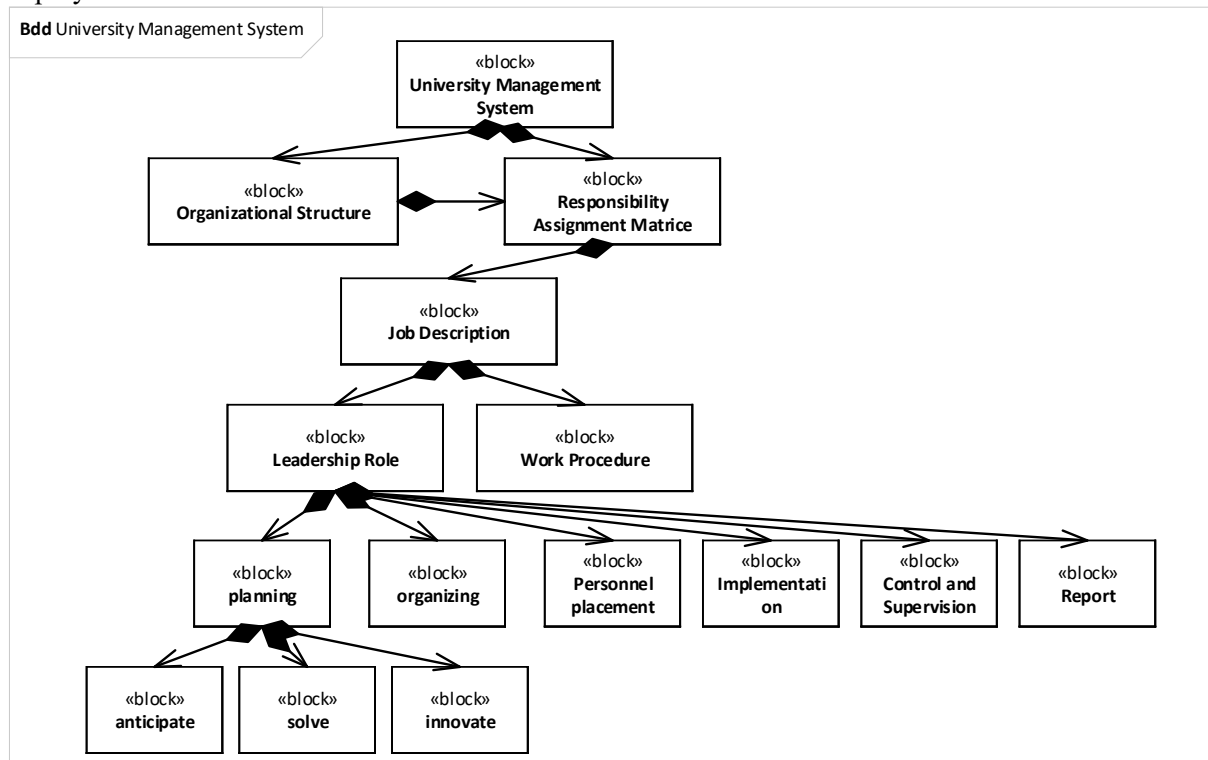
Figure 1. Block definition diagram of university management system

The third indicator discusses in more detail the role of leadership. The role of leadership is discussed in more detail in organizational design. This indicator gives a more specific requirement about what job description for leaders of the organization. In addition to the job description, the unit leader can also be assisted with a set of procedures that direct the leadership role of the head of the study program management unit. The study program management unit can be a particular department, faculty, or school. The leadership role is divided into at least two, namely the role of public leadership and the role of organizational operational leadership. This encourages leaders not only to play a role in the internal organization of universities, but also to play an active role in the public. On the other hand, leaders should not be active figures outside the organization and exist in the community, but do not carry out their leadership role in the organization of study programs.

The management system is firmly set on the first and second indicators, but a good management system is not enough and must be equipped with a strong leadership role. Even a perfect system could have a weaknesses that makes people not work optimally. Rules and systems can be tricked and made as if obeyed but apparently did not support the achievement of objectives. The system can also be designed for a particular situation but it turns out in the future there will be changes in external conditions that cannot be accommodated by the system. The leader can improvise from a running system so that it can still achieve its goals.

For example the system requires that seminars be held once a month to build an atmosphere of scholarship within the institution. If the goal is only to run the system, then an academic meeting can be held once a month with a total of five participants from among the lecturers. This can be done in order to carry out the obligations of the system running. Though the system is indeed running but the goal

fails to be achieved if the participants are limited to only among the lecturers. This is where leadership plays an active role to improvise and provide other requirements besides those required by the system. The leadership can give an encouragement that the minimum number of participants is thirty people with an equivalent composition between lecturers, students, and academic support staff. A detail and requirements that cannot be written in detail in the system because it risks reducing the freedom of movement of the organization.

This third indicator also requires that the process of leadership, both public leadership and operational leadership be documented. Documentation of this process is evidence of leadership. The documentation also acts as a knowledge inventory. Recorded knowledge can be learned and emulated by officials in the next period. The documentation is also useful for the accreditation process by BAN PT and international accreditation bodies. Certification of organizations and study programs can also be supported by documentation of the ongoing processes, especially documentation of the leadership process. ISO 9001: 2015 certification for example requires in clause five that organizations must carry out leadership roles in quality assurance.

The fourth indicator outlines in more detail how the leadership role is carried out. The process carried out in leadership includes planning, organizing, personnel placement, implementation, control and supervision. The leadership also needs to ensure the operation of the reporting system which is the basis of the follow up of the existing problems. Leaders must also, Anticipate problems, solve problems, and innovate. All activities are carried out effectively and efficiently and produce added value. All of these requirements are interwoven beautifully in a complex manner but must be implemented in a management and leadership system in a clear and actionable manner.

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