



Planning Enterprise Systems Architecture at SMK Negeri 1 Kismantoro with TOGAF ADM Approach

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ABSTRACT

Vocational high schools (SMK) are educational institutions that must ensure efficient information management and support a good learning process. This study aims to design enterprise system architecture optimal information for SMK Negeri 1 Kismantoro with the framework TOGAF ADM (The Open Group Architecture Framework - Architecture Development Method) work. In this research case, TOGAF ADM is used as a tool for understanding, designing, and integrating various aspects of system information school, that would increase efficiency, effectiveness, and quality education at SMK Negeri 1 Kismantoro. This research involves stages in TOGAF ADM, including SWOT analysis, Value Chain, Business Process Modeling, and Focus Group Discussion (FGD) for modeling various stages in TOGAF ADM. Data is collected through interviews, observations, and analysis documents. The results of this research include specific recommendations related to enterprise architecture and information system recommendations at SMK Negeri 1 Kismantoro. In addition, this study proposes appropriate implementation stages, along with a roadmap that guides better information system development stages. This study makes a contribution in the context of school information system development with a focus on enterprise architecture. It is hoped that the results can be used as a guide for updating and developing the school information system at SMK Negeri 1 Kismantoro and may also be useful as a reference for other schools that have similar needs in improving the quality of their education.

Keywords: TOGAF, enterprise architecture, school information system

1. Introduction

As time goes by, information technology and information systems have developed very rapidly. The development of this technology provides comfort and convenience for its users so technology becomes very important in everyday life [13]. Education is the backbone of societal development and the progress of a country. The success of a school in providing quality and efficient educational services depends greatly on the information technology infrastructure and information systems they implement. Therefore, designing the enterprise architecture of a school information system is an inevitable aspect to ensure that all technology and data components are well integrated and that the information system can meet operational needs and manage data efficiently.

The use of information technology in educational institutions has an influence on business processes including learning systems, school management, administration systems, and policy planning. By utilizing information technology, it is hoped that the quality of educational services at SMK Negeri 1 Kismantoro, a vocational high school located in Wonogiri Regency, Central Java Province, can be improved.

This research aims to design an optimal school information system enterprise architecture, by the educational needs and goals carried out by the school. By adopting enterprise architecture, schools can optimize the use of their information technology resources, increase operational efficiency, and provide better educational services to students, teachers, and other stakeholders.

In this research, we will describe the steps for designing a school information system enterprise architecture, which involves needs analysis, process mapping, infrastructure design, as well as implementation and sustainable management of the system. This effort is directed at increasing the effectiveness of education in this digital era which is full of challenges.

SMK Negeri 1 Kismantoro in its vision is to create skilled, reliable, and virtuous human resources to welcome the global era. If linked to this mission, SMK Negeri 1 Kismantoro will empower Information Technology (IT) and Information Systems (SI) in school management.

Currently, in the governance of SMK Negeri 1 Kismantoro, the use of information technology and the expansion of information systems has not been fully structured according to the architecture that has been determined and the implementation of the framework is still not optimal. This data was obtained through interview sessions with the Principal and Head of the Informatics Development Team. At present, the application of information technology and the development of information systems is only limited to the level that meets the specific needs of a particular work unit or division. Therefore, the existing information system is still unable to comprehensively manage the needs of all work units, and there is no integration between the systems that will be developed so that they can meet all the work needs of all divisions.

In several school business processes, there is still a dependency on the use of Excel files as a data recording tool, which has the potential to cause data redundancy problems. Data redundancy is a condition where the same or similar data is stored or recorded in several different locations or forms in a system or database. This often occurs due to unnecessary duplication of information, which can lead to wasted resources and complicate data management and maintenance. Uncontrolled data redundancy can result in errors and inaccuracies in information systems. Besides having an impact on data storage capacity, data redundancy can also induce data inconsistencies. Data inconsistency is the appearance of inconsistent data in the same field for several files [4]. Data inconsistency occurs when there is a change in the value of an attribute, the change is recorded in only one data file.

To increase the use of information technology in school administration, especially SMK Negeri 1 Kismantoro, optimization through enterprise architecture needs to be carried out to improve every ongoing business process. Enterprise architecture is a process that includes the design, analysis, planning, and documentation stages of activities aimed at improving the performance of an organization or a series of organizations by utilizing technological resources and facilitating the exchange of information and resources [3]. Enterprise architecture can provide a structured approach to managing information system assets and guide business strategy needs. Enterprise architecture is also able to play a role in supporting strategic decision-making and helping monitor changes, identifying the implications of changes in the organizational and business context of the system. This research will present the design of the School Information System Enterprise Architecture at SMK Negeri 1 Kismantoro using the TOGAF ADM (The Open Group Architecture Framework - Architecture Development Method) approach. TOGAF is an architectural framework used for planning, designing, and managing enterprise architecture in an organization [5]. TOGAF ADM (The Open Group Architecture Framework - Architecture Development Method) is a structured and systematic approach that helps organizations develop and manage their architecture more effectively. The use of TOGAF ADM in this design aims to create a comprehensive framework that can support integrated data management, business processes, and school information technology. TOGAF ADM consists of a series of stages known as phases that describe the architectural development process comprehensively. These stages include planning, business modeling, data management, application development, and technology infrastructure. TOGAF ADM guides how to identify problems, design solutions, and implement architectural changes. This framework helps ensure that system architecture and technology properly support the organization's business goals and strategy. TOGAF ADM (The Open Group Architecture Development Method) has several advantages and characteristics that make it a popular and effective architectural framework. Some of the main advantages and characteristics of TOGAF ADM include: (1) Flexible: TOGAF ADM offers flexibility that allows organizations to customize their stages according to their needs, allowing the selection of the most relevant stages and the abandonment of stages that do not suit their projects. (2) Open and Proven: TOGAF is an "open" architecture framework, meaning it can be used by many types of organizations without being tied to one particular vendor or service provider. TOGAF has also been proven effective in various organizations around the world. (3) Business-Oriented Approach: TOGAF ADM emphasizes the importance of aligning the architecture with the organization's business goals and strategy, ensuring that the architecture properly supports the business objectives. (4) Critical to Business Sustainability: TOGAF ADM considers continuous change and maintenance of the architecture, helping organizations to stay relevant in an ever-changing environment. (5) Layered Approach: TOGAF ADM organizes the architecture in layers or "layers," which makes it easier to understand and plan the system holistically. (6) Process Focused: TOGAF ADM focuses on the architectural development process, facilitating the evaluation, planning, and management of architectural change. (7) Strong Documentation: TOGAF ADM encourages the creation of strong documentation, which is essential for effective understanding and communication of the architecture. (8) Security Policy: TOGAF ADM considers the security aspects of the architecture and helps organizations build a secure architecture. (9) Scalability and Reusability: TOGAF ADM enables organizations to develop architectures that can be adapted and reused, saving time and resources. TOGAF ADM is used to plan, design, and implement effective and efficient enterprise architecture.

TOGAF ADM consists of several stages needed to build an enterprise architecture, namely: 1) Preliminary Phase, 2) Phase A: Architecture Vision, 3) Phase B: Business Architecture, 4) Phase C: Information System Architecture, 5) Phase D: Technology Architecture, 6) Phase E: Opportunities and Solutions, 7) Phase F: Migration Planning, 8) Phase G: Implementation Governance, 9) Phase H: Architecture Change Management, 10) Requirements Management.

This research discusses various aspects of information system architecture, including planning, modeling, and implementation, to ensure that SMK Negeri 1 Kismantoro can optimize its educational services. It is hoped that the results of this research will provide valuable guidance for other schools seeking to improve the efficiency, effectiveness, and quality of their education through the use of advanced information technology.

2. Method

This research has qualitative characteristics, and the research framework refers to the basic structure contained in The Open Group Architecture Framework or TOGAF (Fig. 1). Then the research stages and procedures were arranged based on the TOGAF ADM framework (Fig. 2).



Fig. 1 TOGAF Framework

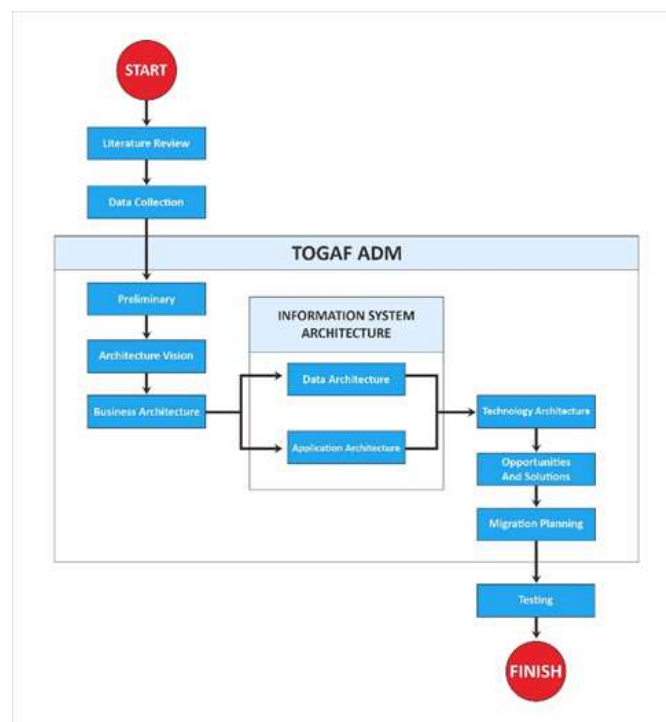


Fig. 2 Research Procedure

In the first stage of research, a literature study was carried out to understand the TOGAF ADM framework and related theories, methods, and relevant concepts, basic concepts related to school information system enterprise architecture. The literature study involves searching and analyzing reading materials, articles, journals, books, and online resources related to TOGAF ADM and best practices in enterprise architecture development. This stage aims to gain a strong understanding of the TOGAF ADM framework, preparation for data collection, and design of information system enterprise architecture at SMK Negeri 1 Kismantoro.

In the second stage, relevant data was collected from SMK Negeri 1 Kismantoro. Data was collected through various methods, such as interviews with stakeholders, surveys of school staff, teachers, and students, as well as analysis of school-related documents. The data collected includes information about the school's needs, business processes, existing technology infrastructure, and the school's future aspirations regarding information systems.

After data collection, in the third stage, enterprise architecture design was carried out using the TOGAF ADM framework. At this initial stage, several procedures implemented include analyzing the business environment using the SWOT method, along with identifying architectural principles. This includes the design stages of business architecture, information systems architecture, and technology architecture. In this stage, the data that has been collected is used to design architecture that suits the needs and vision of the school. This process includes modeling, documentation, and determining the technology solution to be implemented. In the next step, known as architectural vision, there is an important process that involves identifying the scope of the overall school information system design. The method used to achieve this is by mapping the main activities and supporting activities at SMK Negeri 1 Kismantoro using the value chain analysis method. Then, in the business architecture phase, business processes are further evaluated using the value chain diagram as a guide. The business processes that have been analyzed are then realized in the form of a Business Process Model and Notation (BPMN) model and recorded in the Business Process Working Sheet.

Next, in the information system architecture stage, there are two parts, namely application architecture and data architecture. The output of the application architecture is a recommended application catalog table based on the business processes in the previous stage. Meanwhile, in data architecture, there is a

process of identifying data entities that are used to support the application architecture. These data entities are then represented in the form of a class diagram.

The next step is the technology architecture phase, focus is given to critical elements such as technology infrastructure, software applications, as well as integration and implementation of information technology that supports the overall enterprise architecture. There is an analysis of the gaps between the existing architectural structure and the desired (target architecture), and technological solutions are identified in an effort to resolve these differences. This stage acts as a guide in establishing a technology environment that is in line with business strategy and organizational goals.

In this research, the Phase G: Implementation Governance and Phase H: Architecture Change Management stages of TOGAF ADM were not implemented, because these two stages are considered to be implemented simultaneously with the ongoing implementation process.

The final step in this research procedure is to test the sustainability of the blueprint and the results of recommendations for the implementation of Information Systems (IS) and Information Technology (IT) by applying the Focus Group Discussion (FGD) method.

The FGD was held involving various stakeholders from SMK Negeri 1 Kismantoro, including school staff, teachers, and students. FGD is used to validate and discuss the enterprise architecture design that has been prepared in the previous stage. The discussion in the FGD aims to obtain input, feedback, and perspectives from stakeholders who can help improve and perfect the architecture that has been designed.

All stages of this research were carried out carefully and systematically to ensure that the school information system enterprise architecture developed was by the needs of SMK Negeri 1 Kismantoro and could provide maximum benefits for the school.

3. Result and Discussion

3.1 Preparation Phase

This phase begins by identifying the main objectives of developing information system enterprise architecture at SMK Negeri 1 Kismantoro. These goals can include efforts to increase operational efficiency, improve the quality of educational services, or improve data management. The SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis phase in preparing the information system enterprise architecture at SMK Negeri 1 Kismantoro is an important step to understanding the internal conditions and external to the school. This helps formulate architectural strategies and plans that suit the needs and aspirations of the school.

The results of internal data collection are used to analyze the school's strengths and weaknesses. Apart from analyzing internal conditions, the team will also involve itself in analyzing external factors which include opportunities and threats.

The results of the SWOT analysis of the school's internal and external conditions are compiled in a report. This report will include findings, recommendations and a comprehensive picture of the state of the school and its environment.

The results of the analysis of the internal and external business environment in designing the information system enterprise architecture at SMK Negeri 1 Kismantoro using the SWOT method are described in Table 1.

Internal	
Strength	Weakness
The support and commitment from the Ministry of Education and Culture through the Education Office of Wonogiri District.	Some units do not yet have a well-integrated governance information system.
Having a significant number of alumni, some of whom hold key positions in both government and private enterprises.	Many information systems are still external or managed by the central government or local government.
The existence of the Information Technology Engineering Department at SMK Negeri 1 Kismantoro facilitates exploration in the field of technology.	Do not yet possess well-documented planning in the information system development plan.
Having a high commitment to the development of Information Systems.	
External	
Opportunity	Threat
With the continuous advancement of technology, the utilization of devices such as laptops/computers and smartphones has experienced an increase in productivity in line with the economic knowledge in the era of Industry 4.0.	The rapid advancement of technology has not been accompanied by optimal infrastructure and human resources.
Educational budget is also utilized to enhance the quality of Human Resources, add facilities to improve adaptation to technology, and support various activities.	The government's policy regarding the curriculum often undergoes changes at any given time.
The availability of service providers for web and mobile application development.	Do not yet possess well-documented planning in the information system development plan.

A training program that includes seminars and workshops for teachers and educational staff is conducted with the aim of enhancing the quality of human resources.

Table 1 - SWOT Analysis

Architectural principles will serve as a guide in making decisions when designing enterprise architecture, determining the structure and composition of each architectural element, determining criteria for technology selection, and guiding the architectural design and implementation process.

The principles that will be used as a reference in designing the enterprise architecture for the information system at SMK Negeri 1 Kismantoro are: 1) The architecture developed must be in accordance with the needs and business processes at SMK Negeri 1 Kismantoro; 2) The architecture developed must have data and information security and must be protected from access by unauthorized parties; 3) Easy data access; 4) The architecture developed must be integrated; 5) The architecture developed must be easy to repair.

3.2 Architectural Vision Phase

The results of scope identification in the architectural vision phase in preparing the enterprise architecture for the Kismantoro 1 State Vocational School Information System which is outlined in the value chain is an important initial stage in the architectural planning process. At this stage, the school's strategic goals and aspirations will be formulated by determining the main functions and supporting functions at SMK Negeri 1 Kismantoro. To be able to map the main functions and supporting functions of the school, a value chain analysis process is carried out. The results are depicted in the form of a value chain diagram (Fig. 3).

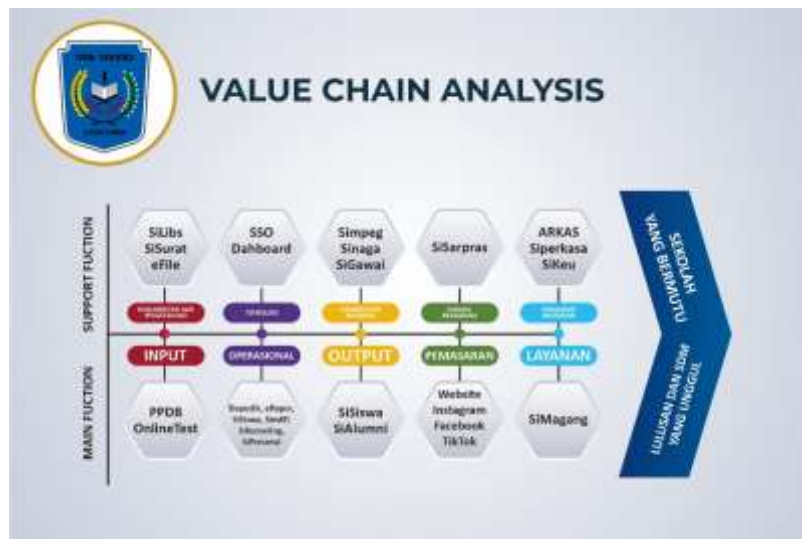


Fig. 3 Value Chain of SMK Negeri 1 Kismantoro

The architectural vision outlined in this value chain provides clear guidance on how information systems will create value in the educational context at SMK Negeri 1 Kismantoro. With a comprehensive understanding of primary and supporting functions, architectural vision can help design and implement information systems that provide maximum benefits to schools and their stakeholders.

3.3 Business Architecture Phase

At this stage, determining the business scope at SMK Negeri 1 Kismantoro refers to the results of the value chain analysis of SMK Negeri 1 Kismantoro (Fig. 2). Existing business processes include main functions and supporting functions. The main business process consists of 5 (five) processes, namely: 1) Input (admission of new students), 2) Operations (academic process), 3) Output (Graduates), and 4) Marketing, 5) Service. Supporting business processes consist of 5 (five) processes, namely: 1) documentation and knowledge management, 2) Information Technology, 3) human resource management, 4) facilities and infrastructure management, and 5) budget and financial management. Based on the results of the business process analysis, the business architecture of SMK Negeri 1 Kismantoro can be modeled as in Fig. 3.

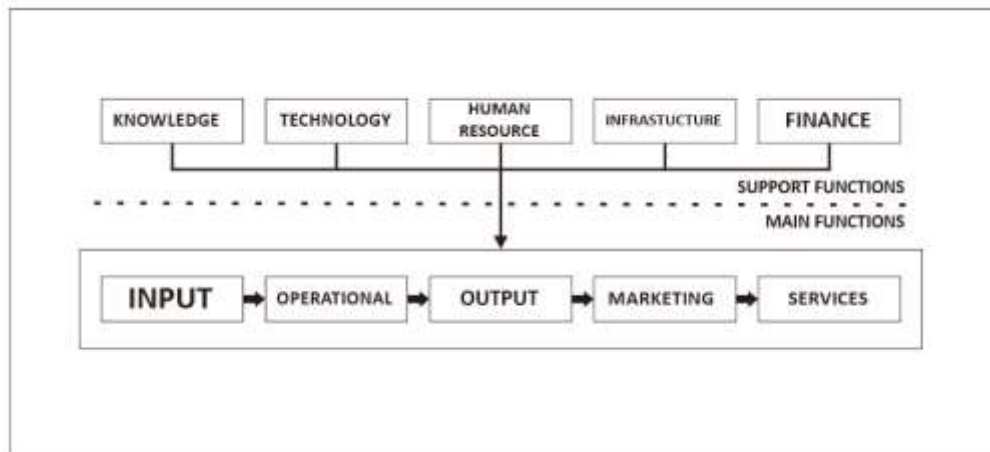


Fig. 4. Business Architecture Model

3.4 Information Systems Phase

In preparing the information system enterprise architecture at SMK Negeri 1 Kismantoro, there are two very important phases, namely the Application Architecture Phase and the Data Architecture Phase. In the application architecture phase, there are recommendations for information system design. The system recommendations are based on data, information, and tool requirements for each business function, both main and supporting functions. There are fourteen (14) recommended applications, including:

SCHOOL MANAGEMENT SYSTEMS		
No.	Application Name	Definition
1	SiSiswa	A functioning information system that manages student data, including registration information, attendance, grades, disciplinary records, and other personal data. It can also be utilized to generate reports and student transcripts.
2	SiGawai	The human resources information system is employed to manage data pertaining to teachers, staff, and school employees, encompassing personal information, employment history, salaries, and human resource administration for both civil servants (ASN) and non-civil servants.
3	SiKeu	This system manages the school's finances, including budgeting, expenditures, income, and financial reporting. It can also assist in managing student payments.
4	SiLibs	This system manages the school library inventory, book borrowing, cataloging, and library services.
5	LMS	This system assists in curriculum planning and management, class scheduling, instructional materials, as well as monitoring student progress.
6	SiPresensi	Attendance and Presence Management Information System (ePRSENSI)
7	SiCBT	Information system designed for conducting online tests in the selection process for new student admissions.
8	SiSurat	Efficient management correspondence information system. Starting from the process of incoming letters, disposition, to outgoing letters.
9	SiAlumni	This information system serves for the recording and management of alumni data.
10	SiKonseling	Guidance and counseling information system and student violation recording.
11	SiMagang	Internship Student Management Information System
12	SSO	Single Sign-On

13	SiDashboard	The executive dashboard information system is a system capable of integrating data with application systems within an institution, with the goal of presenting reports to support leadership in decision-making.
14	SiSarpras	This system is used to manage the school's inventory, equipment, and assets, including maintenance and repairs.

Table 2 - Application Recommendations

1) SiSiswa is an information system that functions to manage student data, such as registration information, attendance, grades, disciplinary records, and other personal data. It can also be used to generate student reports and transcripts. 2) The SiGawai personnel information system is used to manage data on teachers, staff, and school employees, including personal data, work history, salaries, and human resource administration for both ASN and non-ASN. 3) SiKeu This system manages school finances, including budgets, expenses, income, and financial reporting. It can also help in managing student payments. 4) SiLibs This system manages school library inventory, book lending, catalogs, and library services. 5) LMS (Learning Management System) This system helps in planning and managing curriculum, lesson schedules, and learning materials, as well as monitoring teacher development including maintenance and repair. 6) SiPresensi Information System which functions for Attendance and Attendance for students, teachers, and employees. 7) SiCBT Information system that functions to carry out online tests in selecting new student admissions. 8) SiSurat Paperless Office (PLO) information system, efficient mail management information system. Starting from the incoming letter process, disposition, to exit. 9) Alumni This information system functions to record and manage alumni data. 10) SiKonseling Information system for guidance and counseling and recording student violations. 11) SiMagang Information System which functions for managing street vendors and student internships. 12) Single Sign On Information System SSO to log in to the application in 1 portal according to access rights. 13) SiDashboard Executive dashboard information system, namely an information system that is capable of integrating data with application systems at institutions to present reports to support leaders in making decisions. 14) SiSarpras This system is used to manage school inventory, equipment, and assets, including maintenance and repairs.

The overall recommended application design can be mapped into a business architecture model (Fig. 4). The mapping results can be seen in Fig. 5.

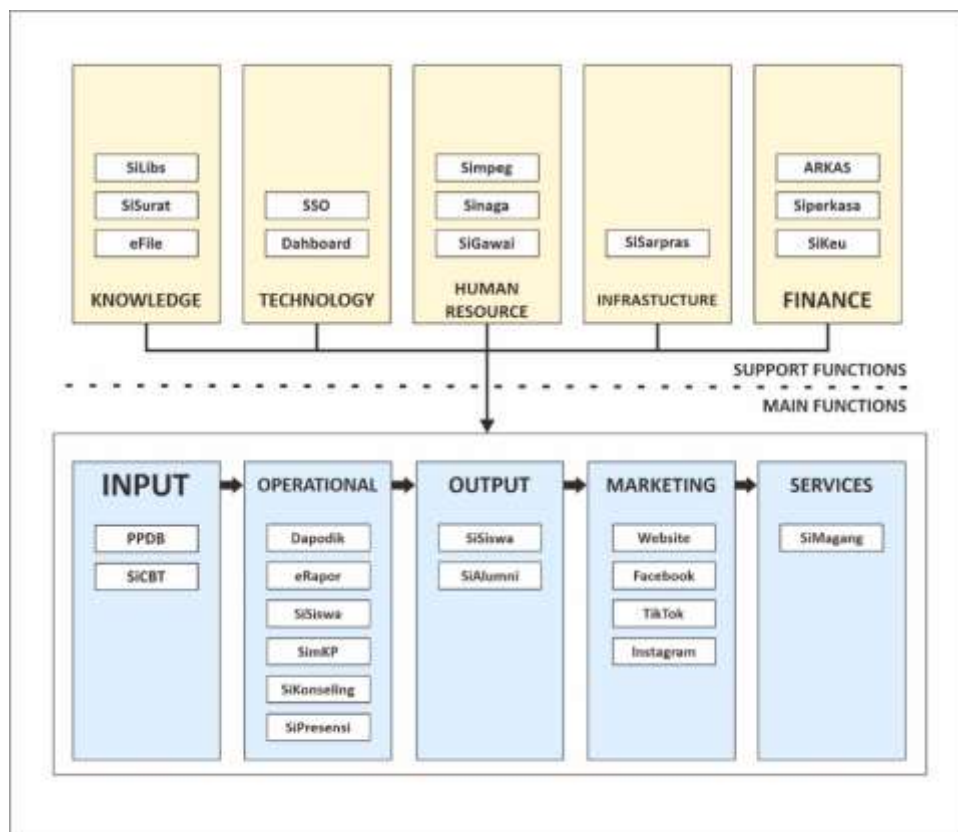


Fig. 5. Application Design Mapping

The application architecture can be modeled using the application landscape presented in Figure 6. Based on the application landscape, it can be seen that the school website can be accessed by the public. Then the systems which are application solutions are limited by user management. User management in this application landscape is in the form of a Single Sign On (SSO) system where users only need to carry out the authentication process once to be able to access existing systems. This SSO will allow a user who has logged in to access any application according to each user's access rights. All these systems are integrated via web services. Network security functions to prevent cybercrime in the form of data theft and data access by unauthorized parties.

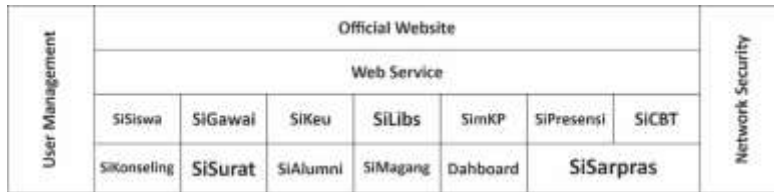


Fig. 6. Application Landscape

In the data architecture phase, it was identified that there were twenty-five (25) entities involved to support the data needs of the recommended application and depicted in a block diagram (Fig. 7).

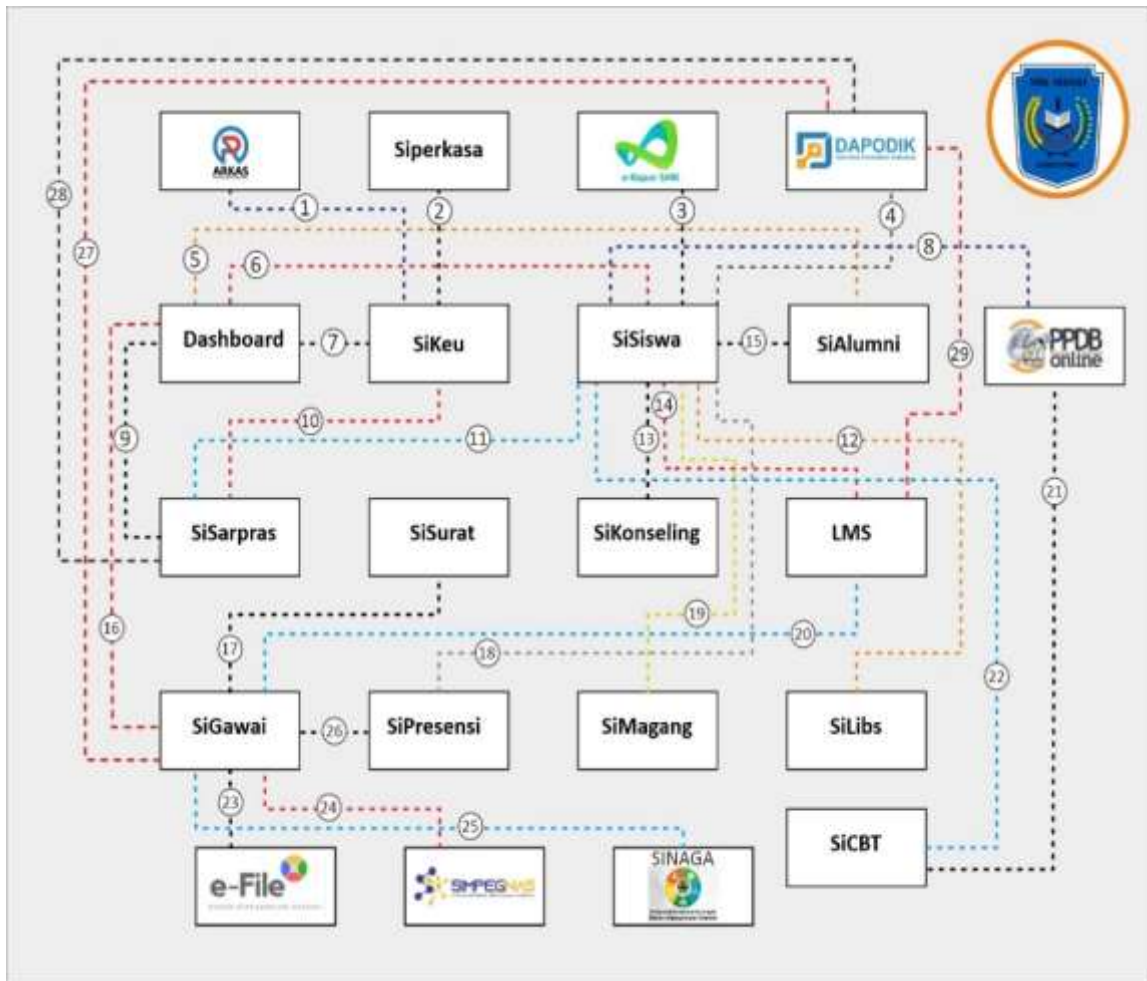


Fig. 7. Block Diagram

All these data entities are connected to each other. Each relationship is symbolized by a number notation from numbers 1 to 29 with information according to Table 3.

No.	Integration Information	No.	Integration Information
1	School Operational Assistance (BOS) Fund Data	16	Teacher and Staff Data
2	Education Operational Assistance (BOP) Fund Data	17	Teacher and Staff Data
3	Student Transcript Data	18	Student Attendance Data
4	Student Data	19	Student Internship Data
5	Alumni Data	20	Teacher Data
6	Student Data	21	Prospective Student Data
7	Planning and Financial Data	22	Prospective Student Grade Data

8	Prospective Student Data	23	Civil Servant Document Data
9	Asset Data	24	Civil Servant Data
10	Asset Depreciation Data	25	Civil Servant Attendance Data
11	Classroom Data and Laboratory Data	26	Teacher and Staff Data
12	Student Data	27	Teacher and Staff Data
13	Student Data	28	Facilities and Infrastructure Data
14	Student Data and Student Learning Activities Data	29	Curriculum Data
15	Graduated Student Data		

Table 3 - Entity Relationship Data Description Table

3.5 Technology Architecture Phase

The technology architecture phase aims to identify the technologies needed to support the operation of an integrated school information system. Apart from that, this phase also determines the technology standards that will be used to design an integrated school information system. From the results of the analysis, it was determined to design an integrated school information system using the PHP 8.2 programming language, a database management system (DBMS) using MySQL, and a framework using Laravel.

No	Needs	Technology used
1	Programming Languages	PHP 8.2
3	Database Management	MySQL
5	Framework	Laravel

Table 4 - Technology Needs

Apart from that, supporting infrastructure is needed, namely in the form of a server to support the development and implementation of an integrated school information system with the following minimum specifications:

Processor:

Number of Cores: Quad-core processor.

Clock Speed: Minimum 2.5 GHz.

Memory (RAM):

RAM Capacity: Minimum 8 GB RAM.

Storage:

Storage Capacity: Minimum 128 GB.

Storage Type: SSD (Solid State Drive)

Operating system:

Operating System: Linux (Ubuntu Server/CentOS)

3.6 Opportunity and Solution Phase

The results of the opportunities and solutions phase are an analysis of gaps in information systems and information technology infrastructure. The information system gap describes the current condition of the information system and the condition of the information system in the future and provides recommendations in the form of additions, updates, or continuing to operate. Information system gaps can be seen in Table 5.

		EKSISTING										
Nama Aplikasi		Aplikasi PPDB	Aplikasi Dapodik	Aplikasi e-Rapor	Aplikasi Perpustakaan	Official Website	ARKAS	SiPerkasa	Efile	Simpeg	SINAGA	Baru
FUTURE	Aplikasi PPDB	Retain										
	Aplikasi Dapodik		Retain									
	Aplikasi e-Rapor			Retain								
	Official Website					Update						
	ARKAS						Retain					
	SiPerkasa							Retain				
	Efile								Retain			
	Simpeg									Retain		
	SINAGA										Retain	
	SiGawai											Add
	SiKeu											Add
	SiLibs				Update							
	LMS											Add
	SiPresensi											Add
	SiCBT											Add
	SiSurat											Add
	SiAlumni											Add
	SiKonseling											Add
	SiMagang											Add
	SSO											Add
SiDashboard											Add	
SiSarpras											Add	

Fig. 8. Information Systems Gap Matrix

3.7 Migration Plan Phase

The results of analyzing the application implementation sequence using McFarland Strategic mapping are as follows in Table 6.

McFarland Strategic Quadrant	
Key Operational	Strategic
SiSiswa	SiLibs
LMS	SiPresensi
SICBT	SiMagang
High Potential	Support
SSO	SiGawai
SiSurat	SiKeu
SiKonseling	SiAlumni
SiDashboard	SiSarpras

Table 6 - McFarland Strategic Quadrant

Based on the implementation sequence and combined with resource availability and the level of difficulty of creating the information system, the implementation roadmap can be seen in Table 7.

No	Application	Years
1	SiSiswa	1
2	SiGawai	3
3	SiKeu	3
4	SiLibs	2
5	LMS	1
6	SiPresensi	2
7	SiCBT	1

8	SiSurat	4
9	SiAlumni	3
10	SiKonseling	4
11	SiMagang	2
12	SSO	4
13	SiDashboard	4
14	SiSarpras	3

Table 7 - System Development Roadmap

4. Testing

Focus Group Discussion (FGD) is an important stage in preparing the information system enterprise architecture at SMK Negeri 1 Kismantoro. FGD is a discussion forum that involves various stakeholders, such as school staff, teachers, students, parents, and school administrators, to discuss, validate, and obtain input that will be used in the architectural design process. This is an effective way to involve various stakeholders in the architectural design process. This makes it possible to gain valuable insights, validate ideas, and ensure that the resulting architecture will meet the needs of the school and the stakeholders involved. During the FGD process the Principal, Deputy Principal for Academic Affairs, Deputy Principal for Student Affairs, Deputy Principal for Public Relations, Deputy Principal for Facilities and Infrastructure, Head of the Informatics Development Team, and Head of Administration provided various input. Apart from that, a high level of enthusiasm for the development of information systems at SMK Negeri 1 Kismantoro was also visible during the FGD process.

The test results showed that the recommendations proposed by the researchers received a positive response from the FGD participants. However, in implementing this information system, several obstacles need to be overcome. One of the main obstacles is the change in habits that teachers, staff, and students need to make, who were previously accustomed to carrying out work manually. Apart from that, the age of teachers and staff can also be a factor that hinders the implementation process.

5. Conclusion

Based on the research results which have been explained by the research stages, the following conclusions can be drawn:

1. Management at SMK Negeri 1 Kismantoro has been successfully analyzed based on TOGAF ADM using value chain techniques. Based on the research results, it is known that the main activities at SMK Negeri 1 Kismantoro include the main business process consisting of 5 (four) processes, namely: 1) Input (admission of new students), 2) Operations (academic process), 3) Output (Graduates), and 4) Marketing, 5) Service. Supporting activities at SMK Negeri 1 Kismantoro include 5 (five) processes, namely: 1) documentation and knowledge management, 2) Information Technology, 3) human resource management, 4) facilities and infrastructure management, and 5) budget and financial management.
2. The design of the information system enterprise architecture at SMK Negeri 1 Kismantoro was carried out using 7 phases of the TOGAF ADM framework, namely the preparatory phase, architectural vision, business architecture, information system architecture consisting of application architecture and data architecture, technology architecture, opportunities and solutions, and migration plans.
3. This research produces information system recommendations which include SiSiswa, SiGawai, SiKeu, SiLibs, LMS, SiPresensi, SiCBT, SiSurat, SiAlumni, SiKonseling, SiMagang, SSO, SiDashboard, SiSarpras.
4. During the Focus Group Discussion, the results of this research were explained and presented to create recommendations for progress in information technology systems and institutional management by utilizing information systems. The results of this research received high enthusiasm from the participants consisting of the Principal, Deputy Principal for Academic Affairs, Deputy Principal for Student Affairs, Deputy Principal for Public Relations, Deputy Principal for Facilities and Infrastructure, Head of the Informatics Development Team, and Head of Management. Business. From the implementation of this FGD, the results were obtained that the researcher's recommendations were well received by the participants and it is hoped that they can be realized. Meanwhile, the obstacles that will be encountered when implementing this information system are in the process of changing the habits of teachers, staff, and students who have relied on manual work for a long time. And the age factor of teachers and employees will also be an obstacle in the adjustment process.

Based on the conclusions outlined above, the following suggestions can be given.

1. For SMK Negeri 1 Kismantoro

If the recommendations from this research are implemented by schools, it is hoped that schools will collaborate with parties who have knowledge and understand in detail the stages in TOGAF ADM modeling. So, what is implemented is by the design and can minimize errors in the process. It is also hoped that schools will prepare a budget draft carefully because every recommendation in the form of applications or infrastructure from the author requires quite a lot of money. A budget is prepared not only for procurement but also for maintenance.

2. For Further Researchers

This research has not tested a school's readiness to implement TOGAF ADM. For further research, it is recommended to test the school's readiness first before designing an enterprise architecture with TOGAF ADM. Each stage in TOGAF ADM can be carried out further research separately to obtain a more detailed enterprise architecture model. Each application recommendation can be carried out further research to create an implementation design. Further research can also be carried out to analyze and evaluate the user experience of application recommendations that have been implemented.

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