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IMPLEMENTATION OF THE ZACHMAN FRAMEWORK IN THE DEVELOPMENT OF THE SMART VILLAGE IT BLUEPRINT IN A FISHING VILLAGE

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Abstract

Digital transformation in rural coastal areas is frequently impeded by fragmented data management and unstructured IT governance. This study applies the Zachman Framework to design a comprehensive Smart Village IT Blueprint for Kangkunawe, a coastal fishing village in West Muna Regency, Indonesia. The framework systematically maps organizational needs across six perspectives and six abstraction levels, ensuring alignment between the village's strategic vision and its technical solutions. The research proceeded through three phases: (1) enterprise analysis of the village's organizational structure, vision, and existing service processes; (2) Zachman matrix population across all six perspectives, yielding business, application, data, technology, and network architectures; and (3) prototype implementation of the SPEDATA module an integrated village population data and administrative correspondence service. The resulting blueprint defines five primary smart village service hubs: SPEDATA, e-marketplace, GIS-Health, e-tourism, and e-finance. Black-box Testing of the SPEDATA prototype confirmed 100% functional correctness across 24 test cases. The Zachman Framework is demonstrated to be effective in systematically structuring village IT governance into a reproducible, scalable blueprint that directly informs prototype development.

Keywords: *Zachman Framework, IT Blueprint, Smart Village, Fishing Village, SPEDATA.*

1. INTRODUCTION

Digital transformation in rural governance has become a strategic imperative for developing nations seeking to bridge the urban–rural service equity gap. In Indonesia, Law No. 6 of 2014 on Village Governance mandates that village governments optimize public service delivery and strengthen community participation through information technology integration[1]. However, realizing this mandate in coastal and fishing communities remains structurally hindered by fragmented data management, absent IT governance frameworks, and limited technical capacity among village officials[2].

The Smart Village Approach an adaptation of the Smart City paradigm to rural contexts provides a coherent response to these challenges by leveraging ICT to improve public service quality, economic participation, and administrative transparency [3]-[9]. Unlike Smart Cities, Smart Villages must contend with additional constraints including limited connectivity, lower digital literacy, and smaller administrative budgets, necessitating lightweight yet systematic architectural approaches [10]-[15].

Enterprise Architecture (EA) frameworks provide the structural scaffolding required to translate a village's strategic vision into an actionable IT development plan. Among available frameworks, the Zachman Framework is particularly suitable for small governmental organizations due to its comprehensiveness, vendor-neutrality, and its simultaneous treatment of data, function, network, people, time, and motivation dimensions across six levels of organizational abstraction[16]. Prior applications in governmental contexts confirm the framework's effectiveness in producing structured IT blueprints that align technical solutions with organizational objectives [17]-[21].

Kangkunawe Village, located in Maginti District, West Muna Regency, Southeast Sulawesi, Indonesia, constitutes the primary case study. With a population of 1,378 and the highest population density in the regency (3,828 persons/km²) [22], the village is the main maritime transit corridor between West Muna and Bombana Regency. Despite its strategic position and rich fishery resources, all administrative services remain entirely manual: residents must physically visit the village office, and officials lack networked workstations or a central data repository, resulting in slow, redundant service delivery.

This study aims to address the methodological gaps identified in various previous studies. Compared to the research by[17], which utilized the TOGAF ADM but stopped at the planning stage, this study goes further to the stage of developing a functional prototype. Meanwhile, although [23] have developed an application portfolio using the Ward & Peppard method, their focus remains limited to educational institutions and has not yet addressed practical implementation.

In terms of framework application, this study expands upon [16] approach which applied the Zachman Framework to hospitality institutions by adapting it to the more complex context of a coastal village. Furthermore, while [24] provide only a descriptive assessment model without a clear IT architecture, and [18] are limited to a systematic review without field implementation, this research offers a concrete solution.

The novelty of this research lies in the integration of the 6 perspectives of the Zachman Framework combined with the evaluated SPEDATA prototype. Its advantages include the use of a Single Identity Number (SIN) for social assistance transparency, as well as the integration of a WhatsApp Gateway as a real-time notification medium for multi-service documents (Letters, Property Tax, and Certificates). This approach ensures the system is not only theoretically robust but also technically validated through Black-box and White-box testing and functionally validated through UAT testing.

2. RESEARCH METHODOLOGY

The research methodology follows a structured three-phase sequential design, illustrated in Figure 1. Each phase builds upon validated outputs from the preceding phase, ensuring internal coherence and reproducibility:

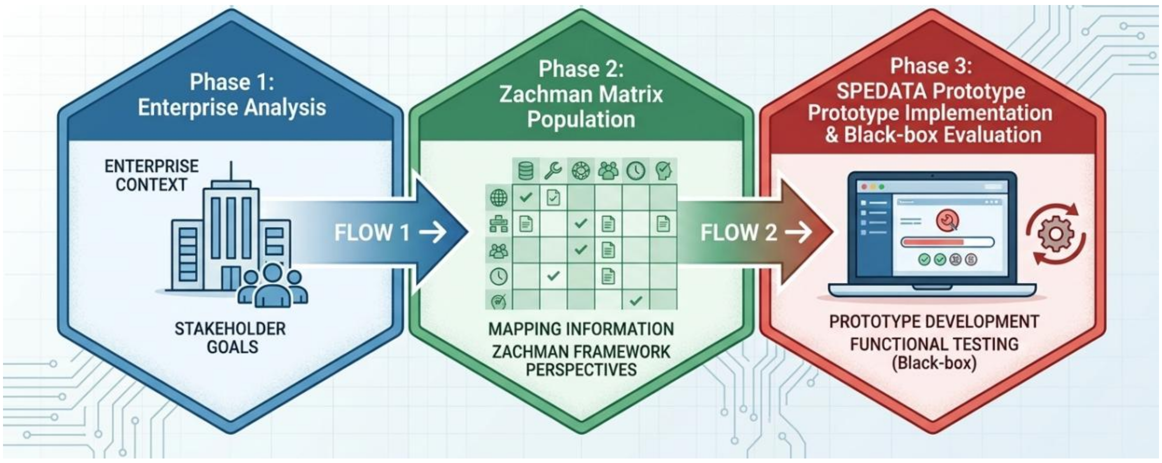

Figure 1. Research Phase of the Study
[Source: Author, 2025]

2.1 Phase 1: Enterprise Analysis

Primary data collection employed three instruments: (1) semi-structured interviews with the Village Head, Village Secretary, and Heads of Administrative and Financial Affairs to capture organizational vision, mission, and service workflows; (2) direct observation of existing administrative service processes over four separate visits; and (3) document analysis of village administrative records, organizational charts, and infrastructure inventories. Outputs are the enterprise overview, current organizational structure, and as-is service process map.

2.2 Phase 2: Zachman Matrix Population

Phase 2 systematically populates all cells of the Zachman matrix. This architectural taxonomy maps six stakeholder perspectives—namely, planner, owner, designer, builder, subcontractor, and enterprise—against six key interrogative columns (what, how, where, who, when, and why). This approach ensures that all information variables and business processes are comprehensively mapped across various levels of abstraction. Each cell was populated based on Phase 1 findings, supplemented by two structured validation workshops with village stakeholders. The specific outputs are: a Business Architecture (service entities and process flows), Application Architecture (SPEDATA module and five-service portfolio), Data Architecture (normalized ERD), and Technology Architecture (proposed network infrastructure).

2.3 Phase 3: Prototype Implementation and Evaluation

Phase 3 implements the highest-priority blueprint component the SPEDATA module as a functional web-based system. Development used a design-first approach with UI wireframes validated by village officials prior to coding. The technology stack comprises PHP 8.1 (server-side), MySQL 8.0 (data persistence), CodeIgniter 4 (MVC framework), and Bootstrap 5 (mobile-responsive front-end). System evaluation used Black-box Testing with Equivalence Partitioning across 24 test cases covering all primary functional requirements derived from the Zachman matrix.

3. RESULT AND DISCUSSION

3.1 Enterprise Overview

Kangkunawe Village (area: 0.36 km²; population: 1,378; density: 3,828 persons/km²) is the most densely populated village in West Muna Regency and serves as the main maritime corridor between West Muna and Bombana Regency. The principal economic base is marine fisheries. The village's strategic development vision is to achieve fisheries-based self-sustaining economic growth while progressively improving public service quality. The organizational structure Village Head, Village Secretary, Heads of Administrative and Financial Affairs, BPD, and LKMD directly informed the People (Who) column of the Zachman matrix.

Kangkunawe village's strategic goal is to achieve self-sustaining fisheries-based economic growth and sustainable prosperity. The village's primary institutional objectives include: improving the overall well-being and living standards of the community; establishing strong governance structures grounded in fisheries industry excellence; enhancing village human resource capacity; and achieving sustainable, inclusive growth. The organizational structure of Kangkunawe Village is depicted in the enterprise overview, directly informing the "People (Who)" column of the Zachman matrix.

3.2 Business Architecture (Zachman: How/Function)

The current administrative service process is entirely manual and visit-based, averaging 45–60 minutes per transaction. As depicted in Figure 2, residents present their KTP and hamlet head recommendation at the village office; the Administrative Head records the request, drafts correspondence, submits for Secretary validation, forwards to the Village Head for signature, and archives before delivering the document to the resident. The principal inefficiencies are: absence of networked workstations, no centralized population database, and redundant manual data entry across multiple correspondence types.

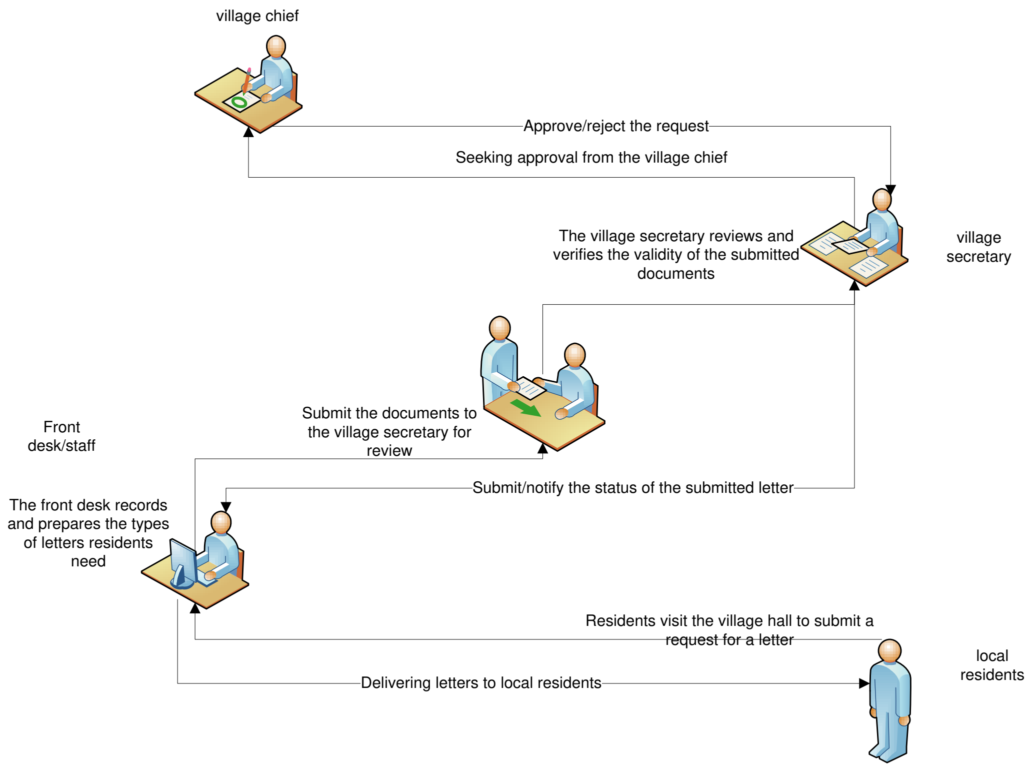

Figure 2. Existing Administrative Service Process Flowmap of Kangkunawe Village
[Source: Primary Research Data, 2025]

3.3 Application Architecture and Service Portfolio

The SPEDATA application architecture includes the physical data model for the Smart Village and the prototype design, which was developed following stakeholder consultations.The application architecture defines a five-hub smart village service portfolio anchored by a centralized data warehouse. Each hub is independently deployable while sharing a common data layer, enabling progressive implementation aligned with budget and capacity. The physical data model (Figure 3) illustrates the warehouse-centred topology:

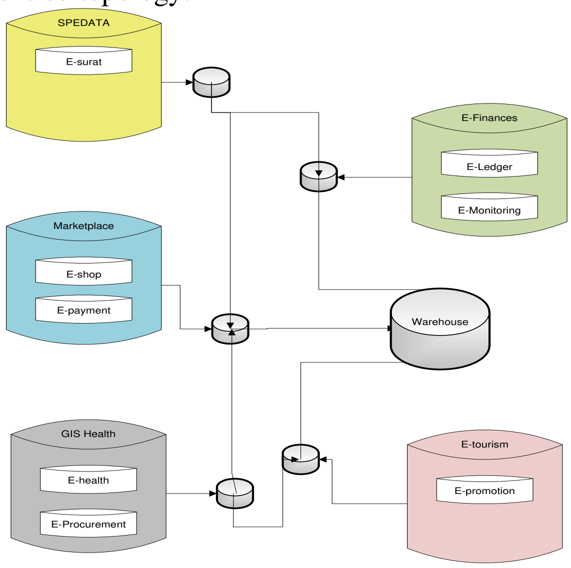

Figure 3 Design of the Physical Data Model for the Smart Fishing Village
[Source: Primary Research Data, 2025]

According to the physical data model, the data warehouse serves as the central storage hub for the smart village service database and its sub-databases. There are five main service databases, including

SPEDATA which is a service that focuses on one-stop village services with one sub-database, namely e-mail, then e-marketplace, or village product buying and selling services with two sub-databases, including e-shop which focuses on developing local product promotions and e-payment to handle payments for transactions from e-shop services, GIS Health which focuses on mapping health services and handling free health consultations, and e-tourism services that have one sub service, namely e-promotion, promoting the village's maritime and nautical tourism potential to a wider audience.

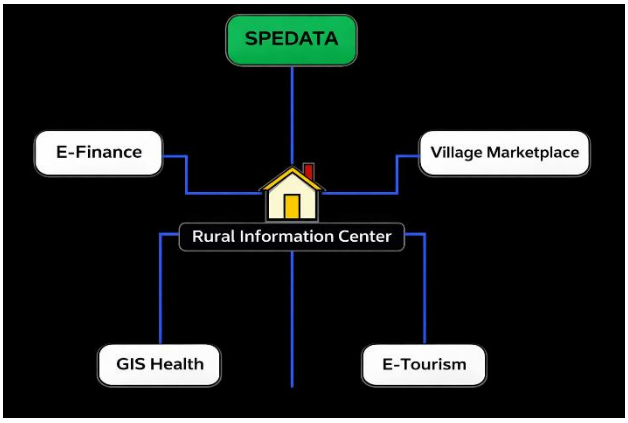

Figure 4. Rural Data Integration Flowchart Diagram
[Source: Primary Research Data, 2025]

Table 1. Proposed Smart Village Application Portfolio (7-Year Horizon)

No.	Service Hub	Sub-Services	Primary Users	Classification	Target Year
1	SPEDATA	Population data, correspondence, fund monitoring	All residents, Village Head, Secretary	Key Operational	Year 1–2
2	E-Marketplace	E-Shop (product promotion), E-Payment (transactions)	Fishermen, buyers, BUMDes	High Potential	Year 2–3
3	GIS-Health	Geographic health mapping, free consultation booking	Health officer, residents	High Potential	Year 2–4
4	E-Tourism	E-Promotion (maritime tourism assets)	Village government, entrepreneurs	Strategic	Year 3–5
5	E-Finance (E-Ledger)	Village fund management, expenditure reporting	Finance officer, Village Head, Secretary	Strategic	Year 1–2
6	E-Monitoring	Development program monitoring dashboard	Village Head, BPD, district government	Strategic	Year 4–6
7	E-Procurement	Goods and service procurement automation	Village Secretary, Finance officer	Strategic	Year 5–7

3.4. Data Architecture (Zachman: What/Data)

The data architecture is formalized through the SPEDATA Entity-Relationship Diagram (Figure 4), which establishes four primary entities with the following cardinality relationships: (1) Family Unit maintains a one-to-one relationship with Citizen Unit (NIK as primary key); (2) Citizen Unit has a many-to-many relationship with Letter entity, capturing multiple letter types per citizen; (3) Letter has a one-to-many relationship with Letter Mutation, providing a complete audit trail from request to issuance; and (4) Fund Monitoring links to Village Officials via a one-to-many relationship, enabling multi-role supervisory access.

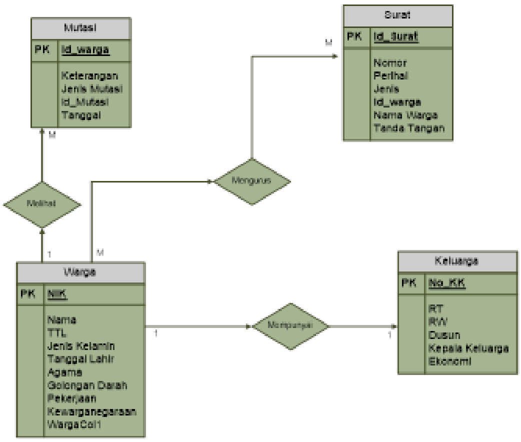

Figure 5. SPEDATA Service ER-Diagram Design
[Source: Primary Research Data, 2025]

As illustrated in Figure 5, the SPEDATA data architecture defines four primary entities with the following cardinality relationships: (1) a Family Unit maintains a one-to-one relationship with Citizen Unit, where the National Identification Number (NIK/Population ID) serves as the primary key; (2) the Citizen entity has a many-to-many relationship with the Letter entity, enabling one citizen to request multiple letter types; (3) the Letter entity has a one-to-many relationship with Letter Mutation, generating a complete audit trail from request submission to document issuance; and (4) Fund Monitoring links to Village Officials via a one-to-many relationship, enabling multi-role supervisory access to financial data.

3.5 Technology Architecture (Zachman: Where/Network)

The current network relies exclusively on cellular hotspot connectivity insufficient for multi-user concurrent database access. The proposed technology architecture (Figure 6) introduces: (1) a star-topology LAN connecting all five divisional workstations to a central switch; (2) a dedicated server node managed by a new Server Administrator role; (3) five additional workstation units with dual monitors for print-intensive roles; (4) two networked printers for Administrative and Financial Affairs; and (5) a stable ISP connection supplementing cellular backup, with bandwidth prioritized for SPEDATA synchronization.

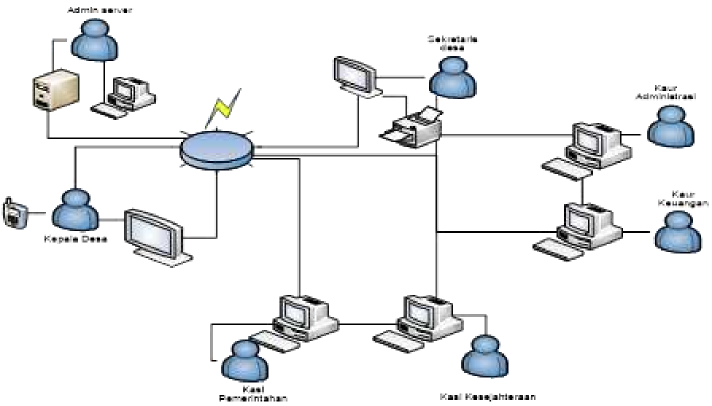

Figure 6. Proposed Network Architecture — Kangkunawe Village Office

[Source: Primary Research Data, 2025]

3.6 Zachman Framework Blueprint Matrix Summary

Table 2 presents the consolidated Zachman Framework IT Blueprint matrix for Kangkunawe Village, providing a single-view reference for the complete IT blueprint across all six perspectives and six interrogative dimensions. This matrix constitutes the primary deliverable of the study and the normative reference for all subsequent system development activities.

Table 2. Zachman Framework IT Blueprint Matrix — Kangkunawe Smart Fishing Village

Perspective	What (Data)	How (Function)	Where (Network)	Who (People)	When (Time)	Why (Motivation)
1. Planner (Contextual)	Business data entities: residents, families, fisheries products	List of village service business processes	Village geographic profile and location	List of key village officials and stakeholders	7-year application portfolio timeline	Village vision: fisheries-based self-sustaining economy
2. Owner (Conceptual)	Business entity relationships (family–citizen–letter–funds)	Administrative service process flows (SOPs)	Village office network topology (current & proposed)	Proposed org. structure (incl. Server Admin role)	5-year IS/IT strategic planning schedule	Village mission and development priority statements
3. Designer (Logical)	Relational data model (ERD, normalized)	SPEDATA module logical application architecture	Distributed system architecture (LAN + ISP + server)	Interface designs: admin dashboard, data input, report output	Project planning milestones and sprint events	IS/IT implementation constraints and rules
4. Builder (Physical)	Physical database schema (MySQL 8.0, InnoDB)	Application code modules (PHP 8.1, CodeIgniter 4, Bootstrap 5)	Network config: IP addressing, switch ports, server specs	User role matrix (Village Head, Secretary, Admin Head, Finance, Server Admin)	Development sprint schedule	Coding standards and development guidelines
5. Subcontractor (Detailed)	Database and table descriptions with data dictionaries	IS business strategy value chain for Kangkunawe	Full network configuration for server hosting environment	User access rights configuration (RBAC)	Maximum delivery timeframe per module	Application coding process guidelines and commit standards
6. Function (Enterprise)	Data processing rules and validation logic	Login form, input forms, output forms (implemented SPEDATA)	Network infrastructure requirements and bandwidth specs	System access rights assignment per role	IS/IT development planning schedule (Year 1–7)	SPEDATA service operational manual

3.7 SPEDATA Prototype Implementation

The SPEDATA module was implemented as a web-based prototype accessible at https://spedata-kangkunawe.com/. The system delivers three primary services: (1) online administrative correspondence request and tracking; (2) village population database management with search and report generation; and (3) village fund utilization monitoring for transparency and accountability.

Implemented UI components include: a public-facing landing page; a secure admin login form with credential validation; an admin dashboard with a population occupational bar chart and educational attainment pie chart; a population data input screen capturing NIK, Family Card Number, name, occupation, and education level; and a printable population data report formatted for official output (Figures 7–11)

Figure 7. SPEDATA Public-Facing Landing Page
[Source: Prototype Implementation Results, 2025]

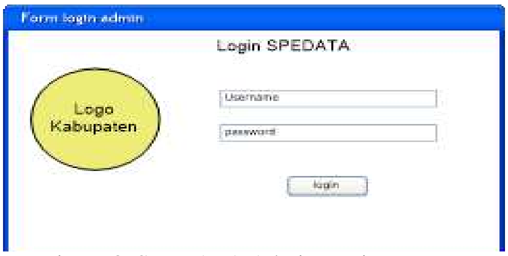

Figure 8. SPEDATA Admin Login Form
[Source: Prototype Implementation Results, 2025]

Figure 9. SPEDATA Admin Dashboard

[Source: Prototype Implementation Results, 2025]

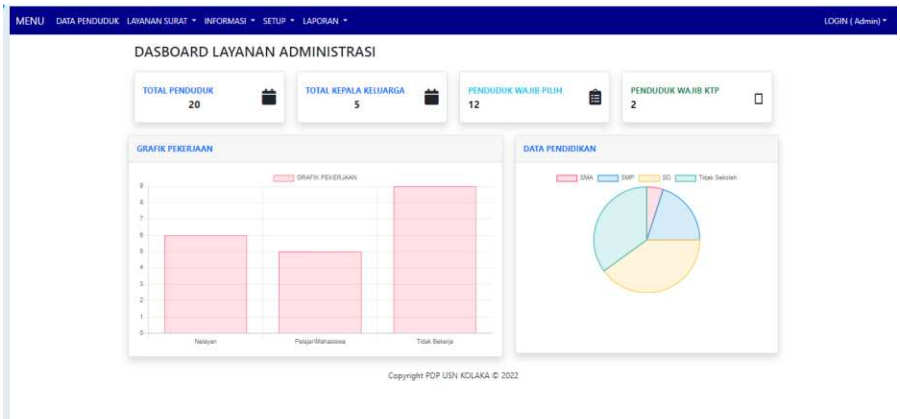

Figure 10. SPEDATA Population Data Input Screen
[Source: Prototype Implementation Results, 2025]

DAFTAR PENDUDUK DESA KANGKUNAWE

Show 10 entries Search:

No	NIK	No KK	Nama	Tempat Tgl Lahir	Jenis Kelamin	Pekerjaan	Pendidikan	Umur
1	74	74	YUSLIN	Maginti, 1991-03-29	Laki-Laki	Nelayan	SD	31
2	74	74	SAMARUDIN	KAPOA, 1976-08-18	Laki-Laki	Nelayan	SD	46
3	74	74	ARSIN	P. Maginti, 1968-07-01	Laki-Laki	Nelayan	SMA	54
4	74	74	LA KAUNGGA	Topa, 1959-07-01	Laki-Laki	Nelayan	SD	63
5	74	74	Fazmin	Maginti, 1991-06-08	Laki-Laki	Nelayan	SMP	31
6	74	74	Norma	Topa, 1959-07-01	Perempuan	Nelayan	SD	63
7	74	74	WA AKA	Maginti, 1936-07-01	Perempuan	Tidak Bekerja	Tidak Sekolah	86
8	74	74	SUMARNI	P. Maginti, 1996-10-07	Perempuan	Tidak Bekerja	SD	25
9	74	74	ANANDA SYIRA	P. Maginti, 2017-02-08	Perempuan	Tidak Bekerja	Tidak Sekolah	5
10	74	74	NUR HAYANI	P. Maginti, 2015-09-19	Perempuan	Tidak Bekerja	Tidak Sekolah	6

Showing 1 to 10 of 20 entries Previous12Next

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Figure 11. SPEDATA Printable Population Data Report
[Source: Prototype Implementation Results, 2025]

3.8 Black-box Testing Results and Comparative Discussion

black-box testing was conducted using Equivalence Partitioning across all functional modules of the SPEDATA system. Table 3 presents the results of 24 test cases covering both valid and invalid input scenarios, with test coverage spanning all primary functional modules of the SPEDATA system.

Table 3. Black-box Testing Results — SPEDATA Module (24 Test Cases)

Module	Test Cases	Technique	Expected Result	Actual Result	Status
Admin Login	4	EP	Valid credentials grant access; invalid credentials rejected with error message	Matched expected	Pass ✓
Population Data Input	5	EP + BVA	Valid NIK accepted; incomplete/duplicate NIK rejected with validation feedback	Matched expected	Pass ✓
Admin. Letter Generation	5	EP	Correct letter template rendered upon valid request submission	Matched expected	Pass ✓
Fund Monitoring Display	4	EP	Expenditure data correctly aggregated per	Matched expected	Pass ✓

Module	Test Cases	Technique	Expected Result	Actual Result	Status
			reporting period		
Population Report Output	3	EP	Report accurately reflects database state; printable format rendered correctly	Matched expected	Pass ✓
Search & Filter Functions	3	EP	Search returns correct records; empty-state message shown for no results	Matched expected	Pass ✓
Total	24	—	—	24/24 Pass	**100%**

The 100% test pass rate across all 24 test cases confirms that the SPEDATA prototype correctly implements every functional requirement derived from the Zachman matrix. To further validate functional correctness from the end-user perspective, a preliminary User Acceptance Testing (UAT) session was conducted with three village administrative staff members (the Village Secretary, Head of Administrative Affairs, and a data entry operator). Participants were guided through the primary workflows—population data registration, administrative letter generation, and fund monitoring display—and confirmed that all tasks were completable without system errors or guidance. Participants indicated that the interface layout (dashboard, data input form, and print-ready report) was intuitive and aligned with their daily service workflows, providing positive qualitative evidence of operational usability prior to full deployment. This finding demonstrates the direct translational value of the Zachman Framework: structured requirements decomposed through the matrix cells produce implementation-ready specifications with high functional correctness.

Compared with [17] who applied TOGAF ADM to produce a village blueprint but did not implement or test a prototype, this study advances the state of practice by bridging the design-to-implementation gap. Compared with Widodo [16], who applied the Zachman Framework in an institutional context but also stopped at the blueprint stage, this study adds the empirical validation component that prior Zachman-based works have omitted. Compared with Adamowicz and Zwolinska-Ligaj [24], whose smart village assessment was purely descriptive, this study contributes a technical blueprint with measurable quality evidence.

From a smart village dimensions perspective [3], the SPEDATA module directly addresses Smart Government (administrative efficiency through digitized correspondence), Smart People (data-driven citizen service delivery), and Smart Economy (transparent fund monitoring supporting fisheries investment accountability). The remaining dimensions Smart Mobility, Smart Environment, and Smart Living are addressed in the subsequent blueprint phases via the e-marketplace, GIS-Health, and e-tourism modules respectively, providing a clear development roadmap for the village government [25]

4. CONCLUSION

This study successfully designed and partially implemented a Smart Village IT Blueprint for Kangkunawe, a coastal fishing village in West Muna Regency, Indonesia, using the Zachman Framework as the governing enterprise architecture methodology. Three primary conclusions are drawn:

1. The Zachman Framework proved effective in systematically decomposing the complexity of coastal village IT governance into a structured, reproducible, and actionable six-perspective blueprint. The complete matrix population produced coherent and internally consistent business, application, data, technology, and network architectures tailored to the village's fisheries-based economic context and resource constraints.
2. The resulting IT blueprint defines five primary smart village service hubs SPEDATA, e-marketplace, GIS-Health, e-tourism, and e-finance structured into a seven-year progressive

implementation roadmap, providing a financially realistic development trajectory for the village government.

3. The SPEDATA prototype achieved a 100% functional correctness rate across 24 black-box test cases, empirically confirming that Zachman-derived requirements specifications reliably inform system implementation and close the design-to-prototype gap that characterizes prior village EA studies. Functional validation was further supported by User Acceptance Testing (UAT) conducted with village administrative staff, confirming that all primary workflows including population data input, administrative correspondence generation, and fund monitoring were operationally executable without system errors, thereby validating real-world usability in addition to technical correctness.

Future research should evaluate user acceptance of the deployed SPEDATA system using The measurements were conducted using standardized instruments, including the System Usefulness Scale (SUS) and the Technology Acceptance Model (TAM), and extend implementation to the e-marketplace module to empirically measure its impact on the economic welfare of the Kangkunawe fishing community

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REFERENCES

[1] A. Akbar and D. I. Sensuse, "Pembangunan Model Electronic Government Pemerintahan Desa Menuju Smart Desa," *J. Tek. dan Inform.*, vol. 5, no. 1, pp. 1–5, 2018.

[2] W. J. Barbon *et al.*, "The mitigating role of climate smart villages to the impacts of COVID-19 pandemic in the Myanmar rural communities," *Curr. Res. Environ. Sustain.*, vol. 4, no. April, p. 100152, 2022, doi: 10.1016/j.crsust.2022.100152.

[3] Rini Rachmawati, "Pengembangan Smart Village untuk Penguatan Smart City dan Smart Regency," *J. Sist. Cerdas*, vol. 1, no. 2, pp. 12–19, 2018, doi: 10.37396/jsc.v1i2.9.

[4] P. Flores-Crespo, M. Bermudez-Edo, and J. L. Garrido, "Smart tourism in Villages: Challenges and the Alpujarra Case Study," *Procedia Comput. Sci.*, vol. 204, pp. 663–670, 2022, doi: 10.1016/j.procs.2022.08.080.

[5] D. Dokl, V. Rogelj, and D. Bogataj, "Smart Age-Friendly Villages: Literature Review and Research Agenda," *IFAC-PapersOnLine*, vol. 55, no. 10, pp. 928–933, 2022, doi: 10.1016/j.ifacol.2022.09.459.

[6] A. M. Manoharan and V. Rathinasabapathy, "Smart Water Quality Monitoring and Metering Using Lora for Smart Villages," *2nd Int. Conf. Smart Grid Smart Cities, ICSGSC 2018*, pp. 57–61, 2018, doi: 10.1109/ICSGSC.2018.8541336.

[7] Jagustović Renata et al, "Contribution of systems thinking and complex adaptive system attributes to sustainable food production: Example from a climate-smart village." Elsevier, Netherlands, pp. 65–75, 2019. doi: 10.1016/j.agsy.2018.12.008.

[8] S. Shen and Q. Wang, "Innovation Strategy of Traditional Village Tourism Development in Liaoning Province under the Background of Smart Village Construction," *Proc. - 3rd Int.*

Conf. Intell. Transp. Big Data Smart City, ICITBS 2018, vol. 2018-Janua, pp. 85–88, 2018, doi: 10.1109/ICITBS.2018.00030.

[9] L. Lombardo, M. Saeli, and T. Campisi, "Smart technological tools for rising damp on monumental buildings for cultural heritage conservation. A proposal for smart villages implementation in the Madonie montains (Sicily)," *Sustain. Futur.*, vol. 6, no. February, p. 100116, 2023, doi: 10.1016/j.sftr.2023.100116.

[10] B. Vidmar, D. Bogataj, and V. Rogelj, "The Framework for Research of Smart Silver Villages," *IFAC-PapersOnLine*, vol. 55, no. 39, pp. 382–387, 2022, doi: 10.1016/j.ifacol.2022.12.059.

[11] M. Khairul Anam, Tri Putri Lestari, Latifah, Muhammad Bambang Firdaus, and Sofiansyah Fadli, "Analisis Kesiapan Masyarakat Pada Penerapan Smart City di Sosial Media Menggunakan SNA," *J. RESTI (Rekayasa Sist. dan Teknol. Informasi)*, vol. 5, no. 1, pp. 69–81, 2021, doi: 10.29207/resti.v5i1.2742.

[12] G. Prinsloo, A. Mammoli, and R. Dobson, "Customer domain supply and load coordination: A case for smart villages and transactive control in rural off-grid microgrids," *Energy*, vol. 135, pp. 430–441, 2017, doi: 10.1016/j.energy.2017.06.106.

[13] J. Choudhary *et al.*, "Study and development of village as a smart village," *Int. J. Sci. Eng. Res.*, vol. 9, no. 6, pp. 395–408, 2021, [Online]. Available: https://www.researchgate.net/profile/Megharima-Datta/publication/340315742_STUDY_AND_DEVELOPMENT_OF_TILLOR_BUZURG_VILLAGE_AS_A_SMART_VILLAGE/links/5e83b77492851c2f5270d8b0/STUDY-AND-DEVELOPMENT-OF-TILLOR-BUZURG-VILLAGE-AS-A-SMART-VILLAGE.pdf

[14] E. Sorongan and Q. Hidayati, "Evaluation of Implementation E-Government with Delone and Mclean," *INTENSIF J. Ilmu Penelitian dan Penerapan Teknologi Sistem Informasi*, vol. 4, no. 1, pp. 22–37, 2020, doi: 10.29407/intensif.v4i1.13067.

[15] A. Bielska, M. Stańczuk-Gałwiaczek, K. Sobolewska-Mikulska, and R. Mroczkowski, "Implementation of the smart village concept based on selected spatial patterns – A case study of Mazowieckie Voivodeship in Poland," *Land use policy*, vol. 104, no. March, 2021, doi: 10.1016/j.landusepol.2021.105366.

[16] S. Bambang Widodo, "Pengembangan Blueprint It Dengan Zachman Framework dI STP Trisakti," *J. Sist. Inf. (Journal Inf. Syst.*, vol. Volume 13, no. Issue 1, pp. 1–5, 2017.

[17] Z. Rifai, T. Bratakusuma, and R. Arvianti, "Perencanaan Arsitektur Enterprise Desa Dengan Kerangka Kerja TOGAF ADM," *J. Sisfokom (Sistem Inf dan Komputer)*, vol. 9, no. 2, pp. 177–184, 2020, doi: 10.32736/sisfokom.v9i2.803.

[18] M. H. A. Susanto, D. Priyandari, "Enterprise Architecture Planning for Smart Village Using Zachman Framework: A Case Study in Rural Indonesia," *Int. J. Adv. Comput. Sciences Appl.*, vol. 14, no. 3, pp. 112–121, 2023.

[19] S. I. Anindita and B. M. Izzati, "SMART VILLAGE DESIGN USING INDONESIAN GOVERNMENT," *JIPI (Jurnal Ilm. Penelit. dan Pembelajaran Inform.*, vol. 07, no. 04, pp. 1058–1067, 2022.

[20] A. K. Darmawan, F. Masykur, M. Muhsi, B. A. Umam, and R. Rofiuddin, "Proposing Enterprise Architecture for Smart Regencies in Indonesia : A Perspective of Zachman Framework (ZF)," in *International Conference on ICT for Smart Society (ICISS)*, IEEE,

2022, pp. 1–7. doi: 10.2209/ICISS55894.2022.9915118.

[21] Rizi Advista, “PERANCANGAN ENTERPRISE ARCHITECTURE PLANNING (EAP) PADA PROGRAM DESA DIGITAL JAWA BARAT MENGGUNAKAN ZACHMAN FRAMEWORK,” *Media Inform.*, vol. 21, no. 1, 2022.

[22] wikipedia, “Maginti, Muna Barat.” [Online]. Available: https://id.wikipedia.org/wiki/Maginti,_Muna_Barat

[23] N.- Ningsi and N.- Rajab, “Perancangan Portofolio Aplikasi Dikbud Kabupaten Kolaka Kerangka Kerja Spis Versi Ward Dan Joe Peppard,” *Sistemasi*, vol. 9, no. 3, p. 444, 2020, doi: 10.32520/stmsi.v9i3.829.

[24] M. Adamowicz and M. Zwolinska-Ligaj, “The ‘smart village’ as away to achieve sustainable development in Rural Areas of Poland,” *Sustain.*, vol. 12, no. 16, 2020, doi: 10.3390/su12166503.

[25] F. D. Prasetyo and Y. Herdiyanti, “Digital Governance Framework for Indonesian Rural Communities: Mapping Smart Village Readiness Indicators,” *J. Theory. Appl. Inf. Technol.,* vol. 101, no. 8, pp. 3012–3024, 2023.