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Enterprise Architecture as a Smart Village Development Strategy with a Focus on Economic Services Using TOGAF 9.2 (Case Study: Advanced Village in Jambi Region)

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ABSTRACT

The smart village is the digital transformation concepts used to organize the economic sector improvement within the village government's scope in supporting and realizing the SDG's sustainable development goals. The selection of objects in this study was based on the Developed Village Index (IDM) classification in the Advanced Village group. Desa Sembubuk is one of the villages in Jambi Province with the status of IDM Advanced Village. The Sembubuk Village Government can carry out smart village implementation to optimize and increase the effectiveness and efficiency of village economic improvement programs such as community skills training and BUMDes management. In implementing a smart village, there must be alignment between the government's strategic plans and technological needs. For this reason, Enterprise Architecture (EA) design is required. The guidelines for creating EA in this study use the TOGAF 9.2 framework. The result of this research is an IT Roadmap and EA design in Sembubuk Village, which can be used as a guide in implementing a smart village.

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1. INTRODUCTION

The growth and evolution of information and communication technology (ICT) can be seen in virtually every aspect of modern living. The community has used the internet in almost all activities, from socializing to searching for information [1]. Likewise, in the aspect of government, IT utilization also encourages the improvement of good, effective and efficient governance, thereby increasing public trust in providing good services in the public sphere [2]. Village governments can also implement IT utilization in providing services to the community so that services become faster and more precise [3]. One form of IT utilization in rural areas is by implementing Smart Village.

Smart Village is a village-level sustainable development planning program focusing on knowledge-based local resource development, particularly in national village development planning [4]. The implementation smart village concept can support the government's efforts to improve sustainable village development in Indonesia. As a result, the Indonesian Ministry of Villages, Disadvantaged Regions, and Transmigration has adopted the United Nations Sustainable Development Goals (SDGs) as the guiding principle for sustainable village development, as outlined in Presidential Regulation No. 13 of 2020, commonly known as Permendes No. 13 of 2020. Village SDGs are integrated efforts at the village level in building socio-economic, environmental, legal and community governance [5]. Based on data from the Ministry of Villages, Indonesia's average village SDGs score in 2022 is still relatively low, at 45.2 out of 100. Therefore, applying the smart village concept can increase the SDGs score and accelerate sustainable development in the village.

Sembubuk Village is one of the Jambi Province villages with the status of Desa Maju. Sembubuk Village has a Village Medium-Term Development Plan (RPJMDes) as a guideline for carrying out all activities in the village. Several problems in the village are written in the guideline, especially in the economic sector.

Table 1. Village Issues Based on SDGs

SDGs	Problem
SDG 8 Equitable Economic Growth	There is still a lack of utilization and development of BUMDes
	Lack of community coaching/training in creating business opportunities.
SDGs 10 Villages Without Gaps	Absence of production from village MSMEs
	There is still a lack of utilization of BUMDes

Table 1 shows the economic problems in Sembubuk village, focusing on SDG 8 Equitable Economic Growth and SDG 10 Villages without Gaps. It can be seen from the table

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that the economic problems present in Sembubuk village are the lack of training to create business opportunities for the community and the lack of development and utilization of BUMDes.

By implementing smart villages, villages can strengthen their economic structure by creating innovations to produce products, thus increasing their competitiveness [6]. With a smart village, a village can also become a smart village and recognize ongoing problems, understand the circumstances of these problems and manage existing resources to achieve sustainable development the quality and efficacy of community services will improve. [7]. In order to facilitate the creation of a Smart Village in Sembubuk Village, it is essential to implement an Enterprise Architecture (EA) that can synchronize the endeavors of the Sembubuk Village administration to enhance the delivery of economic services in the village with the demands of information technology (IT). This framework will enable a cohesive and coordinated approach to the implementation of Smart Village initiatives, ensuring that they are aligned with the overall development goals of the village. By integrating IT solutions with economic development strategies, the EA will help to maximize the benefits of Smart Village technology and promote sustainable economic growth in the community.

Enterprise Architecture is a structural approach that integrates information technology to help businesses, and IT align, processes, organizational functions, and related stakeholders in an organization [8]. In this research, the EA framework that will be used is TOGAF 9.2 because it provides a detailed method for building and implementing enterprise Architecture and IT [9]. The primary purpose of recommending a Smart Village Enterprise Architecture Framework for Village Government is to provide detailed guidance on how to implement a government architecture framework in practice [10]. Applying TOGAF 9.2 to the design of Enterprise Architecture in implementing a smart village in Sembubuk Village can improve village services to be more effective and efficient to increase community satisfaction.

2. LITERATURE REVIEW

2.1. Enterprise Architecture

Enterprise architecture acts as a blueprint for establishing the structure and functions of the organization since it is the method for assuring compliance, consistency, and efficiency in information management [12]. Enterprise Architecture can help organizations in re-organizing. EA is also useful for providing guidelines to the organization by determining standards and unifying processes to be more consistent. The discipline of enterprise architecture is responsible for overseeing the basic structure of the organization. The basic structure of an organization is represented by its components and the relationships among them [13]. Enterprise architecture serves as a tool to influence, direct, and restrict organizational decisions, particularly those related to technology

investments. Its primary purpose is to provide guidance and constraints during decision-making processes [14].

When designing an enterprise architecture, a framework is needed to simplify the design. Framework is a concept, idea or thought used to manage the thought process of a situation [15]. One of the frameworks that exist in enterprise architecture is TOGAF.

2.2. TOGAF

To facilitate the design of Enterprise Architecture, a framework is required. Framework is several concepts, ideas and thoughts that are used to manage the thought process of a situation [15]. TOGAF (The Open Group Architecture Framework) is a framework used for designing enterprise architecture that provides methods for creating, implementing, and managing enterprise information technology architecture. Its main purpose is to offer a structured approach for designing and managing IT systems within an organization [16]. The TOGAF framework offers a supporting approach that facilitates the design of information systems by offering guidelines and suggestions for what should be done to achieve the best results [17]. TOGAF provides a clearer and more specific understanding of how to plan and design an enterprise architecture model [18]. TOGAF Framework consists of several stages; Figure 1 displays the stages of TOGAF.

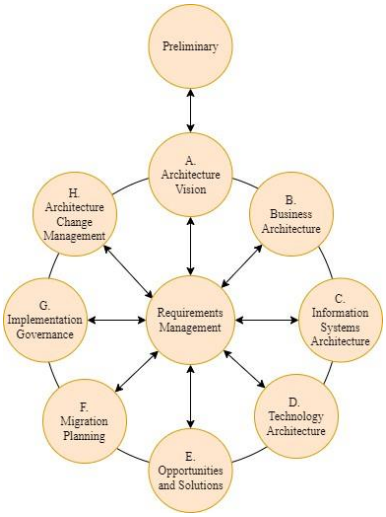

Figure 1. TOGAF Phase

2.3. Smart Village

Smart Village is a village-level sustainable development planning program focusing on developing knowledge-based local resources, especially in national village development

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planning [4]. Information technology plays an important role in realizing smart villages; this is used to increase village progress and independence. In developing smart villages in Indonesia, it is necessary to consider that differences in situations and conditions in each region will affect the realization of smart villages [19]. Smart villages are examples where digital development, and the implementation of information technology is primarily focused on the local government level of villages [20]. One strategy for achieving the Sustainable Development Goals (SDGs) in villages is the smart village.

2.4. Village SDGs Indonesia

Village SDGs are integrated efforts at the village level in building socio-economic, environmental, legal and community governance [5]. The Village SDGs have also been established as the basis for sustainable development based on Parmenides No. 13 of 2020. The Village SDGs indicator points adopt from the National SDGs by adding one indicator point, so the Village SDGs have 18 indicator points. The SDGs indicators will be shown in the figure below.

Figure 2. Village SDGs Indonesia

2.5. Village Development Index (IDM)

The Ministry of Villages, Regional Development and Transmigration has approved the IDM (Indicative Development Map) through Permendes No. 2/2016. The IDM is designed to support rural development initiatives [21]. IDM is based on three indices, namely:

1) Social Resilience Index focuses on aspects of the settlement, health, social capital and education.
2) The Economic Resilience Index focuses on access to trade centers, community production diversity, regional openness, and access to banking and credit.
3) The Ecological/Environmental Resilience Index focuses on aspects of environmental quality, disaster response and natural disasters.

Jurnal Teknologi Informasi dan Pendidikan
Volume 17, No. 1, March 2023
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Table 2. Village Classification Based on IDM

Village Status	IDM Boundary Value
Very Disadvantaged	≤ 0,491
Disadvantaged	> 0,491 dan ≤ 0,599
Developing	> 0,599 dan ≤ 0,707
Advanced	> 0,707dan ≤ 0,815
Independent	> 0,815

Table 2 describe classifies villages into five statuses to identify the status of village development and recommend necessary development strategies.

3. RESEARCH METHOD

3.1. Conceptual Model

The conceptual model is a flow of concepts used in research to understand, apply and assess information systems research by emphasizing the problems that occur and the basic theories related to information systems development [11].

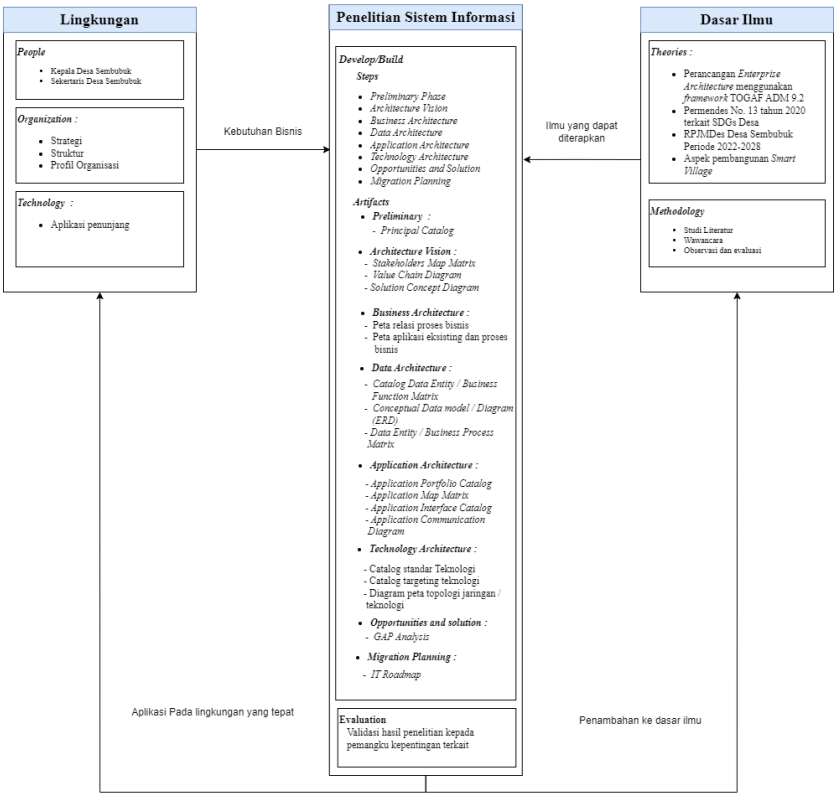

Figure 3. Conceptual Model

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The conceptual model utilized in this research is shown in the above figure, which consists of three components: environment, information systems research, and basic science. The first component is the environment that describes the current issue.; the second component is the information systems research that, contains the steps in building enterprise architecture and basic science elements that are a reference for conducting this research.

3.2. Object

Sembubuk village is located in the Jambi Luar Kota subdistrict, in Muaro Jambi regency, Jambi province, with an area of ± 250 hectares. Sembubuk village has two hamlets, namely Teluk Ketapang and Pantai Layang. The total population of the town at the beginning of 2022 was 1,844. The majority of Sembubuk residents work as labourers, farmers and traders. According to the IDM, Sembubuk is classified as an "advanced" village with 0.769 and an SDG value of 41.05.

Table 1 shows that Sembubuk village's economic problems include lack of training to create business opportunities for the community and lack of BUMDes development and utilization. To overcome these problems, designing a
smart village using enterprise architecture with the TOGAF framework is necessary. Indeed, the EA can align the efforts of the Sembubuk village government to improve economic services in the village with IT needs. Moreover, the TOGAF 9.2 Framework on Enterprise Architecture can provide a comprehensive description of the needs that support the implementation of information systems in the village administration and offer guidelines and suggestions for implementing information systems in smart villages. With TOGAF 9.2, the village government of Sembubuk can also identify the information systems that the needs and objectives of the village government will develop.

4. RESULTS AND DISCUSSION

4.1. Preliminary Phase

Preliminary phase will describe the principles required by the organization in carrying out business activities ranging from business elements, data, applications and technology that will be used to develop Enterprise Architecture.

Table 3. Principle Catalog

Domain	Principle
Business Architecture	*Primacy of principle* *Information Management and integration principles* *Transparency Information* *Compliance with Law*

	Quality human resources. Sustainable BUMDes
Data Architecture	*Data is an asset* *Data Integration* *Access Data* *Data security* *Data valid* *Data Realtime*
Application Architecture	*Application* *usability* *Application integration* *Application flexibility* *Interoperability*
Technology Architecture	*Control and Maintenance* *Technology infrastructure Security*

Table 3 shows the principles used to develop EA in the economic service function in Sembubuk village. The record of codes was set based on the requirements of the identification results of the interviews, the RPJMDes of Sembubuk village and the results of this identification were adapted to the circumstances and objectives of Sembubuk village.

4.2. Architecture Vision

Architecture Vision identifies the scope, stakeholders and approval of EA design from related parties. In this stage, the objectives and constraints of the EA design will also be discussed concerning the to-be-developed smart village concept. The output generated from this phase is the Value Chain Diagram shown in Figure 4, which explains the values held by the organization based on business activities and interactions with external parties. Moreover, Figure 5 illustrates the Solution Concept Diagram that visualizes the solutions that will be developed to achieve the architecture target.

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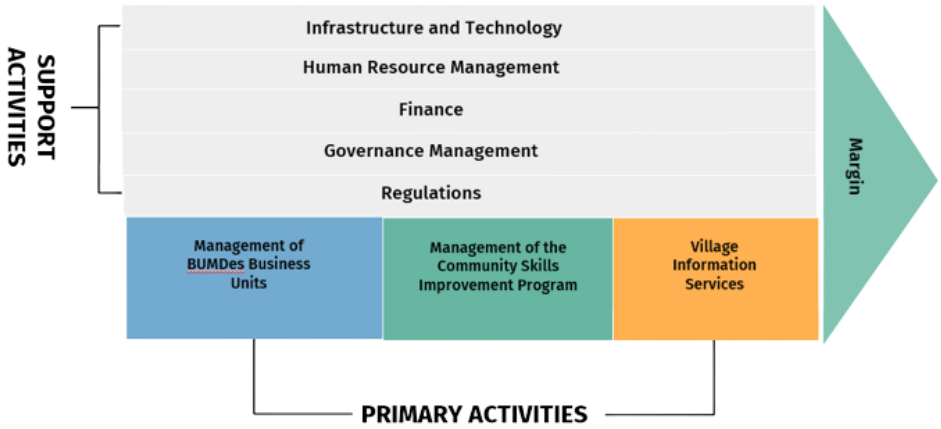

Figure 1. Value Chain Diagram

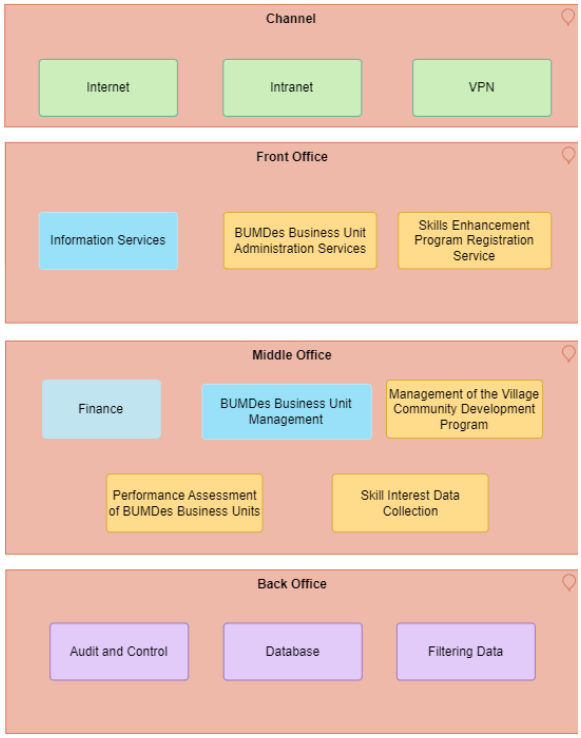

Figure 2. Solution Concept Diagram

4.3. Business Architecture

Business architecture is the stage in which an organization describes its needs in carrying out its business operations and functions to achieve a given goal. This phase will

produce output artifacts in the form of Process/Event/Control/Product Catalog, which describes the relationship between various business processes of the organization and the business services involved and Service Catalog, which will describe the needs of each service to be targeted.

Table 4. Process/Event/Control/Product Catalog

Service	Business Process	Description
Management of BUMDes business units	Administration of BUMDes Business Unit establishment	Business processes related to the application for the establishment of BUMDes business units
	Activity reporting and Monitoring of BUMDes business unit activities	The business process of reporting activities and monitoring BUMDes activities based on reports and BUMDes Business Performance Index
	Business Performance Index Assessment	The business process of assessing defined Business Performance Indicators and providing activity recommendations to improve the value of related indicators
Management of community skills enhancement	Recording people's skill interests	The process of recording the interests of the skills that the community wants to master through IT aims to target the training activities.
	Planning for community skills training	The planning process for organizing training in the village.
	Preparation of community skills training	The preparation process for organizing skills training
	Registration of community skills training	Online registration of trainees
Village Information Service	Reporting and Monitoring of Training Implementation	The Business process of reporting and monitoring training activities by utilizing information technology
	Career Information Provision	The Business process of providing career-related information around the village
	Provision of APBDes Information	The Business process for providing transparency of village budget information
Finance	Budget Data Collection Process	RKPDesa budget data collection process through SISKEUDes application
	Budget Disbursement Process	Disbursement process of activity budget

Table 4 describes the catalogue of processes/events/controls/products in the economic services function, which focuses on the BUMDes business unit's management services, community skills improvement programs, village finance and information, and the business processes that support the management of these services.

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Table 5. Service Catalog

Service	Requirement
Management of BUMDes business units	Develop information system technology related to BUMDes management, starting from administration, reporting, and monitoring activities. The existence of an information system in assessing the performance of BUMDes business units so that it can assist business units in evaluating and improving their business performance.
Management of community skills enhancement	Develop a management information system for community skills improvement programs.
Village Information Service	Provision of platforms for information dissemination and disclosure.
Finance	Improving transparency of government budgets and finances through the development of digital information systems.

Table 5 illustrates the services developed in this study in the form of BUMDes business unit management services, community skills management, village information services and finance.

4.4. Information Architecture

4.4.1. Data Architecture

As part of the EA design and fulfillment of the requirements set at the Business Architecture stage, the Data Architecture phase is needed to determine the data entities used. This phase will produce an artifact as a data dissemination diagram to illustrating the relationships between business service entities, data and application components. The figure below is the data dissemination diagram of the Village Government based on the application that will be targeted.

Jurnal Teknologi Informasi dan Pendidikan
Volume 17, No. 1, March 2023
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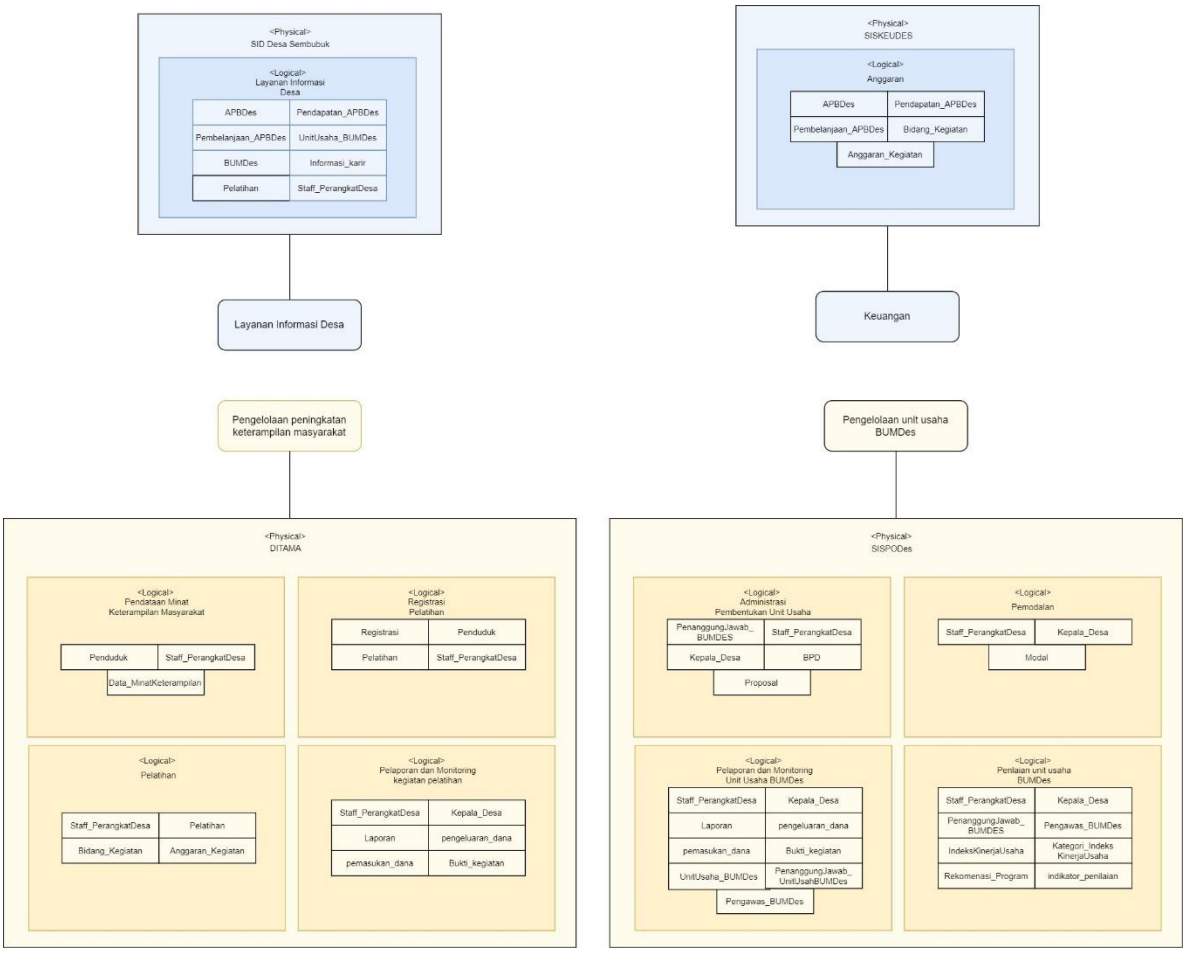

Figure 3. Data Dissemination Diagram

4.4.2. Application Architecture

This phase explains the research results obtained in detail, which can be expressed as tables, program codes or graphs for easy understanding. The table follows the following format. Application architecture is a stage that explains the design of application systems related to business processes in Sembubuk Village and refers to the needs and regulations of the previous architectural principles. This phase produces an Application Portfolio Catalog, and Application Communication Diagrams that shows the communication between existing and targeting applications in the technology development function.

Table 6. Application Portfolio Catalog

Physical Application Component	**Description**
Existing	

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SISKEUDes	SISKEUDES is a village budget control application from planning to accountability.
SID Desa Sembubuk	Village websites inform village profiles, village potential, and village news.
	Targeting
SISPODes	SISPODes is an economic improvement management application in Sembubuk Village focusing on developing BUMDes business unit management activities.
DITAMA	DITAMA is an application that functions to manage village community skills improvement activities.

Application portfolio catalog used to explain the applications used to support the operational activities of business functions in the organization. This artifact was designed using physical application metamodel components that describe existing applications and targeting the Sembubuk Village government, especially mushroom economic services.

Table 7. Application / Function Matrix

	Management of BUMDes business units	Management of community skills enhancement	Village Information Service	Finance
SISKEUDes	-	-	-	V
SID Desa Sembubuk	-	-	V	-
SISPODes	V	-	-	-
DITAMA	-	V	-	-

Table 7. Describe about Application / Function Matrix that explains the relationship between applications and business functions in Sembubuk Village Government agencies

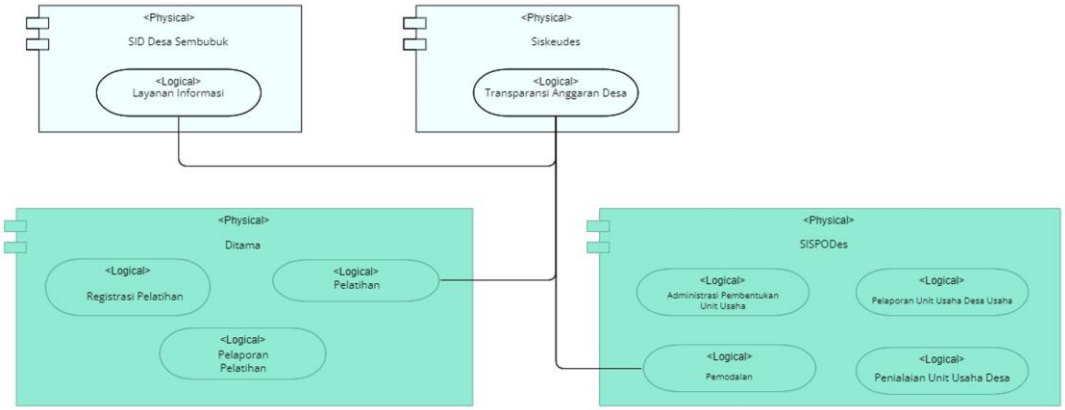

Figure 4. Application Communication Diagram

Figure 7. Describe about application Communication Diagrams that shows the communication between existing and targeting applications in the technology development function

Jurnal Teknologi Informasi dan Pendidikan
Volume 17, No. 1, March 2023
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4.4.3. Technology Architecture

Technology Architecture is a phase that defines how technology will be used in the form of software, hardware and network infrastructure needed to support the operation of an application in carrying out operational functions in business processes in the Village Government. This phase produces artifacts in the form of the platform decomposition diagram, illustrates all aspects of the infrastructure and provides an overview of the technology used by the Sembubuk village government.

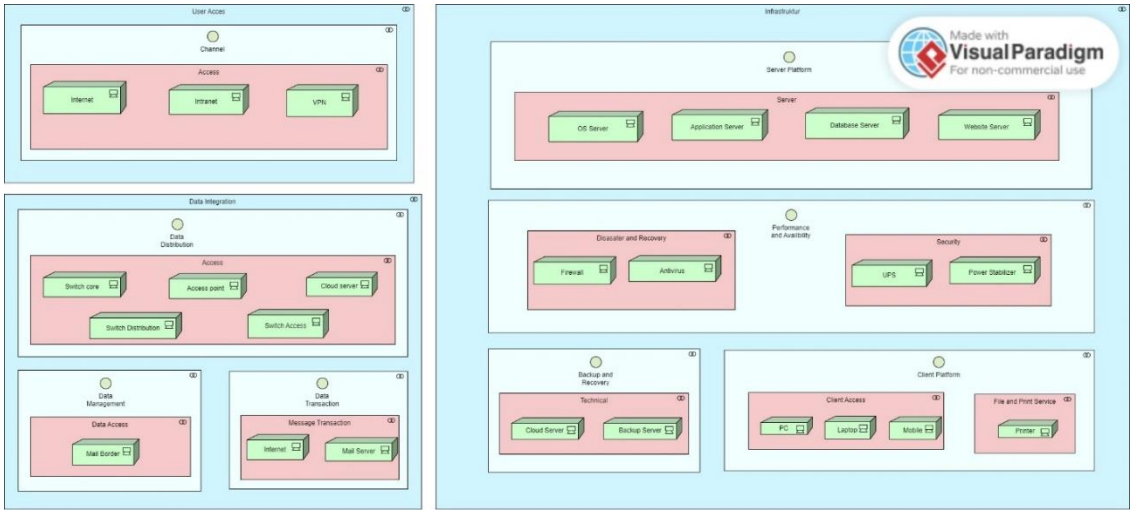

Figure 5. The Platform Decomposition Diagram

4.4.5. Comparison of Research Results and Previous Research

In preparing this study, it is necessary to conduct a literature review of previous research on smart villages to provide a reference and study material for compiling the current study. Table 2-7 below illustrates the comparison between the recent research and previous research.

Table 8. Comparison of Research Results and Previous Research

Title	Author	Year	Objective	Result
Enterprise Architecture as a Smart Village Development Strategy with a Focus on Economic Services Using TOGAF 9.2 (Case Study: Advanced	Putri Raudatul Jannah, Asti Amalia Nur Fajrillah, Widyatasya Agustika Nurtrisha	2022	1. Implement the smart village concept by applying Enterprise Architecture TOGAF 9.2 in Sembubuk, Indonesia, focusing on developing economic services.	The research result of this paper is the development of a smart village development strategy in Sembubuk village with a focus on developing economic services using the TOGAF 9.2 framework. The research also led to the design of an Enterprise Architecture (EA) that can guide the

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Village in Jambi Region)			2. Improve the village's economic sector through digital transformation, aligning with the Sustainable Development Goals (SDGs).	implementation of a smart village in Sembubuk.
Enterprise Architecture: A Strategy to Achieve e-Government Dimension of Smart Village Using TOGAF ADM 9.2	Muhammad Ilham Alhari & Asti Amalia Nur Fajrillah	2022	1. Design of an enterprise architecture model (smart village) using the TOGAF ADM 9.2 approach to governance. 2. Creating an EA model for smart villages to guide the digital development strategy in the Governance dimension.	This research results in an EA project on smart village development that will serve as a guideline for digital development strategies in the e-government dimension, covering various aspects of government services, public development aspirations and village government management.
Development of creative economy through synergy with BUMDES and Smart Village	Keumala Hayati	2021	Discuss creative economic development using BUMDes and smart villages.	This research shows that synergy is needed between the creative economy, BUMDes and smart villages. Government, universities, media, businesses and communities should support this synergy.
The Smart Village Model for Rural Area (Case Study: Banyuwangi Regency	A.A. Aziiza & T. D Susanto	2021	Propose a smart village model that can be adapted to the villages in Banyuwangi regency.	This research provides a model of a smart village consisting of 6 dimensions: governance, technology, resources, village services, housing and tourism.

The four papers in Table 8 show differences in the objectives and results of this and previous research. This is due to the differences in the existing conditions and problems in each region. It can also be concluded from these four papers that implementing a smart village requires local government support, community participation, and infrastructure that supports its management.

5. CONCLUSION

According to the findings of the research on creating enterprise architecture for the smart village development strategy, with a focus on the economic services function in the Sembubuk Village Government, using the TOGAF 9.2 approach, the following conclusions can be drawn:

1) Business Architecture produces a design in the form of business process analysis by adopting the use of IT; this is done because some processes in the Sembubuk Village Government, such as the BUMDes Business Unit Management Process and the Skills Improvement Program, are still not supported by the use of information systems.

2) The Information system phase involves two categories: Data Architecture and Application Architecture. The former focuses on generating necessary data analysis for economic services through the creation of data entities and data integration. In the latter, existing applications such as SISKEUDes and Sembubuk Village SID are developed, while new applications like DITAMA and SISPODes are added to enhance the efficiency of village economic activities.
3) In the Technology Architecture phase, the technology component in Sembubuk Village still requires adjustments to the IT infrastructure to support the implementation of the adoption of information systems and requirements for the economic services function. Therefore, the targeting planning proposes adding and developing technology components in the village.

With the IT Blueprint as an Enterprise Architecture design, it can guide IT design to meet the proposed target of implementing a smart village in the Sembubuk Village Government.

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