Analysis and Design of Planning and Development Systems (Sirenbang)

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ABSTRACT

During the Industry 4.0 era, marked by extensive machine utilization to ease human tasks and the rapid evolution of software, Diponegoro University recognized the need to create an application named Sirenbang (System for Planning and Development). This app was intended to serve as a platform for collecting undocumented proposals submitted by the University's Units/Faculties. However, the development process of this web-based application lacked a well-defined business procedure. It aimed to enhance controlled administrative management. To address this, the initial phase involved comprehending the Sirenbang application's workflow through interviews, observation, and a literature review involving stakeholders like the Planning and Development Agency (BPP) and Programmers. This step aimed to craft the necessary business processes for users, particularly the BPP, to understand the workflow better. As a result of this research, various diagrams such as use cases, activity, sequence, and UI diagrams were generated. These diagrams will assist in developing and future evaluations of the Sirenbang application.

Keywords: *Sirenbang, website, workflow, BPP*

1. INTRODUCTION

In the process of creating company-based information systems/software, the implementation of Standard Operating Procedures (SOP) becomes crucial. SOP ensures adherence to predetermined business requirements and specifications during the development phase, mitigating development risks while enhancing efficiency in system development and management [1].

Quoted from the Diponegoro University Blueprint document 2015 – 2034, it emphasizes the necessity to review and evaluate existing university business processes to determine their optimization and efficiency. If the process is suboptimal, then a modification and alignment with the ongoing IS development is needed to improve overall performance and service. Consequently, an SOP was formulated concerning developing information systems/application software at Diponegoro University. The implementation of this SOP revealed several Diponegoro University information system applications requiring adjustment and harmonization, primarily due to insufficient documentation [1].

Multiple operational information system applications, including software modelling, require adjustments in this scenario [2]. These adjustments facilitate comprehension and communication regarding functionality, workflow, and system structure among the development team, clients, and stakeholders [3]. This practical undertaking centres on the Diponegoro University Sirenbang (Planning and Development System) application. Notably, this application lacks software modelling due to the absence of SOP during its initial creation. Hence, to address these modifications, Sirenbang modelling will adhere to the SOP for developing information systems/application software at Diponegoro University [4], utilizing Sparx EA as a tool, which is not yet widely used for documentation across various applications at the university [1].

The research aims to achieve two primary objectives regarding the web-based Sirenbang application at Diponegoro University. First, the study seeks to analyze how to enhance Sirenbang's features, ensuring a more beneficial user experience during its utilization. Second, the research focuses on analyzing and designing the system within the Sirenbang application to align with the requirements of Sparx EA diagrams, a tool currently not used in the university's Information System environment. This situation adapts the Sparx EA diagrams to fulfil the unique needs of Sirenbang, aiming to address the absence of such documentation within Diponegoro University's Information System landscape.

2. THEORETICAL FOUNDATION
2.1 Business Process Model and Nation (BPMN)

BPMN, which stands for Business Process Model Notation, is a visual representation for delineating business processes within a business process model. It is presented in a graphical notation format to illustrate the sequential steps involved in a business process [5]. BPMN diagrams encompass four key categories of elements: Flow Objects, Connecting Objects, Swimlanes, and Artifacts [6].

2.2 Unified Modelling Language (UML)

According to various experts, Unified Modeling Language (UML) is a set of principles used to describe a software system in terms of objects. Additionally, it is acknowledged as a standardized language crucial for visualizing, defining, constructing, and documenting elements within a software system. Moreover, UML is recognized as a pivotal tool specifically designed for object-based software analysis and design. Considering these expert insights, it can be inferred that UML represents a graphical language for visualizing, specifying, constructing, and documenting object-oriented software systems.

The inception of UML dates back to 1994 when Grady Booch and James Rumbaugh integrated object-oriented development methodologies to establish a standardized process for developing object-oriented systems. Subsequently, Ivar Jacobson joined the collaboration, contributing to the creation of the initial version 1.0 of the standard UML object modelling language [7].

2.3 Use Case Diagram

A Use Case Diagram depicts the interaction between a system and its users, depicting how users engage with the system and who utilizes it. Creating Use Case Diagrams primarily emphasizes the functionality of a system rather than the sequential flow of events. These diagrams outline the system's objectives and elucidate the actions and interactions between users and the system necessary to accomplish this objective. Figure 2.1 below provides an example of a Use Case Diagram [8].

2.4 Activity Diagram

An Activity Diagram portrays a sequence of actions that follow a particular order within an operation, designed to apply to other activities. This diagram resembles a flowchart because it depicts a model transitioning from one state to another. However, the distinction lies in the parallel structure inherent in the Activity Diagram's mechanism. Constructing an Activity Diagram at the initial stages of modelling aids in comprehending the entirety of the process [9]. Figure 1 shows an Activity Diagram and includes the following notation.
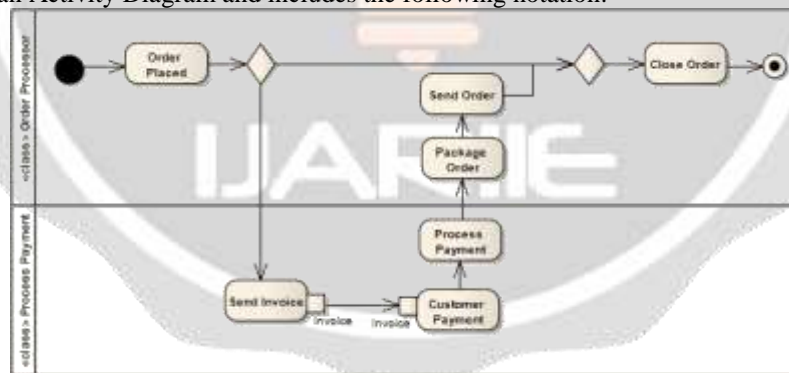

Fig- 1 Activity Diagram

3. RESULTS AND DISCUSSIONS

3.1 General Overview of Planning and Development Systems

The Planning and Development System, known as Sirenbang, is an application developed in collaboration with Simaset. Its primary aim is to streamline the process for various units and faculties within Diponegoro University to submit proposals for acquiring goods, services, or other necessities. Sirenbang boasts two key functionalities, Procurement Proposals and General Procurement Plans, contributing to Diponegoro University's attempt to offer optimal services to its staff and students.
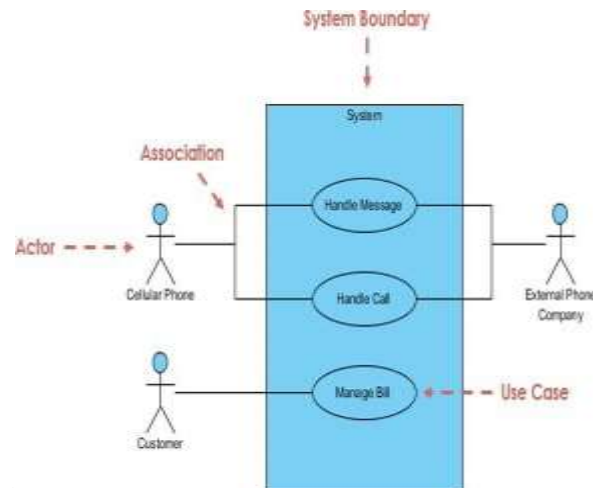
Fig- 2 Use Case Diagram

Beyond consolidating proposals from each unit and faculty at Diponegoro University, Sirenbang plays a vital role in assisting entities like BPP in assessing the proposals submitted by these units and faculties. This assistance aims to aid administrative and operational management for entities such as BPP and overall university governance. Sirenbang's features empower entities like BPP to either reject or approve proposals, facilitating effective decision-making within the administrative process.

The features included within Sirenbang consist of the following functionalities:

1.   Procurement Proposal

• Proposal Submission: This feature enables the submission of various proposals accessible to Units and Faculties at Diponegoro University.

• Proposal Cancellation: This functionality permits the cancellation of submitted proposals by Units/Faculties. Accessible by BPP, the Directorate of Assets and Development, and the Chancellor.

2.   General Procurement Plan

• RUP Approval: This feature facilitates the approval of RUPs (General Procurement Plans) created based on previously approved proposals. Accessible by BPP, the Directorate of Assets and Development, and the Chancellor.

• RUP Cancellation: This functionality allows the cancellation of RUPs due to unmet conditions. Accessible by BPP, the Directorate of Assets and Development, and the Chancellor.

3.2 User

In the Planning and Development System, various parties hold access to the subdomain system, each with designated roles as follows:

        1.   Unit/Faculty

They are authorized to submit procurement proposals encompassing goods. They can also view previously submitted proposals.

        2.   BPP (Planning and Development Agency)

Holds the authority to access, approve, or reject submitted proposals. Concise notes from the BPP accompany rejected proposals.

        3.   Directorate of Assets and Development

There is authorization to access and make decisions regarding submitted proposals. Like BPP, rejected brief notes from this Directorate accompany proposals.

        4.   Chancellor

Possesses comprehensive authority within the Sirenbang application, enabling oversight of all activities. Additionally, There is an approval for the submitted proposals.

        5.   User Verifier

Holds the capability to annul and remove proposals that do not adhere to established regulations.
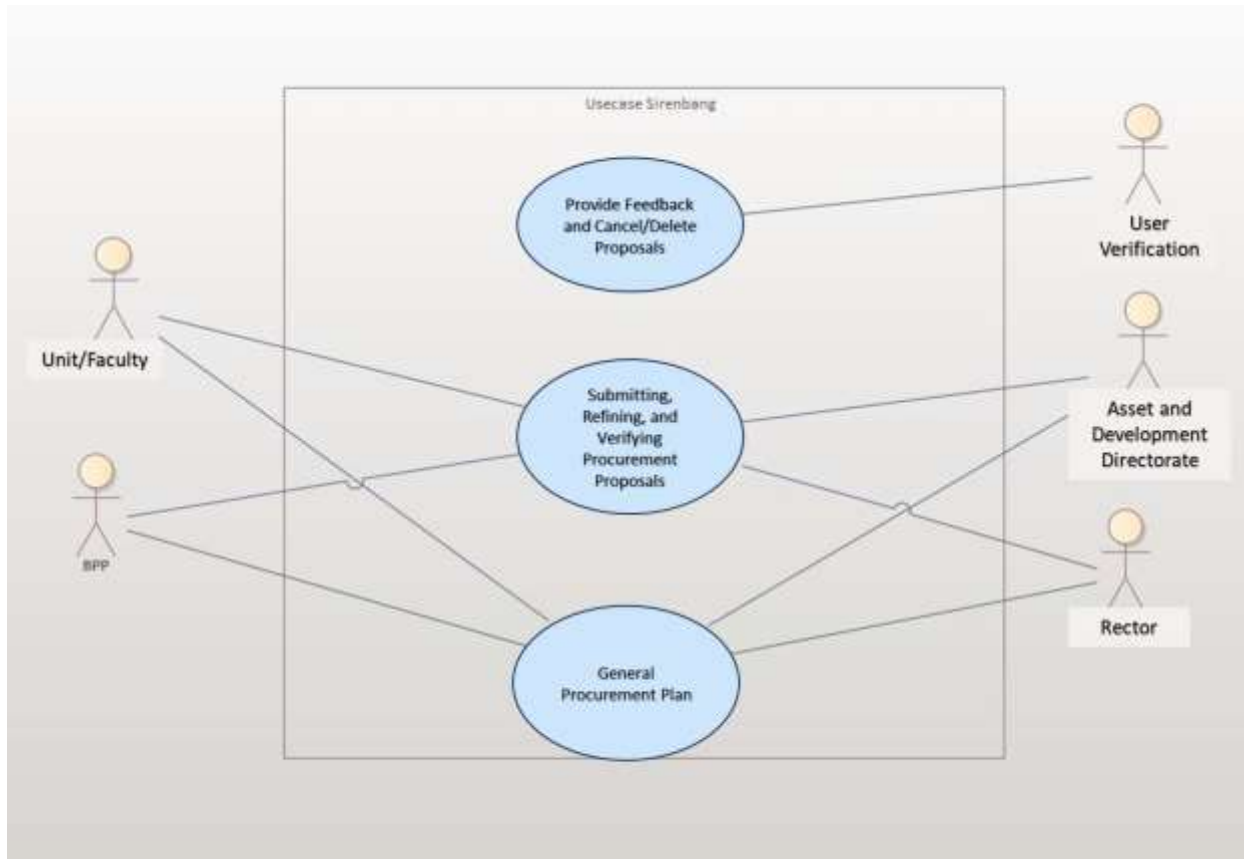
3.3 Use Case Diagram

Fig- 3 Use Case Sirenbang Application

As shown in Figure 3, the relationship between the system and its users is evident. Access to the Sirenbang application or its features requires user authentication. The diagram displays five distinct user roles: Unit/Faculty, BPP, User Verifier, Directorate of Assets and Development, and Chancellor. Units/Faculties are restricted to submitting and amending proposals, with limited access to the proposed RUP. Conversely, BPP and the Directorate of Assets and Development share similar capabilities involving proposal submission, correction, and validation, and additionally possess the authority to approve the RUP. The Chancellor holds absolute control, encompassing the capabilities of all other users. Lastly, the User Verifier's role involves the ability to invalidate or remove unsuitable suggestions within the Sirenbang application.

3.4 Activity Diagram

In Figure 4, the sequence of activities initiates with the Unit/Faculty initiating a procurement proposal, which is subsequently uploaded into the Sirenbang application. The BPP assesses the proposal's completeness and adherence to requirements; upon meeting these criteria, the BPP approves the procurement proposal, creating a general plan for procurement (RUP). Conversely, if there is disagreement, the proposal is returned to the respective Unit/Faculty for revisions. Following BPP approval, the Directorate of Assets and Development reviews the proposal's completeness and requirements; approval occurs if the conditions are met; otherwise, the proposal is sent back to the relevant Unit/Faculty for adjustments. Upon approval by the Directorate of Assets and Development, the Chancellor determines the procurement proposal.

In Figure 7, the sequence of activities begins with the BPP evaluating the completeness and conformity of the RUP. If the RUP satisfies the stipulated requirements, the BPP approves the General Procurement Plan. However, if the RUP fails to meet the criteria, the BPP rejects it. Subsequently, upon obtaining approval from the BPP, the Directorate of Assets and Development re-evaluates the RUP's completeness and adherence to requirements. If the RUP aligns with the specified conditions, the Directorate of Assets and Development grants approval. This approval leads to the Chancellor making the final determination regarding the RUP. Conversely, if the RUP does not meet the prescribed conditions, it is rejected by the Directorate of Assets and Development.
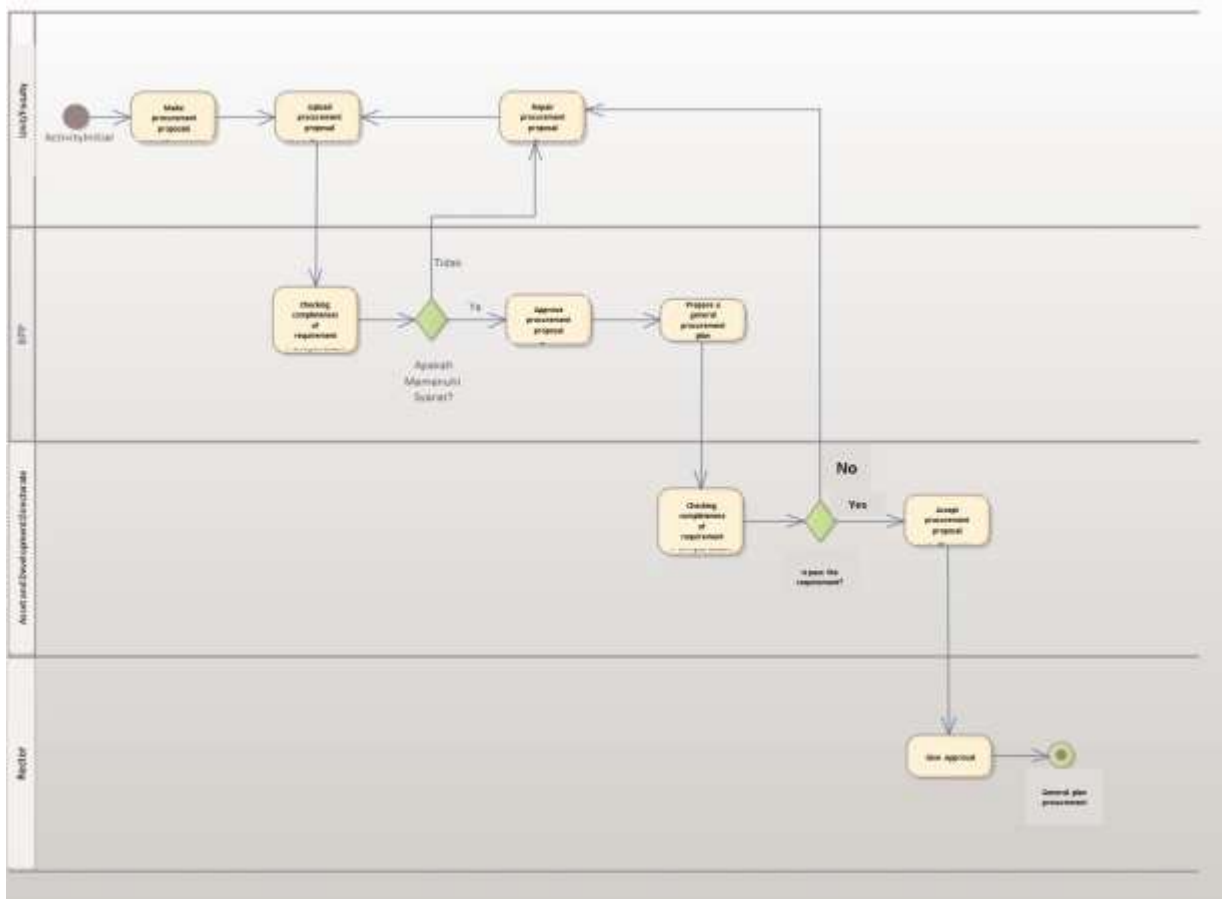
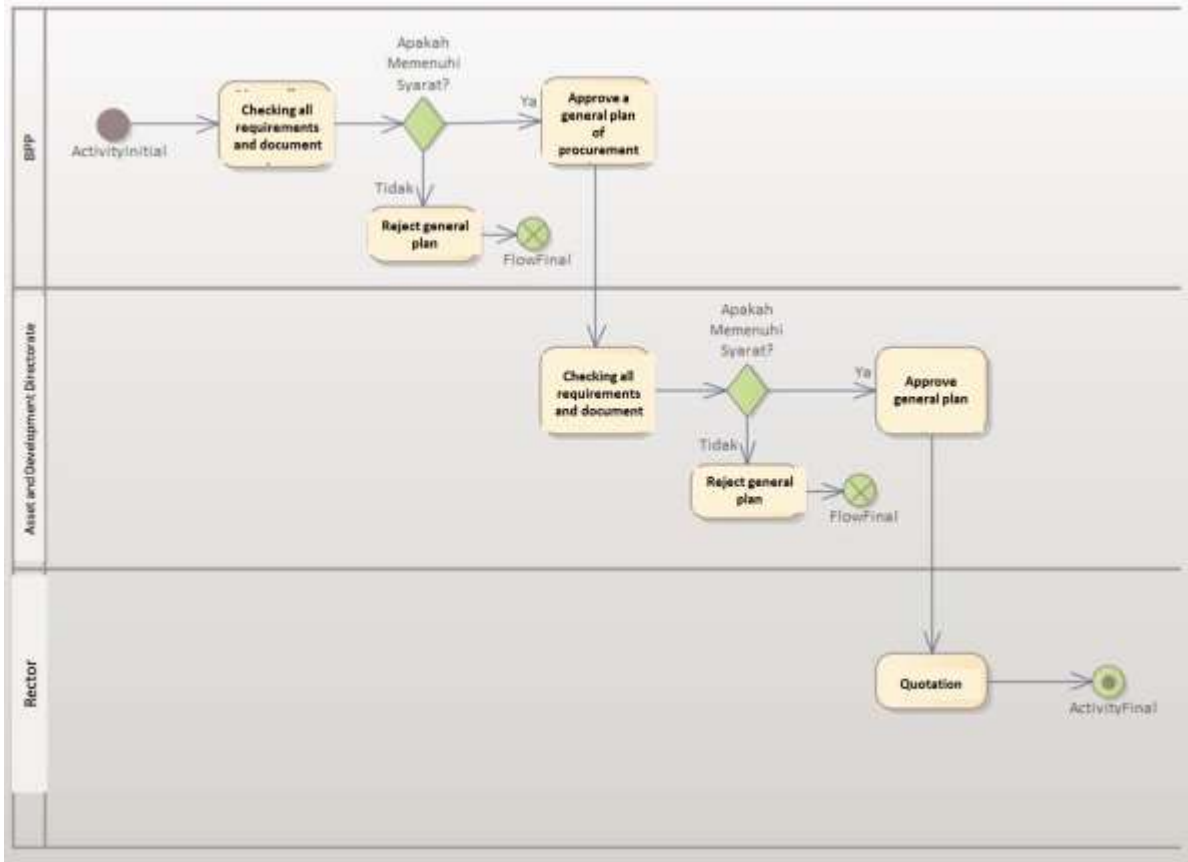**Fig- 4** Activity Diagram Submitting, Refining, and Verifying Procurement Proposals

Fig- 5 Activity Diagram General Procurement Design

Figure 5 initiates an activity with the User Verifier reviewing the proposal. If there are areas for improvement, the User Verifier will offer input. Consequently, the Unit/Faculty can amend the proposal and re-upload it into the Sirenbang application. However, if the proposal cannot be rectified, it will be terminated or removed from the Sirenbang application.

3.5 Sequence diagram

A sequence diagram delineates the chronological interactions among actors or objects during this phase. This sequence diagram is developed in correspondence with the workflow outlined in the activity diagram, specifically involving activities related to providing input and cancelling proposals. The Unit/Faculty and the User Verifier are two key actors engaged in this process. Additionally, various interaction objects are identified, including boundaries for the main menu, controls for function management, entities storing user authentication data, and data repositories for procurement proposals and general procurement plans.
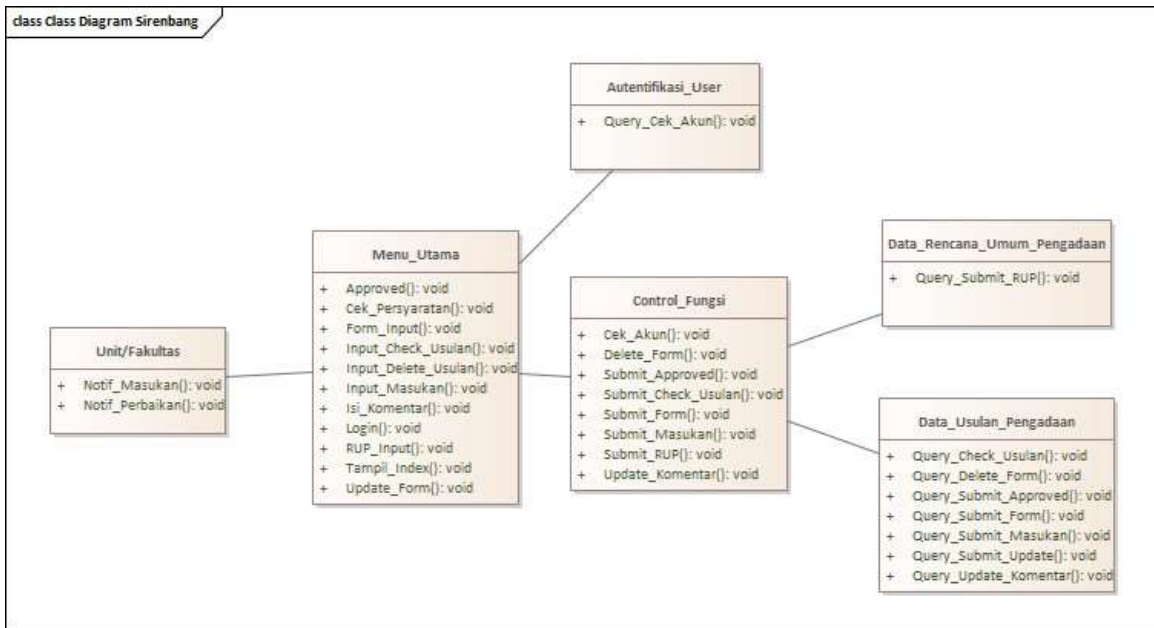
Fig- 6 Sirenbang Application Class Diagram

The presented class diagram is a visual aid to depict the interconnection between the model, view, and controller, showcasing their collaborative methods. Within the diagram, the "main menu" assumes the role of a View, encompassing diverse attributes like login and form_input, serving as primary functionalities. Meanwhile, the "Function Control" functions as a Controller, facilitating the linkage between the view and the database or model. Entities such as "General Procurement Plan Data," "User Authentication," and "Procurement Proposal Data" are depicted as Models within this context.
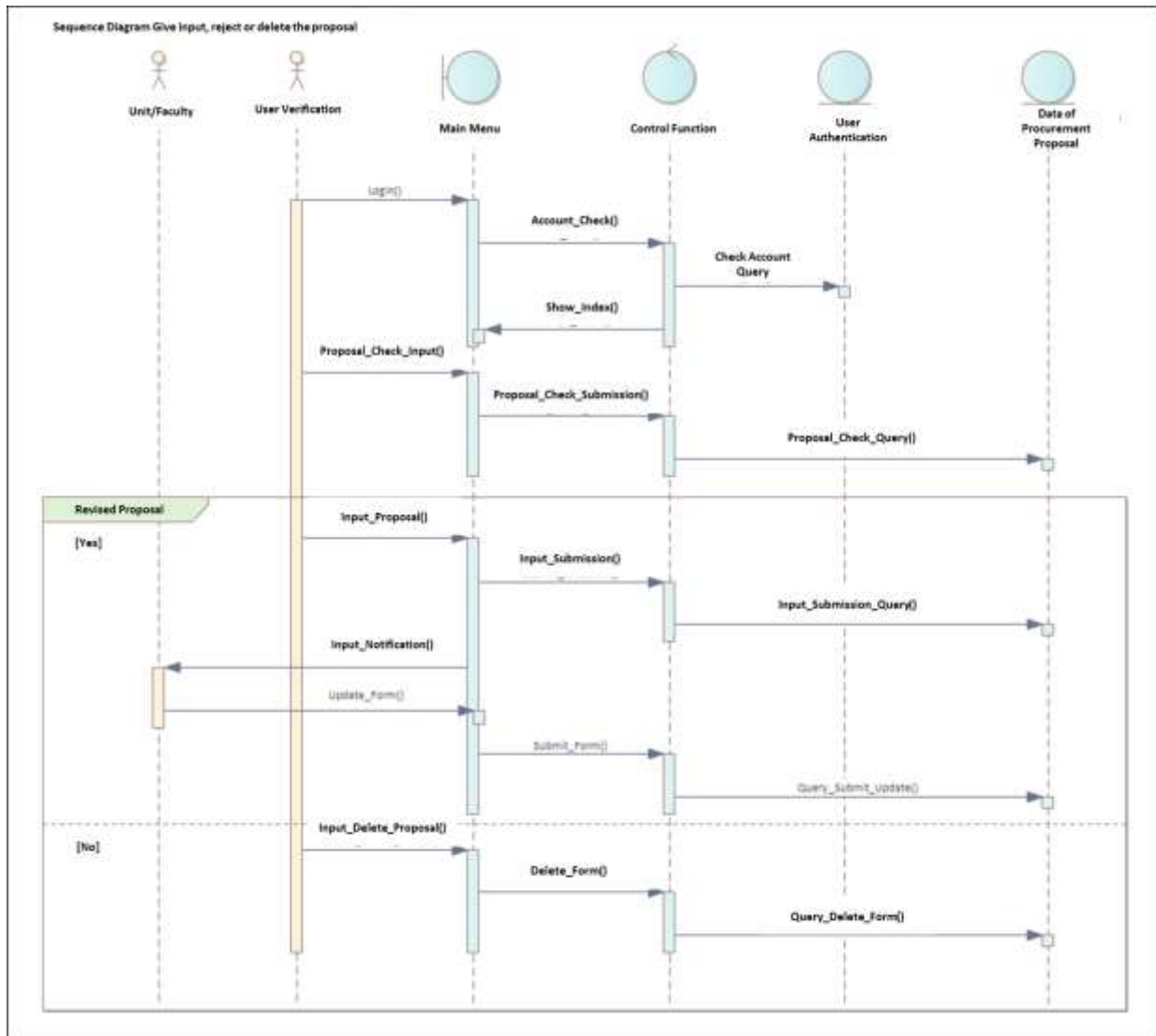
Fig- 7 Sirenbang Sequence Diagram

3.6 User Interface

During this stage, user interfaces are developed to depict the visual representation of a product that connects the system with users. Each designed user interface diagram encompasses functions and boundary components consistent with those presented in the sequence diagram, utilizing Sparx EA software for creation.
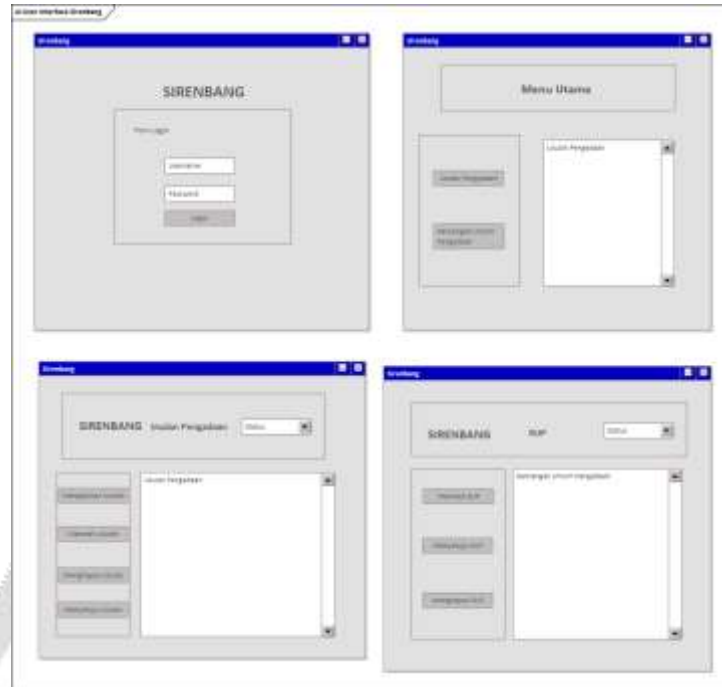
Fig- 8 Sirenbang Application User Interface

4. CONCLUSIONS

The conclusion drawn from the internship with the theme "Design and Analysis of Sirenbang Application System Using Sparx EA" is outlined as follows:

1. The design or creation of the Sirenbang Application System is based on adjusting the Standard Operating Procedure (SOP) related to Information System/Application Software Development within the Diponegoro University environment. Sirenbang lacked documentation in a System Design, which includes outputs such as Use Case, Activity, Sequence, Class, and User Interface Diagrams.
2. The design of the Sirenbang application system was executed using reverse engineering methods, creating a model or system design from an existing system. Interviews with programmers responsible for the Sirenbang application were crucial to understanding the system's requirements. These interviews aimed to align system development with the established SOP. The output from these interviews led to a system design in the application that complied with the Information System/Application Software Development SOP within the Diponegoro University environment.
3. Consequently, the system design or documentation for the Sirenbang application is completed and aligns with the SOP related to Information System/Application Software Development at Diponegoro University. The system design output includes Use Case, Activity, Sequence, Class, and User Interface Diagrams, all crafted using Sparx EA software.

Suggestions derived from the internship experience aimed at enhancing future internship practices for more optimal knowledge acquisition are as follows:

1. For students, it is advisable to delve deeper into knowledge about using Sparx EA software. This operation will enhance students' understanding, facilitating a smoother, more focused internship experience.
2. For Diponegoro University, conducting detailed discussions concerning the workflow and mechanisms involved in internship proposal submissions might benefit better organization and efficiency. Creating an internship handbook would aid in effectively communicating and implementing the internship's objectives and goals proposed by Diponegoro University, ensuring clarity and successful execution by students.

6. REFERENCES

[1] J. HUTAHEAN, "Konsep Sistem Informasi," 1 ed. Yogyakarta: deepublish, 2014
[2] Y. S. Mulyati, "KONSEP SISTEM INFORMASI", Jurnal Administratsi Pendidikan, 2005.
[3] T. Wulandari, "PERANAN AUDIT INTERNAL TERHADAP KEPATUHAN STANDAR OPERASIONAL PROSEDUR (SOP) PADA PT X Fidiana Sekolah Tinggi Ilmu Ekonomi Indonesia (STIESIA) Surabaya."

[4] KEPUTUSAN REKTOR UNIVERSITAS DIPONEGORO Nomor 161/UN7.A/HK/VII/2022   Tentang, "STANDAR OPERASIONAL PROSEDUR (SOP) PENGEMBANGAN SISTEM INFORMASI / PERANGKAT LUNAK APLIKASI   DI   LINGKUNGAN UNIVERSITAS DIPONEGORO

[5] Y. M. Putra, "ANALISA PROSES BISNIS DENGAN BUSINESS PROCESS MODELLING NOTATION (BPMN) PADA PT. MAYORA INDAH TBK"

[6] A. A. A. Wijaya "TA: Rancang Bangun Aplikasi untuk Konversi Business Process Model Notation ke Model Unified Modeling Language Berbasis Website," Doctoral dissertation, Universitas Dinamika, 2020.

[7] M. Muslihudin, "ANALISIS DAN PERANCANGAN SISTEM INFORMASI MENGGUNAKAN   MODEL TERSTRUKTUR DAN UML", Penerbit Andi, 2016

[8] E.a. M. K. Nurelasari, "MODUL PEMBELAJARAN   ANALISA   PERANCANGAN   SISTEM INFORMASI"

[9] Grady. Booch, James. Rumbaugh, dan Ivar. Jacobson, "THE UNIFIED MODELING LANGUAGE USER GUIDE". Addison-Wesley,1999

[10] Ibnu Akil, "REKAYASA PERANGKAT LUNAK DENGAN MODEL UNIFIED PROCESS STUDI KASUS: SISTEM INFORMASI JOURNAL," Jurnal Pilar Nusa Mandiri, vol. XIII, 2016

[11] I. Kharisma Raharjana dan A. Justitia, "PEMBUATAN MODEL SEQUENCE DIAGRAM DENGAN REVERSE ENGINEERING APLIKASI BASIS DATA PADA SMARTPHONE UNTUK MENJAGA KONSISTENSI DESAIN PERANGKAT LUNAK," Jurnal Ilmiah Teknologi Informasi, vol. Volume 13, 2015.

[12] Sparx Systems, "Unified Modeling Language (UML) ENTERPRISE ARCHITECT," dalam User Guide Series, 2021, hlm. 8.

[13] Tsong Yueh Chen, "A Systematic Method for Auditing User Acceptance Tests"