

Enhancing SDGs in Barito Kuala: Enterprise Architecture for Smart Village Development using TOGAF ADM 9.2 in Sungai Pitung

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Abstract

Sustainable village development is essential for realizing the Sustainable Development Goals (SDGs), specifically regarding poverty eradication (SDG 1), inequality reduction (SDG 10), and the establishment of sustainable communities (SDG 11). This study formulates a smart village framework for Sungai Pitung Village, Barito Kuala, by utilizing the Village Information System (SID) to enhance local governance and economic conditions. The methodology employs TOGAF ADM 9.2, covering the Preliminary phase, Architecture Vision, Business Architecture, Information Systems Architecture, and Technology Architecture. The novelty of this research lies in the strategic integration of Village Development Index (IDM) indicators and Village SDGs (Ministerial Regulation No. 13 of 2020) directly into the architectural blueprints. This approach ensures that the resulting digital roadmap is legally and contextually compliant with Indonesian rural mandates. The framework is validated through a formal evaluation of research results with relevant stakeholders to ensure it addresses the digital divide and operational inefficiencies. The findings provide a holistic IT architecture that standardizes technology catalogs and aligns village services with national development targets, ultimately fostering an enhanced quality of life for rural inhabitants.

Keywords: e-Government, enterprise architecture, SDGs, smart village, TOGAF ADM 9.2

1 Introduction

Rural development within the Indonesian context assumes an essential and pivotal role in bolstering the national agenda aimed at realizing the Sustainable Development Goals (SDGs), particularly in the realms of alleviating poverty, mitigating inequality, and nurturing the establishment of sustainable communities that can thrive in the long term [1] [2] [3]. The development of villages is not merely a local concern but rather a significant factor influencing the broader spectrum of national progress; however, the reliance on manual systems for village data collection and management severely hampers the potential for advancement in these areas. In accordance with Law No. 6 of 2014, which pertains to the governance of Villages, it is mandated that regional governments take proactive measures to develop comprehensive village information systems that will facilitate the dissemination of accessible information and reports to the populace, thereby leveraging the capabilities of Information and Communication Technology (ICT) or e-Government initiatives [4] [5] [6]. The establishment of the Village Information System (SID) has been instrumental in generating digital data pertaining to villages, which not only enhances accessibility but also supports a more streamlined and efficient approach to development processes [7] [8]. Furthermore, the deployment of a website or a dedicated village information system can serve as a powerful tool to augment technology-based services, ultimately leading to the creation of what is termed a "smart village," where modern technology can improve daily life and governance [9] [10] [11] [12] [13] [14].

In the specific case of Sungai Pitung Village, located within the jurisdiction of Barito Kuala Regency, the implementation of the smart village paradigm emerges as an exceptionally pertinent strategy, given the village's considerable potential for developmental growth, albeit it continues to grapple with challenges related to the accessibility of information and the overall efficiency of village

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governance structures. One of the methodologies that can be effectively employed in both the planning and design phases of e-Government initiatives is TOGAF, which stands for The Open Group Architecture Framework, a systematic approach that yields an enterprise architecture capable of being utilized by local governmental bodies to successfully execute the e-Government model tailored for village contexts, thereby paving the way for the realization of a smart village. By embracing TOGAF ADM 9.2 [15] [16] [17], the stakeholders in Sungai Pitung Village aspire to craft a comprehensive smart village blueprint that is aligned with and actively supports the attainment of the SDGs, particularly in the enhancement of transparency, operational efficiency, and the overall accessibility of information for the general public. This innovative concept not only fortifies the governance structures within the village but also catalyzes the digitization of rural areas, thereby facilitating a vital connection between rural communities and urban centers, which in turn serves to elevate the quality of life and the overall welfare of the inhabitants of these villages.

The primary research problem that this study seeks to address revolves around the inquiry into how the practical application of a smart village framework, underpinned by the Village Information System (SID), in the context of Sungai Pitung Village can effectively enhance transparency, operational efficiency, and access to information, while concurrently supporting the broader objectives associated with the achievement of the Sustainable Development Goals (SDGs). The pressing urgency that underscores this research is rooted in the critical importance of digitizing villages in order to effectively bridge the existing digital divide that is often prevalent in rural locales, thereby accelerating the process of digital transformation and contributing meaningfully to sustainable development initiatives. Sungai Pitung Village stands as a tangible illustration of how the successful implementation of a smart village model can significantly contribute not only to the progressive development of the village itself but also to the overall enhancement of the well-being and quality of life experienced by the community as a whole. To guide this development, this study formulates the following **research questions**: 1) How can the TOGAF ADM 9.2 methodology be operationalized to bridge the gap between manual village administration and digital requirements? and 2) How can the EA blueprint integrate the Village Development Index (IDM) to ensure digital transformation directly contributes to the SDGs? The primary **contributions** of this research include a contextualized architectural framework for rural governance and a standardized technology catalog for scaling e-government services in similar village contexts.

2 Literature Review

Enterprise architecture serves as a foundational schema for delineating the organizational structure and operational capabilities, functioning as a mechanism to ensure compliance, consistency, and efficacy in the management of information. It facilitates the reconfiguration of organizations. Furthermore, enterprise architecture provides essential directives by establishing standards and harmonizing processes to enhance consistency. This academic discipline is tasked with supervising the fundamental architecture of the organization. The fundamental architecture is characterized by its constituent elements and their interrelations. Enterprise architecture functions as an instrument to shape, guide, and constrain organizational choices, particularly those pertaining to technological investments [18]. Its principal objective is to furnish direction and limitations during the decision-making process. The creation of an enterprise architecture necessitates a framework to streamline the design effort. A framework represents a conceptual model or idea utilized to navigate the cognitive processes within a given context. Among the various frameworks available in enterprise architecture is TOGAF.

In order to enhance the development of Enterprise Architecture, a comprehensive framework is essential. A framework encompasses a variety of concepts, ideas, and perspectives utilized to organize the cognitive processes related to a given scenario. TOGAF (The Open Group Architecture Framework) serves as a framework for the design of enterprise architecture, offering methodologies for the creation, execution, and governance of enterprise information technology architecture. Its primary objective is to provide a systematic methodology for the design and management of IT systems within an organization. The TOGAF framework presents a supportive approach that aids in the design of information systems by supplying guidelines and recommendations aimed at achieving optimal outcomes. TOGAF elucidates a more precise and detailed comprehension of how to strategize

and construct an enterprise architecture model. The TOGAF Framework comprises multiple phases; **Figure 1** illustrates the various stages of TOGAF.

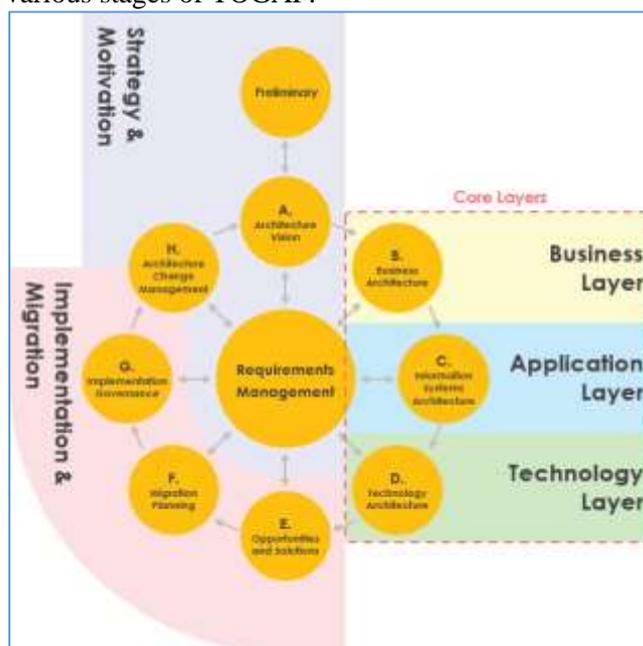


Figure 1 TOGAF ADM phases

This study will concentrate on the formulation of the architectural framework for the Village Information System (SID) in Sungai Pitung Village, aimed at enhancing the efficiency of business processes and facilitating the realization of a digital-centric smart village paradigm that aligns with the Sustainable Development Goals (SDGs). A business process is defined as a sequence of interconnected and sequential activities executed with the objective of attaining a particular outcome. Consequently, this study will progress through the phases of Preliminary Phase, Phase A: Architectural Vision, Phase B: Business Architecture, Phase C: Information System Architecture, and Phase D: Technological Architecture.

Several prior investigations utilized as reference materials pertinent to this analysis encompass the research conducted by Raudatul Jannah et al., which scrutinized the implementation of the smart village paradigm in Sembubuk Village, Jambi, with an emphasis on enhancing the economic sector through the application of Enterprise Architecture (EA) formulated with the TOGAF 9.2 framework. This endeavor culminated in the creation of an IT Roadmap and an EA blueprint to serve as a reference for smart village execution [19]. Additionally, the inquiry by Insyra et al. examined the deployment of smart villages within the Village Service dimension, employing TOGAF ADM 9.2 to craft an efficacious information technology architecture aimed at bolstering sustainable development in villages, informed by the Village Development Index (IDM) and the Sustainable Development Goals (SDGs), thereby potentially elevating the economic quality of life for residents and improving access to MSME services [20]. The investigation by Yusriyahti et al. also underscores the formulation of an Enterprise Architecture tailored for village governance within a smart village context, concentrating on educational services in Pagerharjo Village, Yogyakarta. This study aspires to facilitate the attainment of the fourth SDG, which pertains to quality education, through the establishment of a holistic information technology framework and project development strategy [21]. Collectively, these three scholarly works furnish a robust basis for advancing the smart village concept within this research, concentrating on the enhancement of village services that underpin the realization of sustainable development objectives at the local level. Despite these previous efforts, a notable **research gap** remains in aligning EA designs with the specific Village Development Index (IDM) metrics. The **novelty** of this study lies in the strategic integration of IDM indicators and the Village SDGs (Ministerial Regulation No. 13 of 2020) directly into the Architecture Vision and Business Architecture phases, ensuring that the resulting roadmap is legally and contextually compliant with Indonesian rural mandates.

By formulating an Enterprise Architecture framework for the Smart Village initiative to tackle the challenges faced by Sungai Pitung Village in enhancing regional development through the utilization of information technology. The objective of executing the Smart Village concept through the creation of this foundational plan is to harmonize the interests of governmental entities and technological advancements in the provision of Village Services, thereby ensuring that business operations function efficiently and effectively. In this regard, this study concentrates on fulfilling the primary goals through the application of the TOGAF ADM 9.2 framework to actualize the Smart Village framework within Sungai Pitung Village.

3 Research Method

The conceptual model represents a systematic arrangement of theoretical constructs that are employed within the realm of academic inquiry to facilitate a comprehensive understanding, practical application, and critical evaluation of research pertaining to information systems, with a particular focus on highlighting the various challenges and dilemmas that may arise during the course of this research, as well as elucidating the foundational theories that are intrinsically linked to the development and evolution of information systems [22].

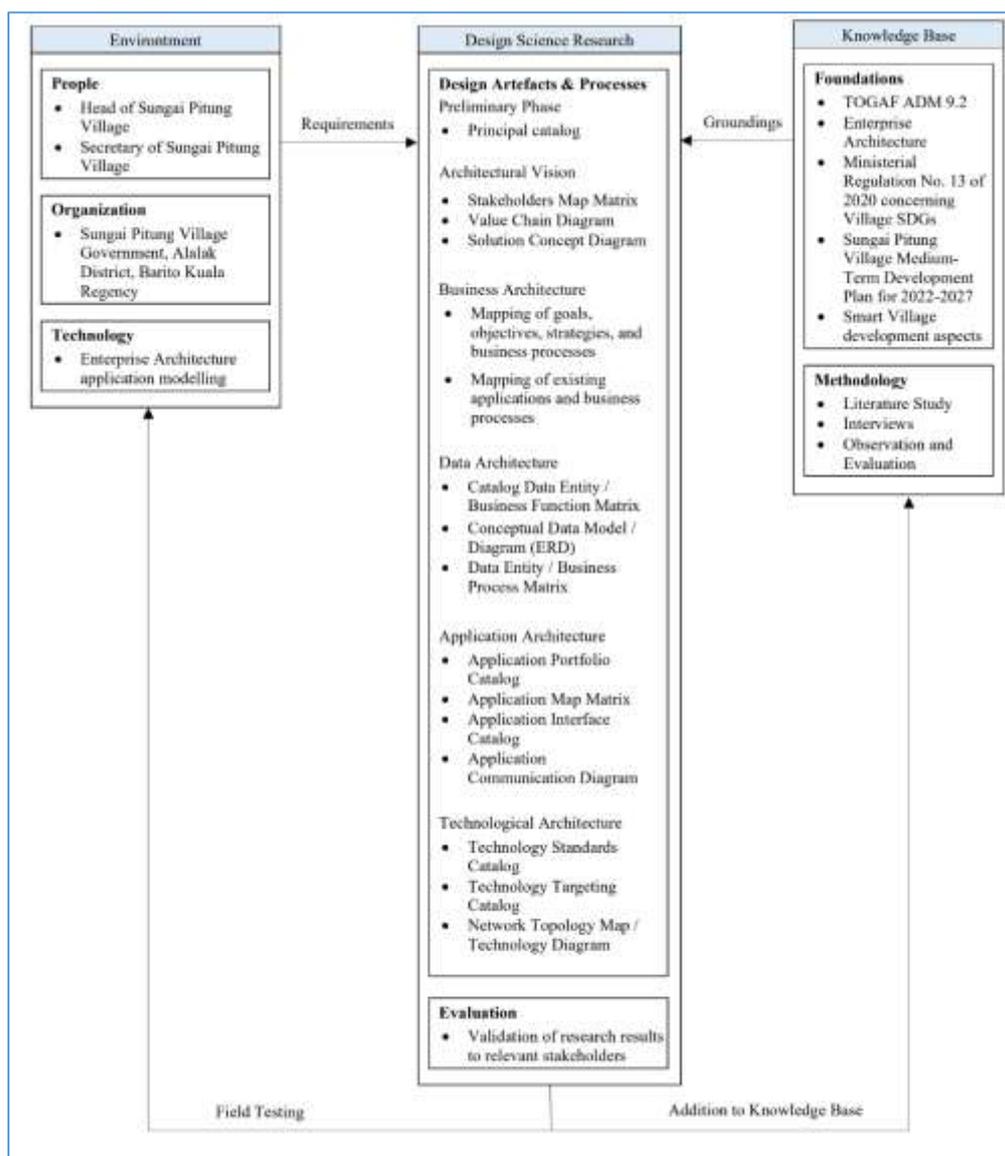


Figure 2 Conceptual model

The conceptual model employed in this study is illustrated in **Figure 2** above, comprising three components: Environment, Design Science Research, and Knowledge Base. The initial section <http://sistemasi.ftik.unisi.ac.id>

delineates the scope, encompassing details pertinent to the components fundamental to this research. The components are the focus of the research, serving as targets for investigation and offering suitable solutions for execution in the pertinent context. Three components—People, Organization, and Technology—are crucial inside the Environment. Individuals signify stakeholders, Organization clarifies the research's emphasis, and Technology indicates auxiliary instruments.

The second segment encompasses an examination of information systems. This segment elucidates the methodologies employed by researchers in the development and assessment of information systems throughout the research continuum. Within the scope of this investigation, scholars utilize a framework in the guise of an EA (Enterprise Architecture) artifact derived from the TOGAF ADM 9.2 methodology. This artifact serves as a navigational tool for the creation of solutions that can be customized to fulfill the specific requirements of an organization or enterprise. The assessment of research findings pertinent to the modeling of various architectural dimensions (including business, data, application, and technology architecture) alongside the meticulous design of research outcomes is also integral to this section.

The final segment emphasizes the scientific foundation. This part encompasses theories and prior studies pertinent to the current research subject, together with the methodologies employed in the research execution. This study incorporates various theories to underpin the research, including EA theory, TOGAF ADM 9.2, the Smart Village concept, and the Sustainable Development Goals (SDGs) concept. Furthermore, documents including the Presidential Regulation (Perpres), the Regulation of the Minister of Villages, Disadvantaged Regions and Transmigration (Permendesa PDTT), and the Village Long-Term Development Plan (RPJMDes) function as primary frameworks for guiding the research development. The employed research methodologies include of literature reviews, environmental observations, and interviews with pertinent stakeholders.

4 Results and Analysis

This study examines the steps of EA design that will yield a blueprint. The subsequent stages of EA design constitute a smart village development strategy employing the TOGAF ADM 9.2. framework in Sungai Pitung Village.

4.1 Preliminary Phase

The preliminary phase of enterprise architecture design is essential, concentrating on finding and articulating the foundational architecture ideas. This phase necessitates a thorough comprehension of the organization's business requirements to connect principles with broad objectives. The outcomes of this identification will serve as a foundation for deliberation in the design of each architectural domain to ensure alignment with organizational objectives. This is **Table 1** from the Principles Catalog, representing the results of the Preliminary Phase.

Table 1 Principles catalog

Domain	Principle	Description
Business Architecture	Primacy of principle	Ensures that all actions align with the village's long-term goals, focusing on sustainable development and community welfare.
	Information Management and integration principles	Promotes seamless data sharing between village departments, improving coordination and decision-making.
	Transparency Information	Ensures that village governance and services are open and accessible, fostering public trust.
	Compliance with Law	Ensures that all systems and operations adhere to legal regulations, ensuring legitimacy.
Data Architecture	Data is an Asset	Treats data as a valuable resource to drive decisions and improve services in the village.
	Data is Shared	Encourages data sharing across departments to enhance collaboration and service delivery.

	Data is Accessible	Makes data easily accessible to stakeholders, empowering residents and improving governance.
	Data Security	Protects sensitive data with secure systems, ensuring privacy and trust.
	Data Integration	Ensures smooth data flow across systems for comprehensive analysis and better coordination.
Application Architecture	Technology Independence	Uses flexible, open technologies to avoid reliance on specific vendors and ensure future scalability.
	Ease-of-Use	Ensures that systems are intuitive and easy to use, requiring minimal training.
	Application Integration	Integrates various applications to ensure seamless operation and improved service delivery.
Technology Architecture	Technology Infrastructure Security	Safeguards the technology infrastructure with secure protocols and encryption to protect data.
	Efficiency	Adopts energy-efficient and cost-effective technologies, reducing operational costs and promoting sustainability.
	Control and Maintenance	Ensures regular monitoring, updates, and maintenance of systems to keep them functional and secure.

4.2 Architecture Vision

The Architecture Vision phase delineates the parameters, stakeholders, and endorsement of the Enterprise Architecture (EA) framework by pertinent entities, engaging in discourse regarding the aims and limitations pertinent to the advancement of the smart village paradigm. The deliverables from this phase encompass the Value Chain Diagram (**Figure 3**), which delineates the fundamental values and processes within the governance of the village, illustrating how commercial activities and engagements with external stakeholders contribute to the realization of the village’s developmental objectives. This diagram is in concordance with the aspiration of establishing a Smart Village, wherein the integration of technology enhances operational efficacy, transparency, and service provision in alignment with the Sustainable Development Goals (SDGs). Additionally, **Figure 4**, the Solution Concept Diagram, visually articulates the interventions to be executed to meet the architectural objectives, depicting how the Village Information System (SID) and digital platforms will facilitate the strategic aims of the village. These diagrams are instrumental in illustrating how digital transformation can mitigate challenges in Sungai Pitung Village, thereby reinforcing the notion of sustainable development through e-government services, as elucidated in the article.

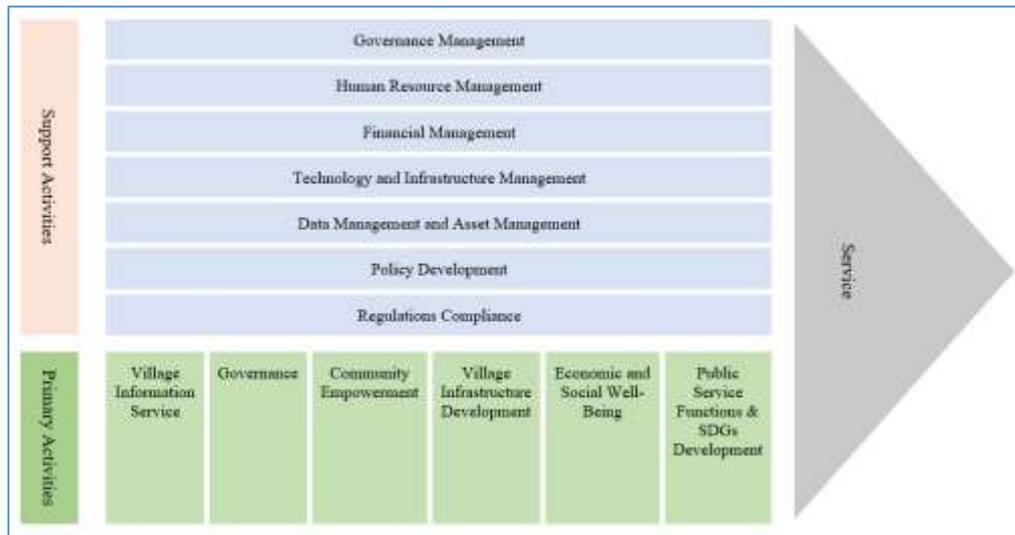


Figure 3 Value chain diagram

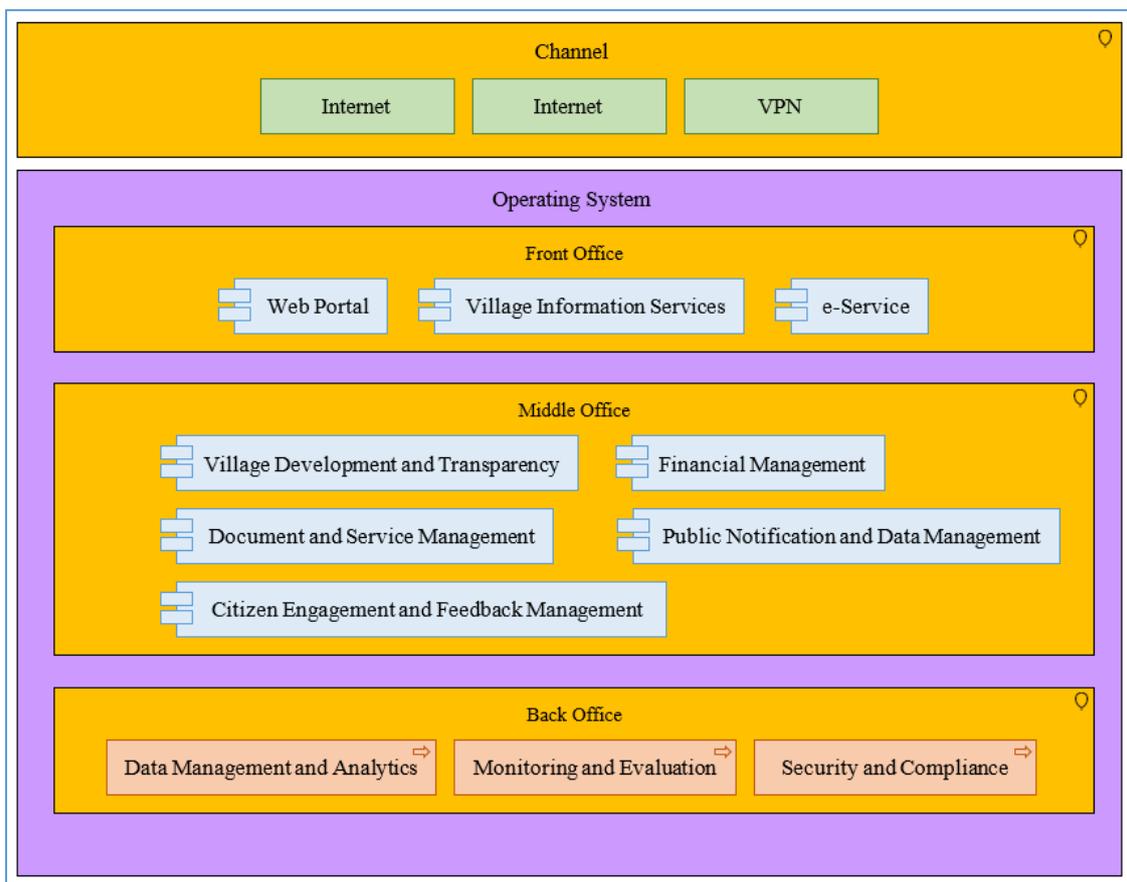


Figure 4 Solution concept diagram

4.3 Business Architecture

This represents the Business Architecture phase, a pivotal segment in the delineation and alignment of essential services, business operations, and their interrelations within the Smart Village paradigm. As delineated in Table 2. Process/Event/Control/Product Catalog above, this phase endeavors to furnish a thorough comprehension of the activities, workflows, and outputs that will facilitate the village's digital transformation and sustainable advancement. The catalog presented in **Table 2** acts as a meticulous reference, associating each process and service with specific aims and objectives, while guaranteeing that all elements function cohesively towards the overarching vision of a smart and efficient village ecosystem. In this framework, we will examine the interactions between

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each service, promoting enhanced governance, public services, and community involvement in alignment with the Sustainable Development Goals (SDGs).

Table 2 Process/event/control/product catalog

Service	Business Process	Description
Information & e-Government Services	Information Dissemination	Providing information on government services, health, education, and public notices.
	Digital Service Access	Enabling residents to access and complete government services online, such as document requests.
	Online Permitting & Licensing	Facilitating online application and issuance of permits, licenses, and other legal documents.
Financial & Resource Management	Budgeting & Financial Reporting	Managing the village's budget, expenses, and revenues to ensure financial transparency and accountability.
	Resource Allocation	Efficient allocation of resources for village development, including financial, technological, and human resources.
Community Development & Empowerment	Program Development & Monitoring	Developing and managing programs for community empowerment, including skills development and local initiatives.
	Capacity Building	Providing training and programs to improve the skills of the local community.
Public Service & Engagement	Service Delivery & Monitoring	Coordinating delivery of essential public services (e.g., health, education) and monitoring service performance.
	Infrastructure Planning & Development	Planning and developing village infrastructure such as roads, electricity, and internet access.
Governance & Compliance	BUMDes Management & Economic Initiatives	Managing BUMDes operations, supporting local entrepreneurs and businesses for economic growth.
	Regulatory Compliance & Data Security	Ensuring compliance with laws and securing data within governance processes.

4.4 Information System Architecture – Data Architecture

The Information System Architecture for the Smart Village framework is instrumental in facilitating the unobstructed transmission of data among the diverse elements constituting the system. This architecture delineates the framework for the effective management, processing, storage, and dissemination of data, aimed at enhancing governance, public services, and civic participation within the Sungai Pitung Village context. The Data Architecture is meticulously crafted to tackle the intricacies associated with village information systems, harmonizing multiple services encompassing governance, healthcare, education, and economic initiatives. The principal objective is to guarantee that data remains accessible, secure, and operational for stakeholders across all tiers, whilst concurrently supporting the overarching aims of sustainable development.

At the core of this architecture lies the Village Information System (SID), which functions as the pivotal nexus for the collection, storage, processing, and dissemination of data pertinent to governance, public services, and community advancement. The Data Repository securely archives all pertinent data sourced from a multitude of channels, including governmental operations, public health registries, educational services, and economic statistics. This data is amalgamated utilizing Data Integration Tools (ETL), which meticulously extract, transform, and load the data into the repository, thereby ensuring its cleanliness, standardization, and compatibility for subsequent processing. The architecture accentuates Data Security & Privacy, establishing that sensitive information is encrypted and accessible solely to authorized personnel through stringent access control protocols. Furthermore, Data Access & Monitoring systems facilitate real-time oversight and management of data access,

ensuring that only sanctioned individuals are permitted to retrieve or amend sensitive information. Data Processing & Analytics tools scrutinize the amassed data, yielding invaluable insights that can steer decision-making processes, enhance governance, and elevate public services. The Admin Dashboard operates as the principal instrument for officials to oversee critical metrics and render data-driven decisions, while the Public Access Portal empowers residents to access services, information, and engage with governmental entities in a digital format.

Real-time notifications and alerts are disseminated to both residents and government officials through the Notifications & Alerts System, ensuring that the community remains apprised of vital updates, such as public health advisories, service modifications, or significant policy proclamations. This dynamic system cultivates a responsive milieu wherein data circulates effectively among stakeholders, facilitating informed decision-making and transparent governance. As illustrated in **Figure 5: Data Dissemination Diagram**, the trajectory of data among various components, from collection to processing, storage, and dissemination, ensures that information is conveyed to the appropriate stakeholders in a timely manner, thereby promoting efficient governance and active community participation.

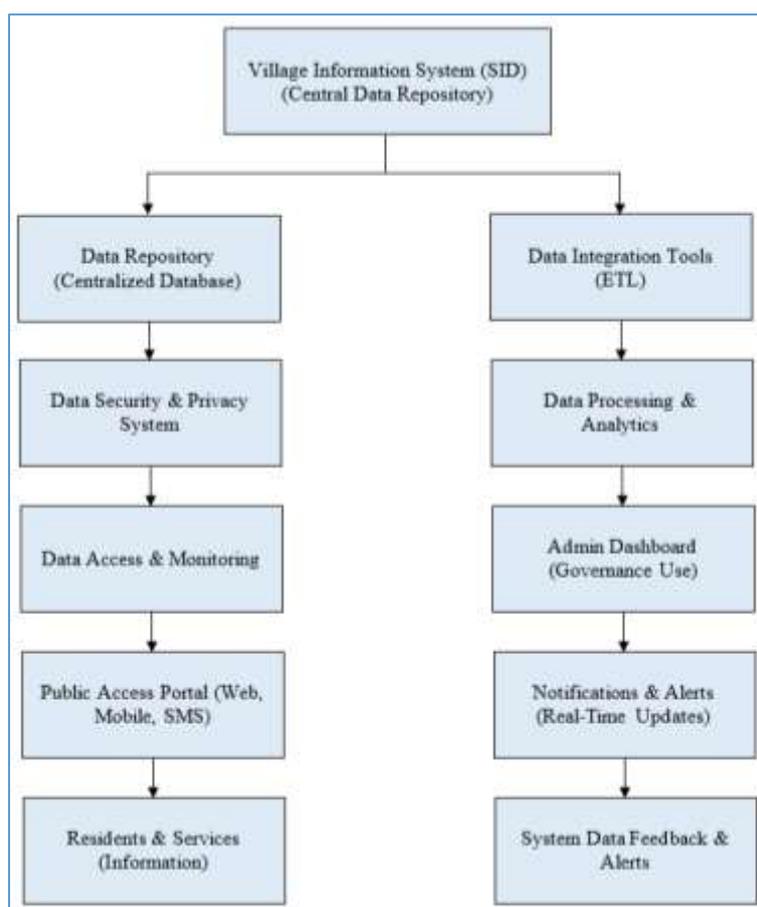


Figure 5 Data dissemination diagram

The Data Entity/Component Catalog outlines the key entities and their logical types within the Information System Architecture. This catalog can be seen in **Table 3** provides a structured overview of how data is categorized and managed across the Smart Village system. This catalog helps in understanding the key components involved in the Smart Village system and how they are logically organized to ensure efficient data flow and system operation.

Table 3 Data entity/component catalog

Entity	Type	Logical
Village Information System (SID)	System	Central hub for collecting, storing, and processing all village-related data.
Data Repository	Data Storage	A centralized database where all data

Data Integration Tools (ETL)	Tools	from government, services, and community is stored securely. Extract, transform, and load (ETL) tools that standardize and integrate data across various systems.
Data Security & Privacy System	Security System	Mechanism that ensures data integrity and confidentiality, including encryption and access controls.
Data Processing & Analytics	Processing	Tools that analyze and process data, generating insights for decision-making.
Admin Dashboard	Interface	User interface for administrators to monitor data and generate actionable reports.
Public Access Portal	User Interface	Digital platform for residents to access government services and information.
Notifications & Alerts System	System	Real-time system that sends notifications and alerts to residents and officials.
Residents & Services	Users/Services	The residents who interact with the system, requesting information and services.

4.5 Information System Architecture – Application Architecture

This phase elucidates the research findings acquired in a comprehensive manner, which may be illustrated through tables, programming code, or graphical representations for enhanced comprehension. The table adheres to the specified format. Application architecture represents a phase that delineates the design of application systems pertinent to business processes in Sungai Pitung Village, aligning with the requirements and stipulations of the prior architectural principles. This phase culminates in the creation of an Application Portfolio Catalog and Application Communication Diagrams, which delineate the interactions between existing applications and those targeted within the technological development domain. **Table 4**, the Application Portfolio Catalog, serves to enumerate a compilation of utilized applications.

Table 4 Application portfolio catalog

Application Component	Component Target
Village Information Services Platform	Enhance accessibility and user engagement by providing a centralized portal for all government services, including health, education, and community notices.
e-Government Services Application	Facilitate online application submissions, document requests, and approval processes for permits, licenses, and government services.
Public Health & Education Applications	Improve public health management and education services, enabling access to medical records, vaccination schedules, e-learning platforms, and local educational programs.
Community Empowerment Platform	Foster community development by providing a platform for skills training, local initiatives, and citizen engagement, with direct access to empowerment programs.
Financial & Resource Management System	Support transparent budgeting and financial management, enabling efficient allocation of resources for village development and monitoring of financial transactions.
Village Infrastructure Management Application	Optimize infrastructure management by tracking and coordinating the development and maintenance of critical services like roads, electricity, and internet access.

Citizen Engagement and Feedback System	Create a direct communication channel between the village administration and residents, allowing feedback, complaints, and suggestions regarding village services.
Monitoring & Evaluation Dashboard	Provide real-time insights into performance indicators for all village services and governance, facilitating data-driven decision-making.

Figure 6, the Application Communication Diagram, is a schematic representation that illustrates the interactions among tangible application components. This diagram portrays the connections and interrelations between the physical elements constituting the application.

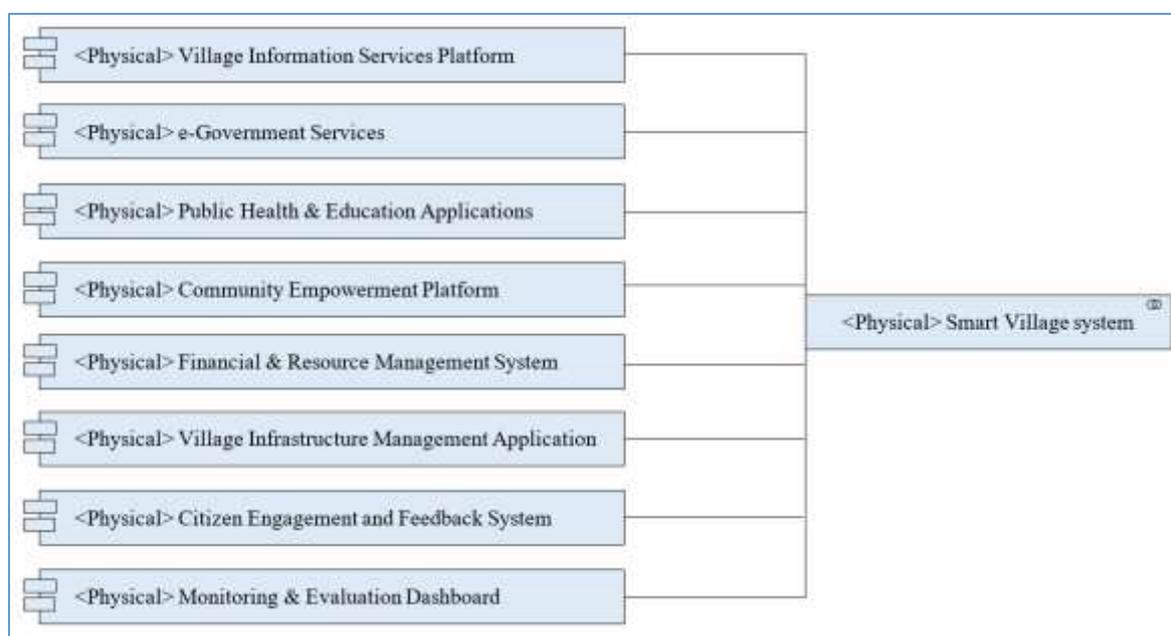


Figure 6 Application communication diagram

4.6 Technology Architecture

The discipline of Technology Architecture encompasses the phase of formulating the requisite technological framework that guarantees system security, scalability, availability, and seamless integration among components. The resultant artifacts consist of a catalog of technology standards, which delineates the consensus regarding technological protocols across the organization, encompassing various technologies and their respective versions, technology lifecycle phases, and the refresh cycles pertinent to the technology, as shown in **Table 5**. Modifications and enhancements to the technological infrastructure were implemented to facilitate the successful execution of the Smart Village system services project.

Table 5 Technology standards catalog

Logical Technology Component	Physical Technology Component	Technology Component	Standards
Server	Application Server	Apache, Nginx	PHP 8.x, Laravel 9.x, Laravel Octane for performance optimization, PHP-FPM
	Database Server	MySQL, MariaDB	MySQL 8.x, InnoDB Storage Engine, UTF-8 Character Set, optimized queries for higher traffic
	Switch Access	Cisco Catalyst, Juniper EX	Gigabit Ethernet, Layer 3 Switching, Low Latency, High Availability
	Access Point	Cisco Aironet, Ubiquiti	Wi-Fi 6 (802.11ax), WPA3 Encryption, High Density Access for

	Router	MikroTik, Cisco ISR	Multiple Devices IPv4/IPv6 Support, Load Balancing, QoS for High-Performance Internet
	LAN	Cat 6/7 Ethernet Cables	Gigabit Ethernet, Fiber Optic Cables for Backbone Connectivity
Security	Firewall	Cisco ASA, FortiGate	Next-Generation Firewall, IPS/IDS, SSL Inspection, Secure Access Control
	Antivirus	Bitdefender, Symantec	Real-time Protection, Multi-Layered Security, Regular Updates
Client Platform	Laptop	Dell XPS, HP EliteBook	Intel i5/i7, 8GB RAM, SSD (256GB or 512GB), High-Resolution Display
	PC/Monitor	Lenovo ThinkCentre, Dell UltraSharp	1080p/1440p Full HD, LED-backlit, 75Hz Refresh Rate
	Printer	HP LaserJet, Canon PIXMA	Wireless Connectivity, Duplex Printing, High-Volume Printing for Offices
Performance and Availability	UPS	APC Smart-UPS, CyberPower	1500VA+, Surge Protection, Long Battery Life
	Backup and Recovery	Backup Server (NAS/SAN)	MySQL Backup Tools (Percona XtraBackup), Cloud Backup (Amazon S3, Google Drive)
Software Platform	PHP Framework	Laravel	Laravel 9.x, Composer for Dependency Management, Laravel Octane for fast request handling
	Web Server	Apache, Nginx	Apache 2.4.x or Nginx 1.18+, SSL/TLS Encryption, HTTP/2 Support
	Cache	Redis, Memcached	Redis for High-Performance Caching, Memcached for Session Management
	Queue	Redis, RabbitMQ	Redis for Job Queues, Asynchronous Task Processing, Performance Monitoring
	Version Control	Git, GitHub, GitLab	Git 2.x+, Versioning with GitHub/GitLab Repositories for Continuous Deployment
Power Supply	Backup Power	Solar Panels, Generators	Off-Grid Backup for Cloud Connectivity (if necessary), Generators for Emergency Use
Networking	Fiber Optic Internet	FTTH (Fiber to the Home)	High-Speed Internet (100 Mbps - 1 Gbps), Low Latency for Reliable Connection

5 Conclusion

In summary, the application of a Smart Village framework in Sungai Pitung Village, utilizing the TOGAF ADM 9.2 methodology, presents a systematic and strategic approach to rural advancement. By harnessing the Village Information System (SID) and aligning it with the Sustainable Development Goals (SDGs), this framework addresses significant issues such as poverty alleviation, inequality reduction, and enhancement of access to fundamental services. The employment of Laravel and MySQL in technological development guarantees a scalable, secure, and effective digital infrastructure to bolster e-Government services, thus enhancing governance and service delivery while encouraging increased community participation. This digital transformation has the potential to empower local populations, improve transparency, and optimize administrative workflows, ultimately resulting in an enhanced quality of life for inhabitants. Moreover, the research underscores the essential function of enterprise architecture in promoting successful digital transformation within rural regions. By implementing TOGAF ADM 9.2, the Smart Village paradigm not only synchronizes

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technology with governance objectives but also facilitates ongoing enhancement and adaptability to emerging demands. With a well-defined framework for technological integration, the village can guarantee sustainable development while fostering economic progress, social inclusivity, and environmental responsibility. The outcomes indicate that through collaborative initiatives, capacity enhancement, and the strategic deployment of contemporary technologies, rural regions can close the digital gap and achieve substantial advancements toward fulfilling the SDGs. This study has certain **limitations**. The research focus is constrained to the first five phases of the TOGAF ADM cycle, focusing on the architectural blueprint rather than the full-scale implementation. Additionally, the scope is primarily centered on the 'Village Service' dimension. Therefore, **future work** should aim to execute the Migration Planning and Implementation Governance phases. Longitudinal studies are also recommended to measure the actual impact of this framework on the village's IDM score after implementation.

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