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Business Architecture Planning to Develop an Academic System Using the TOGAF Architecture Development Method

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ABSTRACT

The increasing complexity of academic administration activities at Mutiara Mahakam Samarinda College of Health Sciences requires an integrated information system architecture capable of supporting effective and accurate management. The current academic services are still partially managed through manual, fragmented procedures, resulting in inefficiencies in data management, information exchange, and administrative processes. This study aims to design an enterprise architecture blueprint for the Academic Administration and Student Affairs unit using the TOGAF Architecture Development Method (ADM) framework. This paper employed a qualitative case study approach using observations, interviews, and document analysis with stakeholders in academic administration and student affairs management. The architectural planning process adopted several TOGAF ADM phases, including the preliminary, architecture vision, business architecture, information system architecture, and technology architecture phases. The business architecture analysis identified the primary academic service processes: new student admissions, academic operations, student graduation management, and alumni data administration. Information system architecture defined the required data entities and application modules to support integrated academic services. In contrast, the technology architecture proposed improvements in network infrastructure, server capacity, and cloud-based data management to enhance operational effectiveness and data accessibility. The results indicate that the proposed enterprise architecture blueprint can provide a structured framework for developing integrated academic information systems aligned with institutional business objectives. The proposed architecture also supports better coordination among organizational units, improves the efficiency of academic services, and enhances institutional readiness for future digital transformation initiatives. Implementation of the proposed enterprise architecture is expected to strengthen information management, improve service quality, and support strategic decision-making processes within the College of Health Sciences.

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■ INTRODUCTION

Mutiara Mahakam Samarinda College of Health Sciences manages various types of academic and administrative data, including student admission records, student academic data, course scheduling, study plan registrations, graduation administration, alumni records, financial administration data, and institutional documents. The increasing volume of data is reflected in the growth of student enrollment, which rose from 248 in 2020 to 587 in 2025. This growth has increased the complexity of academic administration and information management activities. Effective,

integrated data management is needed to ensure that information can be accessed, shared, and used efficiently across organizational units. The development of information systems also requires careful planning to prevent overlapping functions and to ensure interoperability among organizational units. An integrated information system architecture can support data exchange, improve operational efficiency, and provide reliable information for institutional decision-making processes (Congiu et al., 2024; Benlhabib & Berrado, 2025).

The Mutiara Mahakam Education Foundation was established with a Notary Deed of Adward Agustian on January 13, 2007, and has been approved by the Ministry of Agriculture under Number C-611 HT. 03.01. In 2002, he established an education institution called the Mutiara Mahakam Academy, which is led directly by a director who reports directly to the chairman of the foundation. Now, the Mutiara Mahakam Academy has changed its name to the Mutiara Mahakam Samarinda Health Sciences College on 23 August 2019. Activities carried out by the Mutiara Mahakam Foundation are to help the community improve their level of well-being in life and being Health Higher Education institutions that produces superior and character health personnel with degrees in health and knowledge, one of which is organizing higher education in the health sector at the Mutiara Mahakam Samarinda College of Health Sciences (STIKES Mutiara Mahakam Samarinda, 2024).

The annual increase in the number of students requires management to continue improving its student data management as part of the information systems development currently underway. The number of students at Mutiara Mahakam Samarinda College of Health Sciences increased significantly from 248 students in 2020 to 303 students in 2021 (22.18% increase), 368 students in 2022 (21.45% increase), 404 students in 2023 (9.78% increase), 464 students in 2024 (14.85% increase), and reached 587 students in 2025 (26.51% increase). To build an information system, careful planning is necessary so that the circulation of information in each unit meets current needs and is also oriented to future needs. To get a good information system, we have to look at various angles of information systems starting with defining the organization's business architecture, defining the data architecture to find out what data is used in each organizational unit, defining the application architecture to find out what applications the organization needs, defining the architecture technology to find out what technology is needed to support the information system(Pellegrino et al., 2025; Őri & Szabó, 2024).

The Open Group Architecture Framework Architecture Development Method was used in this study because it provides a broad, comprehensive approach to the design, implementation, and control of enterprise information architecture. The Open Group Architecture Framework is a corporate architecture framework that provides a comprehensive approach to planning, designing, and implementing corporate information architecture (STIKES Mutiara Mahakam Samarinda, 2024). The Open Group Architecture Framework provides a detailed description of how to build, manage, and implement the framework and information system used to develop an enterprise architecture model, making it a recommended approach for developing an integrated and valuable system, and outlining the framework's advantages. A good enterprise architecture allows us to strike the right balance between information technology efficiency and business innovation. This enables individual business units to innovate safely in pursuit of their competitive advantage (STIKES Mutiara Mahakam Samarinda, 2024). Good enterprise architecture yields important business benefits, clearly reflected in the company or organization's net profit or loss statement. The Administration Unit at Mutiara Mahakam Samarinda College of Health Sciences conducts activities such as collecting, storing, recording, and sending various information and data that are useful in carrying out the organization's main tasks. The unit is also an important part, quite busy, and most frequently visited. Starting from registering new student candidates, managing files, controlling decrees, processing diplomas, managing promotion files, to legalization of diplomas, and many others.

In the research titled "Enterprise Architecture Planning for Enterprise University Information System Using the TOGAF Architecture Development Method," the study discussed the importance of enterprise architecture planning in supporting the development of university information systems. The Enterprise University Information System (EUIS) developed by Pusilkom UI was designed as a cloud-based academic information system capable of supporting academic and administrative activities with real-time data processing (Ulmi et al., 2020)

The research found that the existing system architecture still employed a centralized

model, creating difficulties with system scalability, integration, maintenance, and the addition of new functions as the number of users increased. Centralized architecture also affected the overall performance of academic services and limited flexibility in system development. To address these issues, the research used the TOGAF Architecture Development Method to design enterprise architecture planning. The study produced an enterprise architecture blueprint comprising business, information systems, data, application, and technology architectures. The implementation of microservice architecture was proposed to improve system flexibility, support integration with various university systems, and simplify future development processes. The research also explained that decentralized architecture could improve data processing performance and facilitate integration between existing systems and additional applications. The study focused on enterprise-level university systems and cloud-based microservice implementation. At the same time, the discussion of academic administration processes in private higher education institutions with limited infrastructure and manual administrative activities remained limited.

An enterprise architecture model for academic information systems was developed using the TOGAF ADM framework to support academic activities within a higher education institution. The study analyzed business processes associated with student admissions, academic administration, graduation services, alumni management, and library services. The architecture development process covered business, data, application, and technology domains and was accompanied by an implementation roadmap. The resulting blueprint identified application modules required to support institutional operations and improve the alignment between academic services and information technology resources. The study also demonstrated the applicability of TOGAF ADM for structuring academic business processes and defining information system requirements in the higher education sector. The proposed architecture primarily focused on business service identification, data entities, application portfolios, and technology infrastructure, while organizational support functions and integration among institutional services were addressed in less detail (Darkel et al., 2022).

In the research conducted, entitled Designing Information System Architecture Using the Open Group Architecture Framework ADM at SMA Negeri 1 Muara Bungo, the process of developing a good information system is to build an information system based on enterprise architecture, a paradigm for planning, designing, and managing information systems. At present, SMA Negeri 1 Muara Bungo has not implemented an information system across all fields, including academics, administration, libraries, and infrastructure. The activities carried out in each of these fields are assisted by computers, and there is no integrated information system across fields. So, using data together to help in every field cannot be done; besides that, the data processing system used today delays the required data and information due to the difficulty of accessing them. To design an enterprise architecture, a complete and easy-to-use methodology is needed. *The Open Group Architecture Framework* Architecture Development Method is a framework for designing enterprise architecture. Each stage in *the Open Group Architecture Framework Architecture Development Method can be carried out correctly if the organization's business processes are fully understood and identified*. Enterprise architecture modeling guides create blueprints for developing information systems across data, applications, business, and technology (Purnasari et al., 2018).

In a study conducted by, entitled Modeling of strategic alignment to modify the TOGAF architecture development method based on business strategy model. The problem in this research is that it does not have an integrated information system, because the existing information system is still partial to the unit and has not been resolved so that the existing information system architecture can integrate, so that the required data and information can be obtained quickly, precisely, and accurately (Maulana et al., 2023).

In research conducted by Jonathan and Andry (2024), entitled "Business enterprise architecture in fitness centers using the Open Group Architecture Framework." The problem in this research is that it lacks a common key at the management level for the development of its information system.

From the three previous studies described above, there is a similarity in the method used, namely The Open Group Architecture Framework Architecture Development Method. in a study entitled Building an Enterprise Architecture Planning System Academic at Mutiara Mahakam Samarinda College of Health Sciences by Applying the Open Group Architecture Framework Architecture Development Method, researchers also use a similar method because the method to be used is in accordance with the media to be studied.

Researchers conduct observations and interviews as methods of data collection and blueprint testing.

Based on the identified problems, this study examines the application of the TOGAF ADM to develop an enterprise architecture for the Academic Administration and Student Affairs Bureau at Mutiara Mahakam Samarinda College of Health Sciences. The study focuses on identifying the business, data, application, and technology architecture components required to support integrated academic services and establishing the relationships among these components within an enterprise architecture framework. The study also develops an enterprise architecture blueprint that can serve as a foundation for future information system development and support the institution's operational and strategic objectives.

To support the framework of this research, a Literature Review of several key concepts is foundational. Enterprise refers to an organizational entity that brings together the people, activities, objectives, resources, processes, and supporting infrastructure needed for an organization to operate as a whole (Grego et al., 2025; Pancote et al., 2026). It may refer to a single institution, a business unit, a department, or a group of related organizations that share common ownership or control and work toward connected goals. In enterprise architecture, the term is broader than a company name or legal form (Alisyahbana et al., 2025; Blocker et al., 2025). It covers the business functions, information services, technology services, and operational processes that must interact in a coordinated way to support daily work and strategic goals (Pamungkas et al., 2025; Afarini & Hindarto, 2023). This view treats the enterprise as a structured, interconnected system in which each component plays a role in maintaining service delivery, information flow, decision-making, and organizational continuity. In this sense, an enterprise is not only a place where activities occur but also a framework of coordinated parts that must be aligned for the organization to function effectively and consistently. Meanwhile, Architecture is a description of a company's structure, comprising various supporting components and their relationships. Architecture is the way in which a system comprising hardware, software, and network components is structured (Li et al., 2022; SiCosta et al., 2020).

Enterprise Architecture Planning (EAP), introduced by Spewak, is a business-driven approach for developing an information architecture that supports organizational goals and operational requirements. In this approach, architecture is viewed as a blueprint or model that provides a structured foundation for planning, developing, and managing organizational information systems. EAP emphasizes aligning business processes and information systems by identifying the data, applications, and technology required to support organizational activities (Gallegos-Baeza et al., 2023; Kotusev et al., 2022; de Castilho Junior et al., 2023). The approach is commonly described from the perspectives of planners and owners, allowing architectural decisions to reflect both managerial objectives and operational needs (Rahmadani et al., 2025; Srisawat et al., 2024; Ulmi et al., 2020). EAP comprises several planning components that guide the development of data, application, and technology architectures. These components provide a structured basis for determining information system priorities, identifying organizational information needs, and establishing a roadmap for system implementation (Busch & Zalewski, 2025; Suprapto & Wella, 2024; Van Riel et al., 2025). The resulting architecture serves as a comprehensive representation of organizational information, business processes, and technological resources, enabling management to understand interrelationships among organizational components and support informed decision-making. Architectural planning also contributes to improved coordination, integration, and governance across organizational units (Alhakamy, 2026; Ghahremani-Nahr et al., 2025; Iyamu, 2018). EAP provides important concepts for aligning business requirements with information system development; this study employs TOGAF ADM as the primary methodological framework. EAP is used as a conceptual reference, while TOGAF ADM provides a more detailed process for developing business, data, application, and technology architectures and translating them into an enterprise architecture blueprint.

In university environments, an Academic Information System is an application designed to manage academic data, including student and lecturer data, recorded lecture results, curriculum, and lecture schedules. Academic information systems have become a focus of research aimed at testing their effectiveness across various topics. Elements that are integrated and interconnected are used to achieve a desired goal and meet the needs of campus management. The Academic System provides information services, including data on academic matters. In this case, the services provided include: data storage for new students,

determining classes and lesson schedules, creating teaching schedules, and the assessment process. The Academic System processes data and academic activities involving students, teachers, academic administration, assessment, and other attribute data (Suresh & Mahale, 2011; Suprapto & Wella, 2024).

The Open Group Architecture Framework (TOGAF) is a widely used architectural framework for building enterprise architectures, created by "The Open Group". The Open Group Architecture Framework provides a methodology (methods and tools) to assist in the acceptance, production, use, and maintenance of an enterprise architecture (Myauo, 2020; Sridevi & Gundoor, 2024; Hadyaoui & Cheniti-Belcadhi, 2025). The Open Group Architecture Framework is built on an iterative process model supported by best practices and a reusable set of existing architectural assets (Jonathan & Andry, 2024; Sari et al., 2025). The methods and tools used in The Open Group Architecture Framework are collectively called the Architecture Development Method, an iterative cycle of enterprise architecture design activities that includes steps for developing an organizational architecture, such as architectural content development, transition, and architectural realization (Desfray & Raymond, 2014). From the above statement, it can be concluded that the Open Group Architecture Framework (TOGAF) is a widely used architectural framework for designing, planning, implementing, and managing enterprise architectures (Desfray & Raymond, 2014).

Finally, the Open Group Architecture Framework Architecture Development Method (TOGAF ADM) provides a complete method for building, managing, and implementing enterprise architecture and information systems, called the Architecture Development Method. Architecture Development Method is the result of continuous contributions from many architectural implementers. This method combines elements of the Open Group Architecture Framework with the organization's business and Information Technology needs (Ananda et al., 2025; Andrea et al., 2025). The Open Group Architecture Framework Architecture Development Method is a result of the continuous contributions of many architectural practitioners (Abughazala et al., 2026). The Open Group Architecture Framework Architecture Development Method describes a method for building an enterprise architecture and forms the core of the Framework. The Open Group Architecture Framework Architecture Development Method integrates the Open Group Architecture Framework elements described in The Open Group Architecture Framework documents, such as other architectural assets, to obtain business and Information Technology needs from the organization, and is an appropriate and proven method to develop Information Technology and business enterprise architectures (El Samaty & Albadi, 2026).

■ METHOD

Study Area

This research was conducted at the Academic Administration and Student Affairs Unit of Mutiara Mahakam Samarinda College of Health Sciences. The study focused on academic administration activities, including new student admissions, academic operational services, student graduation management, and alumni data administration. This study evaluated the existing information technology infrastructure, including computer networks, servers, internet bandwidth, supporting administrative devices, and academic data management systems currently implemented within the institution. The research materials consisted of institutional documents, organizational structures, academic operational procedures, information system documents, student data, and network topology configurations that supported academic administration services.

Research Design and Procedures

This study employed a qualitative case-study approach using the TOGAF Architecture Development Method (ADM) framework. Data were collected through direct observation, semi-structured interviews, and institutional document analysis. Informants were selected using purposive sampling based on their direct involvement in academic administration management and information system development. The participant criteria included having structural or technical responsibilities in academic administration, possessing at least 2 years of work experience, and understanding the institution’s business processes and information systems. A total of six informants participated in this study, consisting of the Chairperson of Mutiara Mahakam Samarinda College of Health Sciences, the Vice Chairperson I for Academic Affairs, the Head of Academic Administration, one academic administrative staff member, and two information technology personnel. The selected informants represented both managerial and operational perspectives required to identify business processes, information needs, and

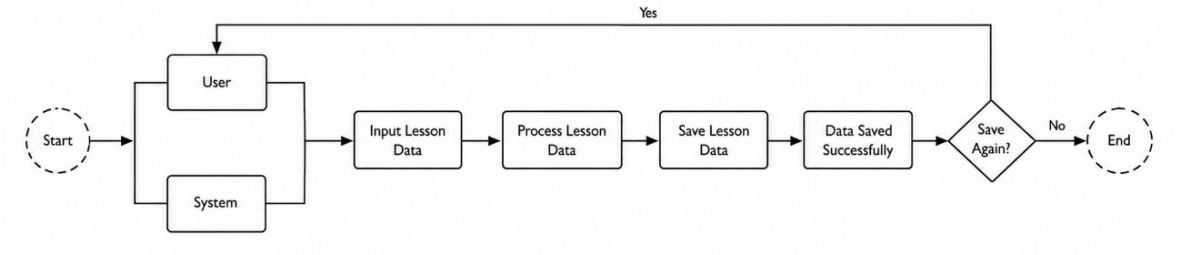

Figure 1. Research procedure

technology requirements within the institution.

The interview instrument used a semi-structured guideline derived from the TOGAF ADM phases and the requirements for enterprise architecture analysis. The main interview questions included:

1. Problems and constraints in the current academic administration process
2. Requirements for data integration among organizational units
3. Requirements for academic application systems
4. Constraints related to network and server management
5. Institutional needs for information technology development
6. Institutional expectations regarding integrated academic information systems

Observations were conducted directly on academic administration activities and information system utilization to obtain actual descriptions of business processes and technology infrastructure conditions. The research procedures began with the preliminary phase to determine organizational scope, institutional vision and mission, and architectural principles. The architecture vision phase was conducted to identify organizational and stakeholder requirements related to academic information systems. In the business architecture phase, business process modeling was performed using Value Chain analysis and Business Process Model and Notation (BPMN). The information system architecture phase focused on identifying data entities, application requirements, and system integration needs using Unified Modeling Language (UML). The technology architecture phase evaluated the existing technological infrastructure and proposed improvements related to network topology, servers, bandwidth capacity, and cloud computing implementation. The overall stages of the research procedure are illustrated in Figure 1.

The technology architecture phase evaluated the existing technological infrastructure and proposed improvements related to network topology, servers, bandwidth capacity, and cloud computing implementation.

The open group architecture framework architecture development method

A method used to build, manage, and implement enterprise architecture and information systems. At this stage, research will be carried out to determine the framework and scope of the Enterprise Architecture, which will be built in the stages of admission, as can be seen in Figure 2

The Preliminary phase collects the vision and mission of the Administration Unit at Mutiara Mahakam Samarinda College of Health Sciences. This phase also collects documents from the ongoing component processes in this institution. Following this initial stage, the Architecture Vision phase focused on identifying organizational objectives and requirements for academic information systems within the Academic Administration and Student Affairs Unit at Mutiara Mahakam Samarinda College of Health Sciences. At this stage, researchers analyzed several administrative documents, including student admission records, academic calendar documents, course scheduling procedures, study plan card procedures, graduation administration documents, alumni data collection reports, organizational structure

Figure 2. TOGAF architecture development cycle

documents, and academic regulations. Researchers also reviewed existing information system reports, network infrastructure documentation, and data management procedures used by the institution. The document analysis process aimed to identify information flow, data processing activities, coordination among organizational units, and existing technological constraints in academic services. The findings from document analysis were validated through interviews and direct observations involving academic administrators, administrative staff, and information technology personnel.

The Business Architecture phase was used to model the academic service processes at Mutiara Mahakam Samarinda College of Health Sciences through Value Chain analysis and Business Process Model and Notation (BPMN). This phase not only mapped the existing workflow but also identified inefficiencies in the current administrative process, such as repeated approvals, manual data transfer, and multiple handoffs between units. Based on the comparison between the current and proposed processes, the redesigned BPMN is expected to reduce bureaucratic steps by simplifying verification stages and minimizing redundant document handling. In the current process, service completion often requires multiple sequential approvals and repeated administrative confirmations, thereby extending processing time. The proposed architecture streamlines these activities by integrating related tasks into a more direct workflow, enabling information to move more quickly from one unit to another. As a result, the proposed design is expected to shorten service time, improve coordination among organizational units, and increase administrative efficiency. Business architecture provides a clearer, more practical process structure to support an integrated academic information system.

Moreover, the next step involves Information System Architecture. In the Information System Architecture phase, the data mapping and data store (data application) design first uses class diagrams to clarify which data entities are used and the relationships between them. After the data architecture is designed, the researcher designs the application architecture using Use Case Diagrams to ensure that the process flow supports academic business processes and academic data architecture. Finally, Technology Architecture phase, at this stage designing hardware (hardware) and computer networks are designed to support the implementation of the information system architecture. The technique used to design the technology architecture consists of 2 activities: designing the Environment and Location Diagram and the Network Computing Diagram.

Equipment and Parameters

The research instruments consisted of interview guidelines, observation sheets, institutional documentation, and system modeling tools. The interview guidelines were developed based on TOGAF ADM concepts and enterprise architecture requirement indicators. Observation sheets were used to record the actual conditions of business processes, application usage, and information technology infrastructure. Institutional documentation was utilized to validate organizational data, work procedures, and academic service structures. Business process modeling used the Business Process Model and Notation (BPMN) standard, while system modeling used the Unified Modeling Language (UML), including class and use case diagrams. The TOGAF ADM framework was adopted as the primary reference for enterprise architecture development. The evaluated parameters in this study included:

1. Business process integration, which measured the interconnection among organizational units in academic services.
2. Data management effectiveness, which assessed the ease of storing, accessing, and exchanging academic data.
3. Application interoperability, which evaluated the capability of applications to support information exchange across departments.
4. Network infrastructure capacity, which measured the readiness of bandwidth, servers, and network topology to support integrated systems.
5. Information accessibility, which assessed the ease of obtaining academic information accurately and efficiently.
6. Data security and sustainability, which evaluated technological support for data protection and data availability.

Data validity was ensured through source and method triangulation by comparing results from interviews, observations, and institutional documents. Research reliability was maintained through the consistent use of interview instruments and standardized observation recording formats throughout the data collection process. Instrument calibration was conducted by preliminarily testing the interview guidelines with two administrative staff members before the main interview sessions.

Data Analysis

The data collected were analyzed using qualitative descriptive analysis techniques. Interview, observation, and documentation data were categorized according to TOGAF ADM phases to identify problems and requirements related to academic information systems. The analysis process compared the current system conditions with the proposed enterprise architecture requirements. Business process analysis was conducted using BPMN modeling to identify service inefficiencies, while system analysis was performed by mapping the data, application, and technology architectures.

■ RESULT AND DISCUSSION

This enterprise architecture design stage refers to The Open Group Architecture Framework Architecture Development Method which consists of ten phases of activities, namely preliminary, requirement management, architecture vision, business architecture, information system architecture and technology, opportunities and solutions, migration and planning, implementation governance, architecture change management needed in building an enterprise architecture, but in this study limiting it using 6 phases, namely preliminary, requirements management, architecture vision, business architecture, information system architecture and technology architecture. Before entering the The Open Group Architecture Framework Architecture Development Method cycle, several preparations will be made, namely the Preliminary phase.

Preliminary phase

The preliminary stage is the initial stage of preparing an enterprise architecture design. At this stage, the framework for building the enterprise architecture is determined. At Mutiara Mahakam Samarinda College of Health Sciences, approximately 300 prospective students are accepted annually, and it offers 3 regular study programs: obstetrics, Occupational Health and Safety, and hospital administration. The existing database in the Academic Administration and Student Affairs Bureau, as well as the current system, still

Table 1. Principles of architecture

Principle Type	Principle Name	Rationale
Business Principles	Main Principle	The enterprise architecture must support the institutional vision, mission, and academic service objectives of Mutiara Mahakam Samarinda College of Health Sciences.
	Alignment of IT and Business	Information technology development must align with academic administration and student service business processes to improve operational effectiveness.
	Business Continuity	Academic services such as student admissions, scheduling, and graduation processes must continue to operate consistently without major disruptions.
	Development of Appropriate Technology	Technology implementation must be tailored to institutional needs, organizational capacity, and the development of future academic services.
	Organizational Policy Standards	The system designed must comply with institutional academic regulations and administrative procedures.
	Data is an Asset	Student admission data, academic records, financial data, and alumni information are important institutional assets that support reporting, decision-making, and academic services.
	Data is Shared	Academic data must be accessible and exchangeable among related organizational units to reduce duplication and improve service efficiency.
	Defining Data	Data entities and classifications must be clearly defined to ensure consistency and accuracy in academic information management.
	Data Security	Student and institutional data must be protected from unauthorized access, modification, or loss.
	Data Confidentiality	Sensitive academic and personal student information must only be accessible to authorized personnel.
Application Principles	Supports User Mobility	Academic applications should support access from different locations and devices to facilitate administrative activities and academic services.
	Ease of Use	The academic information system should be user-friendly to reduce operational complexity and improve staff productivity.
Technology Principles	Capacity Management	Network bandwidth, server capacity, and storage systems must support the increasing volume of academic data and student service activities.
	Interoperability	The proposed applications and systems must be able to exchange data and communicate effectively across organizational units.
	Need-Based Change	Technology development and system upgrades should be implemented in accordance with institutional operational requirements and future scalability needs.

requires time-consuming steps to prepare a business process architecture design:

Organization scope

The scope of the organization under study encompasses all activities in each section of the Administration of Mutiara Mahakam Samarinda College of Health Sciences.

Architectural principles

The architectural principles presented in Table 1 were developed from interviews, direct observations, and document analysis involving the Chairperson, the Vice Chairperson I for Academic Affairs, the Head of Academic Administration, administrative staff, and information technology personnel. These principles were then discussed and validated with the relevant stakeholders to ensure they reflected the institution's vision, mission, academic service objectives, and operational realities.

Architecture Vision Phase

Identify the stakeholders involved.

In this step, the stakeholders involved in the architectural study at Mutiara Mahakam Samarinda College of Health Sciences were identified, including the Chairperson, Vice Chairperson I for Academic Affairs, Head of Academic Administration, academic administrative staff, and information technology personnel. Interviews with these stakeholders revealed several challenges in academic administration and information management. The Head of Academic Administration stated, *"Student and academic data are still managed separately by different units, resulting in repeated data entry and difficulties in maintaining data consistency."* An academic administrative staff member explained, *"Most administrative activities still rely on manual document processing and verification, causing delays in service delivery and information exchange."* An information technology staff member noted, *"The current systems operate independently and do not provide integrated access to academic, graduation, and alumni information."* These findings were consistent with observations and analysis of institutional documents, which indicated fragmented data management, limited coordination among organizational units, and the absence of an integrated academic information system. The identified issues were used as the basis for defining stakeholder requirements and developing the proposed architecture vision.

Solution Concept Diagram

Based on the results of interviews, observations, and document analysis conducted in the Academic Administration and Student Affairs Unit, several problems were identified, including fragmented data management, repeated manual administrative processes, limited coordination among organizational units, and the absence of integrated academic information systems. The proposed solution concept focuses on developing an integrated academic information system architecture that connects major academic service units through centralized data management and coordinated information exchange. The proposed conceptual architecture integrates new student admissions services, academic operations management, financial administration, graduation administration, and alumni management systems. In this architecture, each organizational unit is connected through a centralized database and supported by integrated applications to improve data

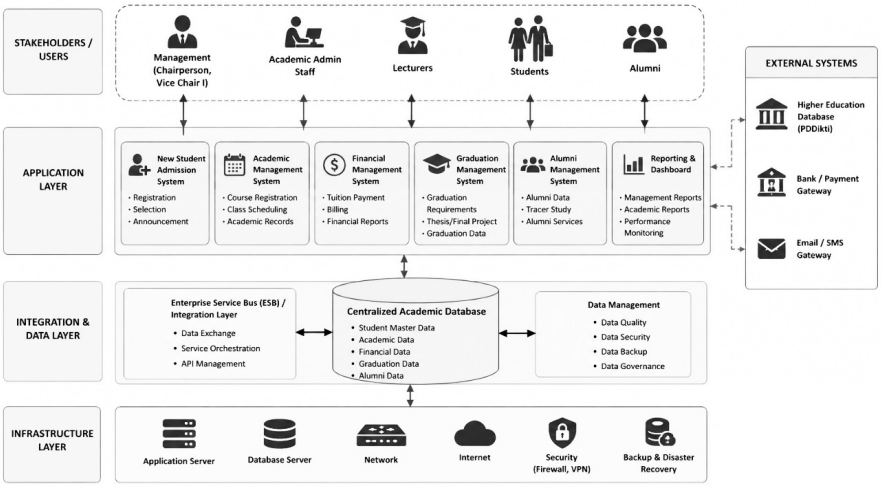

Figure 3. Solution Concept Diagram

accessibility, reduce duplication, and accelerate academic service processes. The proposed architecture also supports communication among academic administration staff, institutional management, lecturers, and students through a unified information system. Figure 3 shows the conceptual relationship among organizational units, applications, and centralized data management.

Business Architecture Phase

At the Business Architecture phase, business process analysis was conducted using Porter's Value Chain to identify the primary and support activities within the Academic Administration and Student Affairs Bureau at Mutiara Mahakam Samarinda College of Health Sciences. The purpose of this analysis was to determine how each organizational activity contributes to the delivery of academic services and to the creation of institutional value. As shown in Figure 4, the primary activities comprise four core academic service processes: admission of new students, academic and student operations, student graduation management, and alumni management. These activities directly engage with students and serve as the primary means of delivering academic services. Meanwhile, the support activities include institutional governance and management, finance and budget management, human resource management, information systems and technology, and infrastructure and facilities management. These supporting activities provide operational, technological, and administrative support to ensure that the primary activities can operate effectively and efficiently. The value chain analysis demonstrates that integrated information systems and coordinated support functions are essential for improving academic service quality, reducing administrative inefficiencies, and accelerating information exchange among organizational units.

This phase also identifies the current business process flow and the proposed business processes using the Business Process

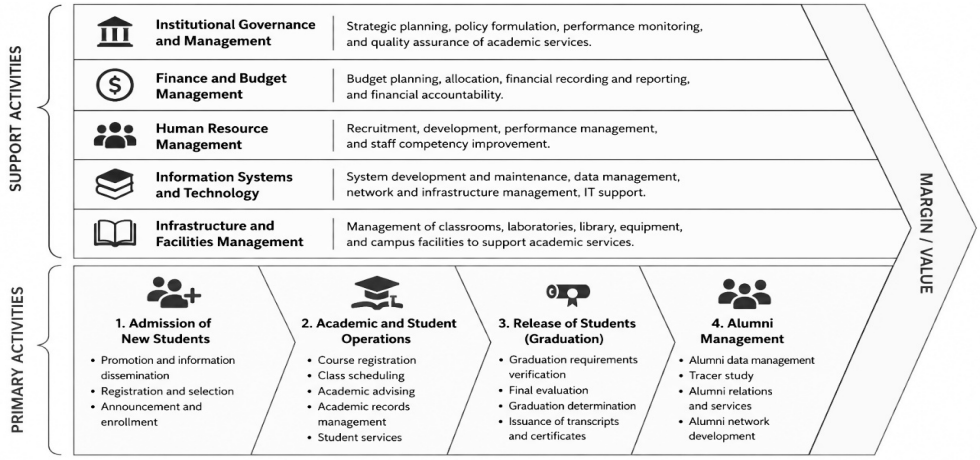

Figure 4. Value Chain for Academic Administration and Student Affairs Bureau at Mutiara Mahakam College of Health Sciences

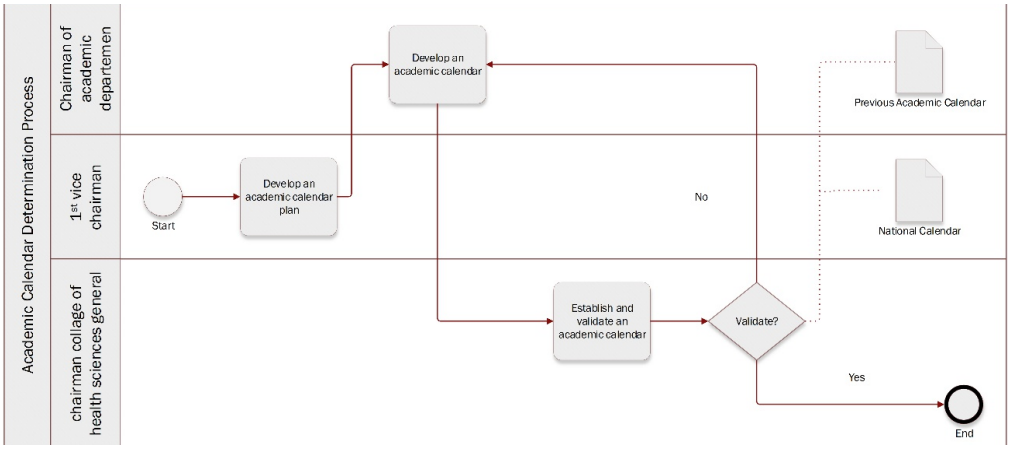

Figure 5. Business Process Mapping Notation: the Process of Determining the Academic Calendar

Mapping Notation. The proposed business process is contained in the business flow of new student admissions, academic operations, student release, and alumni data collection as follows:

Current academic operational business process flow

Figure 5 shows the current business process for establishing the academic calendar at Mutiara Mahakam College of Health Sciences and illustrates the three stages involved in its management. These stages consist of steps carried out by the Deputy Chairman 1, namely compiling an academic calendar plan, which usually takes 1 to 2 days. The Chairman of the Academic Administration and Student Affairs Bureau will compile the academic calendar, and the head of the Institute of Health Science will determine and validate it. If the head of the Institute of Health Science has validated it, the process of determining the academic calendar is complete.

Figure 6 shows the process of determining courses and lecture schedules currently in progress, which consists of identifying courses and lecturers, compiling courses, determining lecture schedules, and assigning classrooms. The results of the two stages are then submitted to Deputy Chair 1 for determination and endorsement.

Illustration of the Study Plan Card trusteeship process and cost of providing education Semester Credit Units payments currently running in Figure 7. This process has nine stages, consisting of paying the cost of providing education and then obtaining the cost-of-providing-education payment slip at the General Financial Administration Bureau. Then pay the cost of providing education at the bank and get proof of payment. Students who have been paid submit a payment confirmation at the General Financial Administration Bureau, then, after confirmation, log in to the Population Administration Information System and enter the course. Then the students carry out

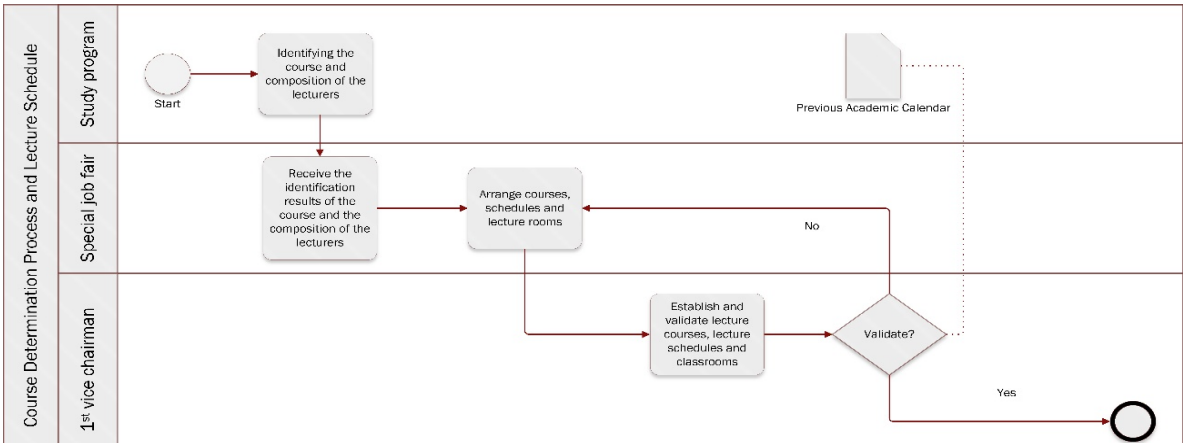

Figure 6. Business Process Mapping Notation: The process of determining courses and class schedules

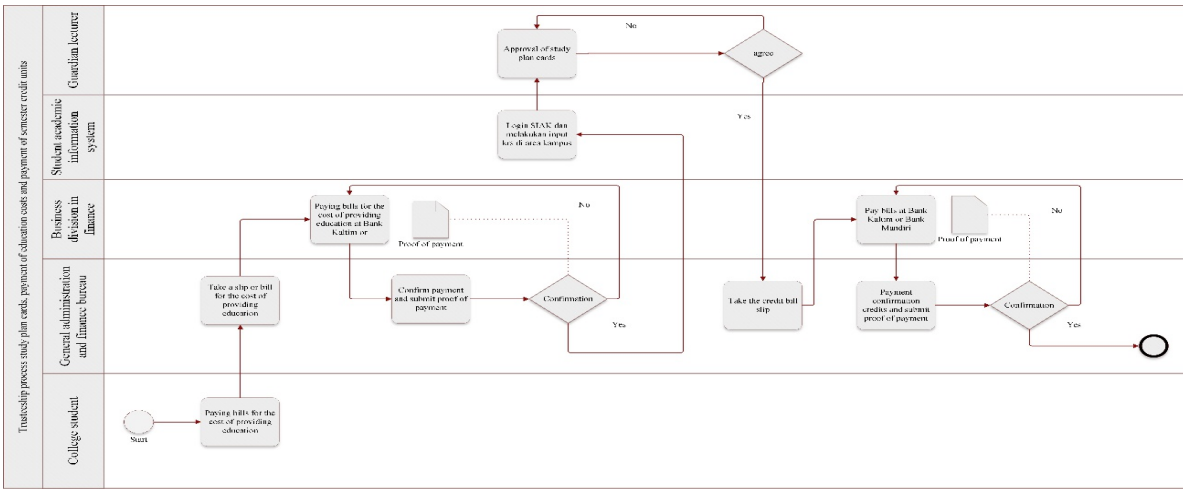

Figure 7. Business Process Mapping Notation study plan card Trusteeship Process, cost of providing education and Semester Credit Units Payments

guardianship with the supervisor, after completing the student guardianship at the General Financial Administration Bureau to obtain the credit payment slip. Students make credit payments at the bank and obtain proof of payment. After paying credits, students confirm payment to the General Financial Administration Bureau again.

The new student admissions business process flow

The new student admission business process also identified the absence of an information system that specifically supports the processes involved in carrying out new student admissions. This is illustrated in Figure 8, which shows the process of implementing the formation of new students, currently underway in several stages, including the formation of the New Student Admission Selection Committee. Deputy Chairman 1 issues a decree to form the New Student Admission Selection Committee, and the Academic Administration and Student Affairs Bureau prepares a plan to implement the New Student Admission Selection. The head of Mutiara Mahakam Samarinda College of Health Sciences determines and approves the New Student Admission Selection implementation plan, and then the admission of new students will be published.

Business process flow of student graduated

In the process of releasing students at Mutiara Mahakam College of Health Sciences, which is currently running, there is also no use of an information system. This process is shown in Figure 8. The illustration of the student discharge process currently underway includes several stages, such as graduation and the implementation of the graduation plan. After the graduation and graduation plans are determined, the Academic Administration and Student Affairs Bureau will inform them of their implementation. Students register for graduation and graduation on the Academic Administration and Student Affairs Bureau website. Then students go to the library to pick up the free library letter. After that, students go to the General Financial Administration Bureau to obtain free financial documents, collect graduation payment slips, and handle financial matters. If the student has made a graduation payment at the bank, they submit proof of payment to the General Financial Administration Bureau. Then, students submit graduation requirements to the Academic Administration and Student Affairs Bureau. If the graduation requirements have been fulfilled, the Academic Administration and Student Affairs Bureau will issue the transcript, diploma, and SKPI. Students do the last judicium graduation.

Alumni data collection business process

The current data collection process for alumni at Mutiara Mahakam Samarinda College of Health Sciences still faces the same problems as in previous business processes, namely the lack of use of information systems. This process is illustrated in Figure 10. The alumni data collection process currently underway has several stages, including the first stage, in which BKK will collect alumni phone numbers. The Academic Administration and Student Affairs Bureau will request alumni phone contact information. BKK will create a WhatsApp group and distribute the Google Form link to alumni. Alumni will complete the alumni data form in Google Forms. It has been noted that once the alumni data collection form is completed, the process is complete.

Information System Architecture Phase

At this stage of the information system architecture, the data and application

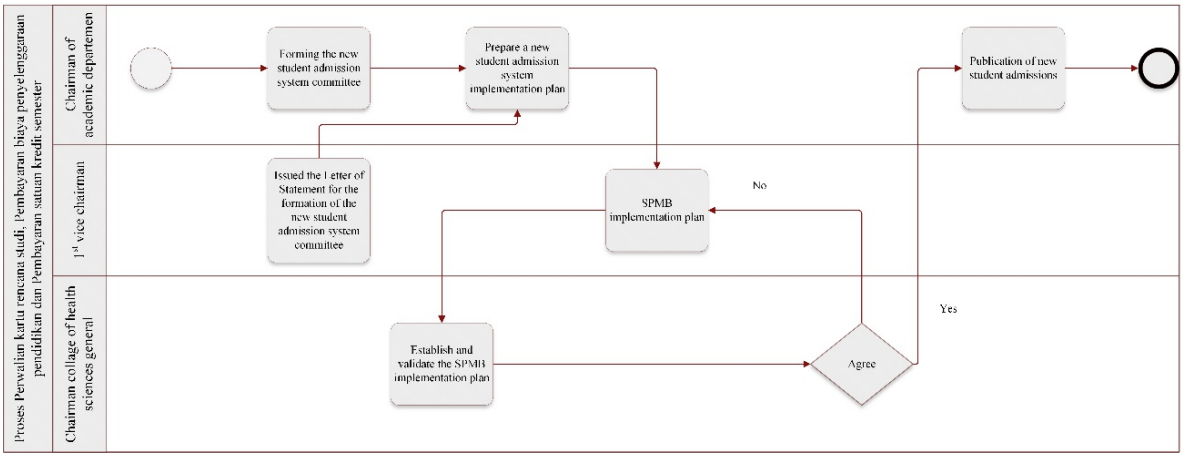

Figure 8. Business Process Mapping Notation New Student Admission Selection Implementation Process

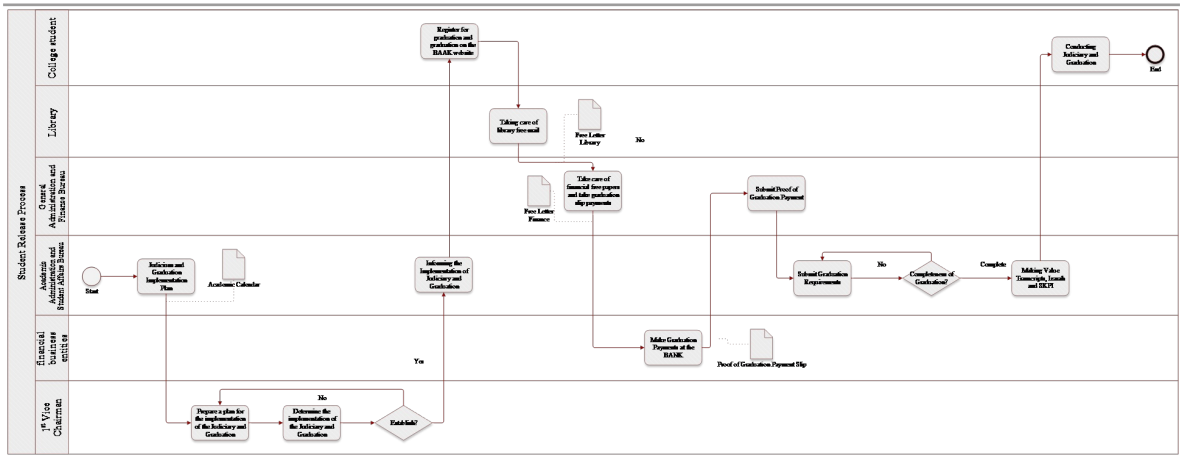

Figure 9. Business Process Flow of Student Graduated

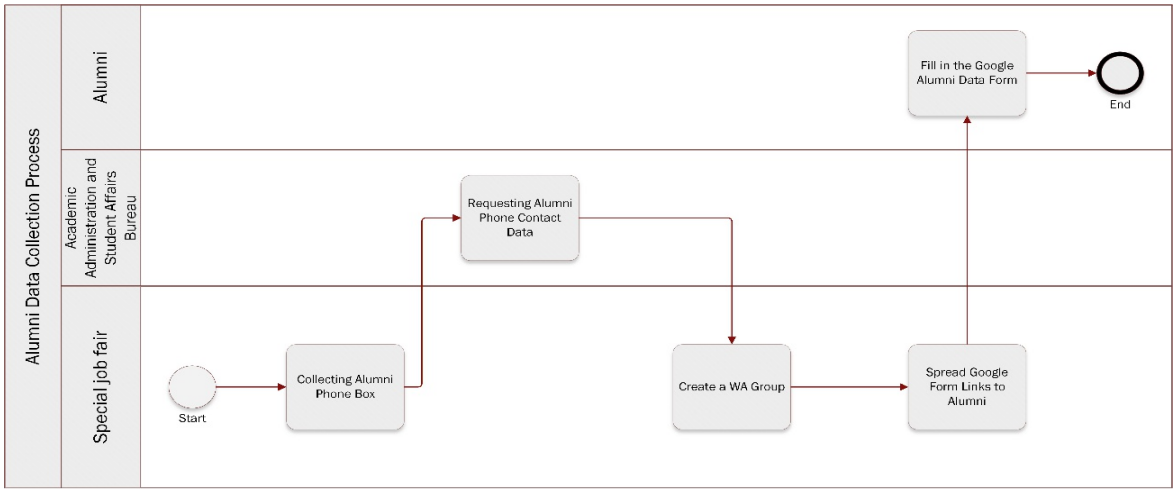

Figure 10. Business Process Mapping Notation Alumni Data Collection Process

architectures are to be determined to support the business in Academic Administration and Student Affairs at Mutiara Mahakam Samarinda College of Health Sciences.

Data architecture

In this data architecture, the needs of entities that will later be modeled using class diagrams are addressed. Furthermore, it can later support the design of data architecture modeling for the Academic Administration and Student Affairs scenario at Mutiara Mahakam Samarinda College of Health Sciences.

Application architecture

This application architecture aims to define the main types of applications that work together in an integrated manner. These applications are needed to process data and support business processes in the Academic Administration and Student Affairs Bureau at Mutiara Mahakam College of Health Sciences. At this stage, it also defines which applications are needed to manage data and provide users with information to carry out business processes.

Table 2 shows the proposed application architecture mapping developed to support integrated academic administration and student affairs services at Mutiara Mahakam Samarinda College of Health Sciences. The architecture consists of several interconnected application modules designed to efficiently manage academic data, administrative processes, and institutional information exchange. The core modules include the New Student Admission System, Student and Academic Data System, Course and Lecture Scheduling System, Study Plan Card and Academic Advising System, Graduation Administration System, and Alumni Management System. These modules support the institution's primary academic business processes. Several supporting modules, such as the Academic Financial System, Academic Document Management System, Management Dashboard and Reporting System, User Management and Access Control System, and Application Integration/API Layer, were

Table 2. Proposed Application Architecture Mapping

No.	Application Module	Main Users	Main Functions	Output / Integration
1	New Student Admission System	Prospective students, academic staff, management	Manages registration, applicant selection, document verification, and admission announcements	Applicant data are integrated into the academic database and connected to the student management module.
2	Student and Academic Data System	Academic administration staff	Stores student master data, academic status, study history, classes, and study programs	Functions as the primary database for all integrated modules
3	Academic Calendar System	Vice Chairperson I, academic staff	Creates, validates, and publishes academic calendars	Integrated with course scheduling, study plan, and academic activity modules
4	Course and Lecture Scheduling System	Academic staff, study programs, lecturers	Manage courses, lecturer assignments, classrooms, and lecture schedules	Integrated with lecturer data, classroom data, and academic calendars
5	Study Plan Card and Academic Advising System	Students, academic advisors, academic staff	Manages study plan submission, advisor approval, and study registration status	Connected to payment and academic status modules
6	Graduation Administration System	Students, academic staff, library staff, finance staff	Manages graduation registration, graduation requirements verification, transcripts, diplomas, and supplementary certificates	Integrated with library, finance, and academic record modules
7	Alumni Management System	Alumni staff, academic administration staff	Manages alumni records, tracer studies, alumni contacts, and alumni information updates	Connected to graduate and institutional reporting databases
8	Academic Financial System	Finance staff, students, management	Manages tuition payments, graduation fees, and payment verification	Integrated with study plan, graduation, and academic validation modules
9	Academic Document Management System	Administrative staff, management	Manages decrees, academic letters, legalization documents, and archives	Integrated with all academic administrative services
10	Management Dashboard and Reporting System	Institutional management, department heads	Provides reports related to student data, academic services, graduation, alumni, and finance	Collects and visualizes data from all application modules
11	User Management and Access Control System	System administrators	Manages user accounts, user roles, authorization, and system security	Supports secure and integrated access across all modules
12	Application Integration / API Layer	System administrators	Facilitates data exchange and communication among application modules through RESTful services	Ensures interoperability, data consistency, and integrated services across all modules

proposed to enhance data accessibility, interoperability, information security, and organizational decision-making.

Technology Architecture Phase

At the technology architecture stage, the goal is to identify current technologies, assess their use in the application, and propose new technologies aligned with the needs of the Academic Administration and Student Affairs Bureau at Mutiara Mahakam Samarinda College of Health Sciences.

Current network topology

At the technology architecture stage, the existing technological infrastructure was identified and evaluated to determine its capability in supporting academic administration and student affairs services at Mutiara Mahakam Samarinda College of Health Sciences. The current network infrastructure uses a wired broadband internet connection from Telkom with a bandwidth of 20 Mbps. This network infrastructure supports several organizational units, including administration offices, lecturers' rooms, computer laboratories, libraries, and language laboratories, as illustrated in Figure 11. The previously used term dial-up network was technically inaccurate because dial-up technology only supports low-speed connections in the kilobit range. Current infrastructure is more appropriately classified as a fixed broadband network connection. Although the existing infrastructure can support daily operational activities, the current bandwidth capacity and network configuration still have limitations in handling integrated

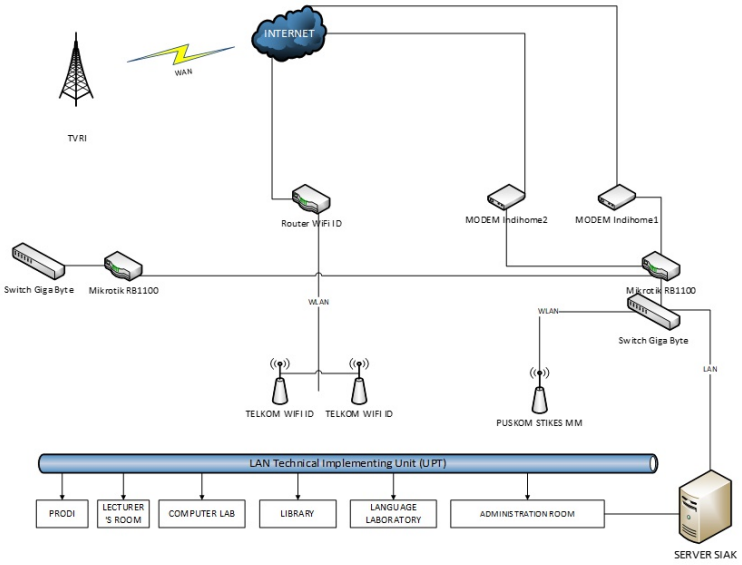

Figure 11. Current Network Topology

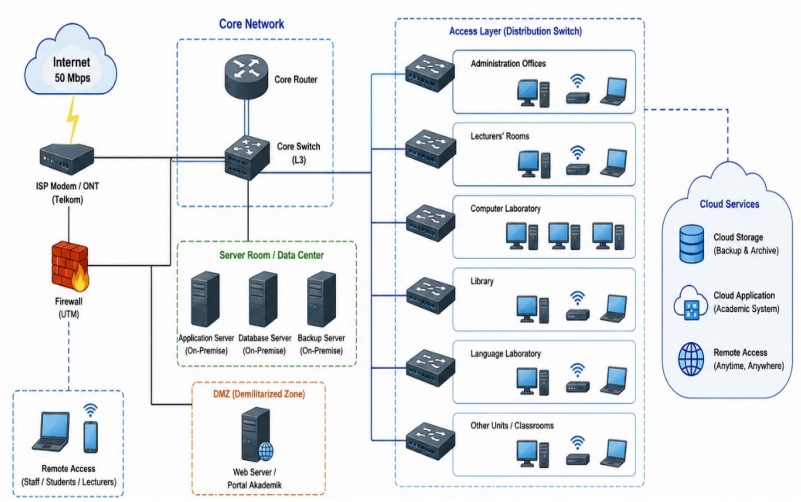

Figure 12. Proposed Network Topology

academic information systems, centralized data management, and increasing institutional services.

The proposed network topology

The proposed network topology is designed to support the integrated academic information system of the Academic Administration and Student Affairs Bureau at Mutiara Mahakam Samarinda College of Health Sciences. Unlike the current infrastructure, the proposed design adopts a hybrid architecture that combines the institution's local network with cloud-based services. Figure 12 shows that the campus network is planned to use a wired LAN connected through a router, switch, and firewall to support secure data exchange across administrative offices, lecturers' rooms, computer laboratories, libraries, and other related units. In this design, the internet bandwidth is increased from 20 Mbps to 50 Mbps to accommodate the growing number of users and the higher data traffic generated by integrated academic services. The cloud environment is proposed primarily for backup storage, data synchronization, and off-site access. At the same time, the main operational systems remain hosted on an on-premise server to ensure control, reliability, and faster internal access. In addition, a backup server is proposed to improve system availability and facilitate data recovery in the event of hardware failure. This network design is expected to improve connectivity, strengthen data security, support scalability, and provide a more reliable

infrastructure for academic administration, student services, and future system expansion.

Application integration architecture

The proposed application integration layer uses RESTful APIs over HTTP/HTTPS with JSON as the primary data exchange format to connect the academic application modules. REST was selected because it is lightweight, easy to implement, widely supported by web and mobile development frameworks, and suitable for interoperability among heterogeneous academic systems. This approach also reduces development and maintenance costs compared with more complex alternatives such as SOAP, while still providing sufficient flexibility for modular integration. To ensure secure data exchange, the API layer is combined with token-based authentication, role-based access control, and encrypted communication through HTTPS.

■ CONCLUSION

The enterprise architecture design developed in this study provides a structured model for integrating academic administration services at Mutiara Mahakam Samarinda College of Health Sciences. Using the TOGAF ADM framework, the proposed architecture mapped organizational business processes, defined academic data requirements, identified integrated application modules, and determined the technological infrastructure needed to support academic services. The resulting architecture model comprises business, data, application, and technology architectures, interconnected to support institutional operational activities. The business architecture identified four primary academic processes consisting of new student admissions, academic and student affairs operations, student graduation management, and alumni management, supported by nine supporting institutional functions. The mapping of these processes provides a clearer structure of organizational interactions and academic service workflows. The application architecture defined several integrated application modules, including admissions management, academic administration, scheduling, financial administration, graduation services, alumni management, reporting systems, and user access management. The data architecture established the main academic data entities required to support information consistency, data integration, and institutional reporting processes. Furthermore, the proposed technology architecture improved network infrastructure, server management, centralized databases, and cloud-based storage to support system availability, accessibility, and data security. The developed enterprise architecture blueprint provides a structured reference for future development of academic information systems at Mutiara Mahakam Samarinda College of Health Sciences. The proposed architecture is expected to reduce repetitive manual processes, minimize data redundancy, improve coordination among organizational units, accelerate information exchange, and support more effective administrative services and institutional decision-making processes.

■ DECLARATION OF AI USAGE IN SCIENTIFIC WRITING

During the preparation of this manuscript, the authors utilized ChatGPT by OpenAI to assist in refining sentence structure, improving grammar, and enhancing the clarity of academic writing in English. After using this tool, the authors carefully reviewed, revised, and validated all content and take full responsibility for the manuscript's final version.

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