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ENTERPRISE INTEGRATION READINESS IN A PHILIPPINE MUNICIPAL GOVERNMENT: AN EXPLORATORY CASE STUDY OF SYSTEM INTEROPERABILITY, DATA INTEGRATION, AND DIGITAL TRANSFORMATION

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ABSTRACT

Enterprise integration is increasingly important in digital government as public institutions deploy multiple information systems that must exchange data and support services across organizational boundaries. This study assessed the enterprise integration readiness of the Municipal Government of Rodriguez, Rizal, Philippines using a descriptive-exploratory single-case study design. Documentary analysis and a MITO-validated administrative inventory of 16 major municipal information-system areas were evaluated using an adapted Enterprise Integration Readiness Index (EIRI) informed by enterprise and public-sector interoperability literature. Five dimensions were assessed: application and technical interoperability; data and semantic interoperability; process and organizational interoperability; governance and institutional readiness; and shared infrastructure, identity, and security. Six systems (37.50%) were reported as fully integrated and four (25.00%) as partially integrated, meaning 62.50% of the assessed portfolio exhibited some degree of application integration. Nevertheless, the overall EIRI was 2.72/5.00, classified as Partially Integrated. Governance and Institutional Readiness scored highest at 3.70, followed by Shared Infrastructure, Identity and Security at 2.70, Process and Organizational Interoperability at 2.50, Data and Semantic Interoperability at 2.38, and Application and Technical Interoperability at 2.33. The 1.22-point Governance-Implementation Gap indicates that institutional readiness has progressed ahead of technical and operational implementation. The findings show that application connectivity alone may overstate enterprise integration maturity. Sustainable interoperability requires standardized interfaces, master-data and semantic standards, integrated processes, shared identity, governance mechanisms, and common ICT infrastructure.

Keywords: Enterprise integration; Enterprise interoperability; Digital government; Systems integration; Local government; Enterprise architecture.

1 INTRODUCTION

Digital transformation has become an increasingly important component of public-sector modernization as governments seek to improve operational efficiency, responsiveness, transparency, and citizen access to services. However, the implementation of individual information systems does not necessarily result in an integrated digital government. As organizations introduce applications for taxation, licensing, financial management, human resources, records, geographic information, citizen services, and other functions, these systems may develop independently and create fragmented information environments unless mechanisms are established to enable them to exchange and consistently use information across organizational boundaries [1-3].

Enterprise integration addresses this problem by enabling heterogeneous applications, data sources, organizational processes, and technology infrastructure to operate in a coordinated environment. In public administration, this requirement extends beyond technical connectivity. Government interoperability requires systems and organizations to meaningfully exchange information, preserve the meaning of exchanged data, coordinate business processes, and establish governance mechanisms that support sustained collaboration [2-5]. The European Interoperability Framework consequently treats interoperability as a multidimensional issue encompassing organizational, semantic, technical, and governance considerations rather than merely the ability of computer systems to connect [4].

Research on digital-government maturity similarly demonstrates that integration develops progressively. Gottschalk identified five maturity levels of interoperability in digital government, moving from basic computer interoperability toward increasingly sophisticated process, knowledge, value, and goal interoperability [1]. Guédria, Naudet, and Chen developed a maturity model specifically for enterprise interoperability, emphasizing that an organization's ability to interoperate should be assessed across multiple enterprise concerns rather than through technical interfaces alone [2]. Interoperability-assessment research further indicates that maturity evaluation requires clearly defined dimensions, criteria, evidence, and scoring mechanisms if the resulting assessment is to be meaningful and reproducible [3].

These considerations are particularly important in government because information and services frequently cross departmental boundaries. Pardo and Tayi identified interorganizational information integration as a major enabler of digital government, while subsequent research found that successful government information-sharing initiatives depend on both technical compatibility and organizational arrangements [6, 7]. Comparative case research has likewise shown that process integration, information sharing, and system interoperation are interrelated but distinct elements of government integration [8]. Consequently, a local government may possess several interconnected applications while still experiencing duplicate encoding, inconsistent identifiers, manual handoffs, incompatible data definitions, fragmented authentication, and weak enterprise-wide governance.

The Philippine policy environment has also moved toward interoperable digital government. Republic Act No. 12254, the E-Governance Act, institutionalizes the transition toward a digitally empowered and integrated government and expressly applies the national e-governance direction to government institutions, including local government contexts [9].

Within this broader context, the Municipal Government of Rodriguez, Rizal has progressively implemented information systems supporting real property taxation, business licensing, financial administration, human resources, management information, sanitation, ticketing, geographic information, public market operations, transport management, civil registration, health services, and citizen-facing applications. Based on the current system inventory assessed in this study, six of sixteen major system areas are reported as fully integrated, four as partially integrated, and six as standalone or still under development. At the same time, the municipality's ICT Plan identifies enterprise GIS and systems integration as a strategic priority and establishes a target architecture that includes API-first applications, master-data standards, centralized identity, single sign-on, role-based access, authoritative spatial data, integrated citizen services, and interoperability requirements in future technology procurements [10].

These conditions indicate that Rodriguez has already progressed beyond an entirely fragmented application environment. Nevertheless, the existence of integrated applications does not by itself establish enterprise-wide interoperability. Several critical capabilities identified in both the literature and the municipality's target architecture—including common data standards, enterprise identity, reusable interfaces, semantic consistency, cross-departmental workflow integration, and shared governance mechanisms—remain at different stages of implementation [10].

The research problem therefore concerns the difference between application-level integration and enterprise integration readiness. Despite substantial progress in the deployment and integration of municipal applications, the extent to which the Municipality of Rodriguez possesses the technical, semantic, organizational, governance, and shared-infrastructure capabilities necessary to operate as an interoperable enterprise has not been systematically assessed.

This study evaluates enterprise integration readiness across five dimensions: application and technical interoperability; data and semantic interoperability; process and organizational interoperability; governance and institutional readiness; and shared infrastructure, identity, and security. An adapted Enterprise Integration Readiness Index (EIRI), informed by established enterprise and public-sector interoperability maturity literature, is applied to documented current-state conditions and the municipality's ICT architecture.

The general objective is to assess the enterprise integration readiness of the Municipality of Rodriguez, Rizal by examining the interoperability of its information systems, data, organizational processes, governance mechanisms, and shared ICT infrastructure. Specifically, the study aims to: (1) identify and classify the current integration status of major municipal information systems; (2) assess enterprise integration readiness across the five identified interoperability dimensions; (3) determine the principal gaps affecting enterprise-wide interoperability; (4) examine the difference between governance and institutional readiness and technical and operational implementation; and (5) recommend priority actions and an integration pathway toward a more standardized, interoperable, and sustainable municipal digital ecosystem.

The study is significant because it provides an applied assessment of enterprise integration in a Philippine local-government environment. Rather than evaluating integration exclusively according to the number of interconnected applications, it examines whether the surrounding data, processes, governance mechanisms, identity services, and shared infrastructure are sufficiently developed to support enterprise-wide interoperability. The resulting assessment may provide the Municipal Government of Rodriguez with a structured basis for prioritizing integration initiatives and may also provide an exploratory model that other local governments can adapt and validate in future studies.

2 REVIEW OF RELATED LITERATURE

2.1 Enterprise Integration and Enterprise Interoperability

Enterprise integration concerns the coordination of applications, information, processes, and technology resources so that organizational functions can operate as part of a coherent enterprise environment. Within contemporary interoperability research, technical integration represents only one component of a broader organizational capability. Enterprise interoperability refers to the ability of different enterprise entities to work together and exchange and use information while preserving intended functionality and meaning across organizational boundaries [2, 3].

This distinction is important because application integration can exist without full interoperability. Two applications may technically exchange data through a file transfer, database connection, or application programming interface while maintaining inconsistent data definitions, duplicate master records, separate authentication mechanisms, or incompatible business processes. Enterprise interoperability therefore requires alignment at multiple levels, including information, applications and services, organizational processes, governance structures, and supporting technological infrastructure [2, 4].

Guédria, Naudet, and Chen's Maturity Model for Enterprise Interoperability provides a theoretical foundation for assessing this broader capability [2]. Leal, Guédria, and Panetto's systematic review further demonstrated that interoperability is assessed through a range of multidimensional approaches and that the definition of assessment scope and criteria is critical to the credibility of maturity results [3]. For the present study, the EIRI is therefore an adapted analytical rubric informed by established interoperability maturity literature; it is not presented as the original MMEI.

2.2 Interoperability Maturity in Digital Government

Gottschalk proposed five maturity levels for interoperability in digital government: computer, process, knowledge, value, and goal interoperability [1]. The model demonstrates that basic system connectivity represents an early stage rather than the endpoint of government interoperability.

Earlier e-government maturity research reached a similar conclusion from the perspective of service development. Layne and Lee described e-government evolution through cataloguing, transaction, vertical integration, and horizontal integration [11]. Andersen and Henriksen subsequently extended e-government maturity thinking by emphasizing process transformation and the relationship between ICT applications and core public-sector activities [12].

The European Commission's Interoperability Maturity Assessment of a Public Service (IMAPS) provides a public-sector assessment approach applicable across government levels [5]. These approaches support the use of staged readiness levels in the present study, while the indicators were adapted to reflect local application integration, municipal data, cross-departmental processes, governance, identity, and shared ICT infrastructure.

2.3 Dimensions and Enablers of Government Interoperability

The literature treats interoperability as a multidimensional capability. Technical interoperability concerns compatible interfaces, protocols, APIs, services, and infrastructure, while semantic interoperability requires shared definitions, identifiers, metadata, and authoritative data sources so that exchanged information retains consistent meaning [4, 13]. Government information-sharing research further shows that technical compatibility must be accompanied by formal management responsibility and organizational arrangements [6-8].

Process and organizational interoperability concerns workflows that cross departmental boundaries without unnecessary manual handoffs or duplicate encoding. Governance provides the institutional mechanisms for architecture ownership, data stewardship, procurement standards, security responsibilities, vendor management, and performance monitoring [4, 6-10]. Shared infrastructure, identity, authentication, role-based access, monitoring, resilience, and security function as reusable horizontal capabilities supporting multiple applications [14].

These dimensions are directly relevant to the Rodriguez target architecture, which identifies API-first applications, master-data standards, authoritative GIS information, centralized identity, SSO, role-based access, resilient connectivity, and integration requirements [10]. They also align with the Philippine E-Governance Act and DICT digital-platform direction toward interoperable government systems and services [9, 15].

2.4 Synthesis of Literature and Research Gap

The reviewed literature consistently indicates that enterprise integration and government interoperability are multidimensional capabilities. Technical system connectivity is necessary but insufficient. Mature interoperability also requires semantic consistency of data, coordinated organizational processes, governance mechanisms, shared infrastructure, and institutional capacity [1-8, 13, 14, 16].

The literature further demonstrates that interoperability develops through maturity stages and that public organizations can use structured assessment frameworks to identify gaps between existing capabilities and target states [1, 2, 5]. However, much of the established literature addresses national government interoperability, cross-agency information sharing, international frameworks, or enterprise interoperability in broader organizational settings.

The present study addresses this applied gap through an exploratory assessment of enterprise integration readiness in the Municipal Government of Rodriguez, Rizal. The study adapts established interoperability concepts into five assessment dimensions and evaluates documented current-state capabilities against an emerging target enterprise architecture. It does not seek to replace established maturity models; instead, it applies their core principles to determine whether progress in connecting individual municipal systems is accompanied by sufficient development in data semantics, cross-departmental processes, governance, enterprise identity, and shared ICT infrastructure.

3 MATERIALS AND METHODS

3.1 Research Design

This study employed a descriptive-exploratory single-case study design to assess enterprise integration readiness within the Municipal Government of Rodriguez, Rizal, Philippines. A case-study approach was selected because the research examines enterprise interoperability within an actual organizational and technological environment characterized by multiple operational, partially integrated, standalone, and developing information systems.

Rather than measuring individual user perceptions through a questionnaire, the study evaluated observable and documented enterprise integration capabilities. The analysis combined documentary evidence with an operational inventory of major municipal information systems and assessed the resulting evidence using a structured Enterprise Integration Readiness Index (EIRI). The approach was informed by established research on enterprise interoperability maturity, digital-government interoperability, interoperability assessment, and public-sector interoperability frameworks [1-5]. The EIRI is an adapted analytical rubric designed specifically for exploratory assessment of the Rodriguez case and is not presented as the original MMEI or IMAPS instrument or as an independently validated universal maturity instrument.

3.2 Unit and Scope of Analysis

The primary unit of analysis was the enterprise information-system environment of the Municipal Government of Rodriguez. The assessment covered 16 major system or application areas. GIS and RPTAS were treated as separate analytical units: RPTAS was assessed according to its existing operational integration status, while the emerging GIS platform was assessed separately because its broader integration with real property, business, and spatial information services remained under development. The analysis did not attempt to evaluate software quality, user satisfaction,

cybersecurity compliance, or functional completeness except where these conditions directly affected enterprise interoperability.

3.3 Sources of Evidence

The primary documentary source was the Municipality of Rodriguez Information and Communications Technology Plan 2024-2028, Version 1.3 [10]. It documents the municipality's current ICT environment, existing and planned systems, enterprise GIS and integration priorities, application and data architecture, master-data direction, identity and authentication direction, governance arrangements, data ownership provisions, procurement interoperability requirements, vendor-lock-in controls, cybersecurity direction, and implementation roadmap.

A structured administrative inventory of major municipal applications was used to establish their current reported integration status. The operational system status was established through an administrative inventory validated by the Municipal Information Technology Office (MITO), which is responsible for municipal ICT operations and systems coordination. The inventory reflected the operational condition of the assessed systems at the time of the study and was used to classify each application as fully integrated, partially integrated, standalone, or under development/standalone. Operational classifications were treated as organizational administrative evidence and were distinguished from documentary evidence derived from the municipal ICT Plan.

3.4 Evidence Classification

Assessment evidence was classified as Documented (D), Operationally Reported (O), or Inferred (I). Documented evidence was explicitly stated in an official municipal plan, architecture, policy, or other documentary source. Operationally Reported evidence reflected current system conditions established through the MITO-validated administrative inventory. Inferred evidence represented analytical conclusions derived from documented and/or operational evidence but not directly stated by either source.

This distinction was particularly important when evaluating target-state and implemented capabilities. Planned capabilities identified in the target architecture were treated as evidence of strategic or institutional direction, but not automatically as evidence that those capabilities were fully implemented.

3.5 Enterprise Integration Readiness Framework

The EIRI assessed enterprise integration through five equally weighted dimensions: D1 Application and Technical Interoperability; D2 Data and Semantic Interoperability; D3 Process and Organizational Interoperability; D4 Governance and Institutional Readiness; and D5 Shared Infrastructure, Identity and Security. Equal weighting of 20% per dimension was used because the exploratory case study did not provide empirical evidence sufficient to justify preferential weighting.

3.6 Readiness Scoring Scale

Each indicator was assessed using a five-point maturity scale: 1 = Fragmented; 2 = Developing; 3 = Partially Integrated; 4 = Integrated; and 5 = Enterprise-Interoperable. A score of 5 required evidence of standardized, reusable, governed, secure, enterprise-wide capability and was not assigned merely because an individual application was described as fully integrated.

3.7 Calculation of Dimension Scores

For each dimension, the readiness score was calculated as the arithmetic mean of its indicator scores. The overall EIRI was calculated as the mean of the five equally weighted dimension scores. Study-specific interpretive ranges were: 1.00-1.80 Fragmented; 1.81-2.60 Developing; 2.61-3.40 Partially Integrated; 3.41-4.20 Integrated; and 4.21-5.00 Enterprise-Interoperable. These thresholds were created for this exploratory assessment and are not presented as thresholds prescribed by MMEI, IMAPS, or another external standardized instrument.

3.8 System Portfolio Analysis

Descriptive analysis was performed on the 16-system application portfolio. The number and proportion of applications classified as fully integrated, partially integrated, standalone, or under development/standalone were calculated. This allowed direct comparison between reported application-level integration and the broader multidimensional EIRI assessment.

3.9 Governance-Implementation Gap

A secondary descriptive indicator was calculated to examine the difference between institutional readiness and operational implementation. The technical/operational implementation score was defined as the average of D1, D2, D3,

and D5. The Governance-Implementation Gap (GIG) was calculated as D4 minus this four-dimension mean. A positive value indicates that governance and institutional readiness is more mature than technical and operational implementation. The GIG is a descriptive indicator developed specifically for this case analysis and is not presented as an established interoperability metric.

3.10 Analytical Procedure

The assessment followed six stages: system identification; current-state classification; documentary review; evidence coding; indicator scoring; and descriptive analysis. Planned capabilities were not treated as fully implemented unless supported by operational evidence. No inferential statistical tests were performed because the study did not use a probability sample or respondent-level dataset and was designed as an exploratory organizational case assessment.

3.11 Reliability and Analytical Controls

Several controls were incorporated to reduce overstatement and improve consistency. Current-state and target-state conditions were separated; scoring criteria were defined before interpretation of the overall EIRI; each score was required to correspond to identifiable documentary or operational evidence; application-level integration and enterprise interoperability were analyzed separately; and all calculated results were treated as descriptive case-study findings rather than population estimates.

Operational classifications were validated at the organizational level by MITO and cross-checked against available planning and systems documentation where applicable. Where documentary evidence was unavailable or insufficient to independently establish an operational condition, the evidence was explicitly classified as operationally reported rather than documented.

3.12 Ethical Considerations

The study primarily analyzed organizational systems, ICT architecture, operational integration status, and institutional documents rather than collecting personal information from individual research participants. No sensitive personal records, citizen-level datasets, passwords, system credentials, or confidential transaction data were included. Operational information was presented at the system or organizational level rather than attributed to individual municipal personnel.

3.13 Limitations

This is a single-municipality case study and the resulting EIRI score cannot be generalized statistically to other Philippine LGUs. The EIRI is an adapted exploratory assessment framework, not an externally validated standardized instrument. Part of the current-state assessment relies on an administrative operational inventory rather than direct technical inspection of source code, databases, APIs, middleware, or network traffic. The ICT Plan contains both current-state information and planned target-state capabilities, and implementation status may change as projects progress. The study does not directly measure employee perceptions, citizen satisfaction, system performance, cost effectiveness, or software quality. Finally, enterprise integration is dynamic; the findings represent readiness at the time of assessment rather than a permanent maturity classification.

4 RESULTS

4.1 Integration Status of Municipal Information Systems

Of the 16 assessed systems, six (37.50%) were classified as fully integrated and four (25.00%) as partially integrated. Three systems (18.75%) remained standalone, while another three (18.75%) were under development and remained standalone at the time of assessment. Collectively, 10 of the 16 systems (62.50%) demonstrated either partial or full integration. The remaining six systems (37.50%) were either standalone or still under development.

Table 1: **Distribution of municipal information systems by integration status.**

Integration status	Frequency	Percentage
Fully integrated	6	37.50%
Partially integrated	4	25.00%
Standalone	3	18.75%
Under development / standalone	3	18.75%

Total	16	100.00%

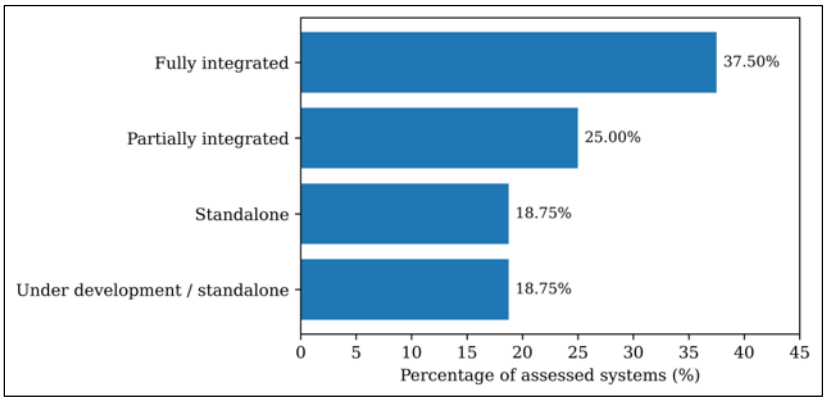

Figure 1: Distribution of municipal systems by integration status.

4.2 Enterprise Integration Readiness by Dimension

Table 2: Enterprise Integration Readiness Index scores by dimension.

Dimension	Score	Readiness classification
D1. Application & Technical Interoperability	2.33	Developing
D2. Data & Semantic Interoperability	2.38	Developing
D3. Process & Organizational Interoperability	2.50	Developing
D4. Governance & Institutional Readiness	3.70	Integrated
D5. Shared Infrastructure, Identity & Security	2.70	Partially Integrated
Overall EIRI	2.72	Partially Integrated

The overall Enterprise Integration Readiness Index was 2.72 out of 5.00, corresponding to the Partially Integrated classification established for the study. Governance and Institutional Readiness recorded the highest score at 3.70, followed by Shared Infrastructure, Identity and Security at 2.70. Process and Organizational Interoperability received 2.50, Data and Semantic Interoperability 2.38, and Application and Technical Interoperability 2.33.

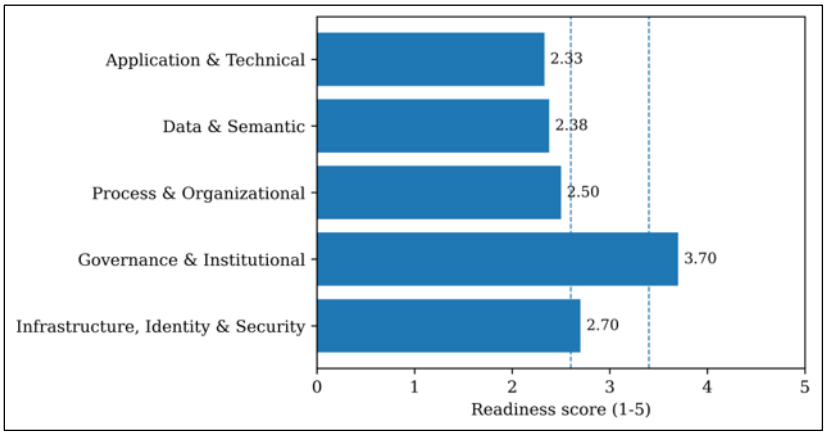

Figure 2: Enterprise Integration Readiness Index scores by dimension.

4.3 Application and Technical Interoperability

Application and Technical Interoperability obtained 2.33, classified as Developing. Several applications already exchange information or participate in integrated municipal processes, but standalone and developing applications remain. More importantly, the existence of individual integrations did not establish that a standardized enterprise

integration mechanism had been implemented across the application portfolio. The ICT Plan identifies API-first architecture and further enterprise systems integration as target-state capabilities [10].

4.4 Data and Semantic Interoperability

Data and Semantic Interoperability obtained 2.38, classified as Developing. Data exchange occurs among several integrated systems; however, heterogeneous structures, inconsistent identifiers, duplicate encoding, and mixed mechanisms of exchange remain concerns. The ICT Plan recognizes master-data standards and authoritative enterprise datasets as target capabilities and positions GIS as an intended authoritative spatial-information base [10].

4.5 Process and Organizational Interoperability

Process and Organizational Interoperability received 2.50, classified as Developing. Cross-departmental process integration was evident in selected operations, particularly taxation, business-related transactions, and financial administration. However, manual handoffs, duplicate encoding, and incomplete automation remained present in portions of the enterprise environment.

4.6 Governance and Institutional Readiness

Governance and Institutional Readiness achieved 3.70, the highest score and the only dimension classified as Integrated. The assessment identified ICT ownership, executive sponsorship, defined responsibilities, identified business ownership, and integration-related procurement provisions. The ICT Plan assigns strategic responsibility for ICT modernization and identifies requirements concerning application integration, data ownership, and avoidance of vendor lock-in [10].

4.7 Shared Infrastructure, Identity and Security

Shared Infrastructure, Identity and Security obtained 2.70, classified as Partially Integrated. Significant infrastructure supports digital operations, but several enterprise-wide enablers remain under development or target-state capabilities, including centralized identity, broader role-based access, single sign-on, standardized API/service infrastructure, centralized monitoring, resilience improvements, and continuing network modernization [10].

4.8 Governance-Implementation Gap

Table 3: Governance-Implementation Gap.

Measure	Score
Governance & Institutional Readiness	3.70
Mean Technical/Operational Readiness	2.48
Governance-Implementation Gap	1.22

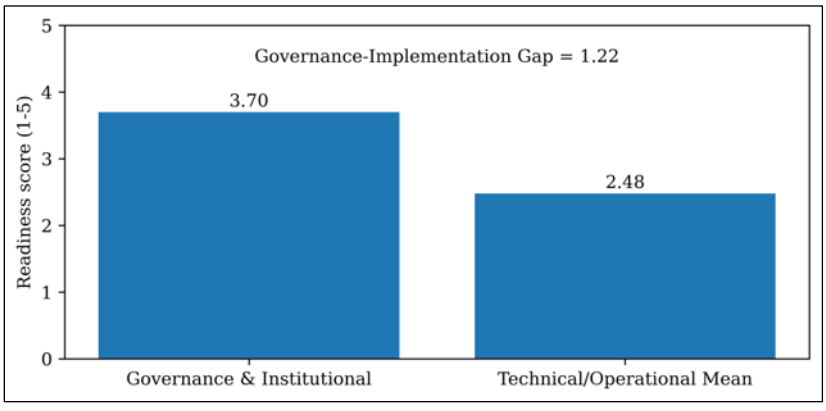

Figure 3: Governance readiness compared with mean technical and operational readiness.

Governance and Institutional Readiness obtained 3.70. The mean of the four technical and operational dimensions (D1, D2, D3, and D5) was 2.48. The resulting Governance-Implementation Gap was therefore 1.22. The positive gap indicates that documented governance and institutional arrangements are approximately one maturity point ahead of technical and operational enterprise-integration capabilities. Because the GIG was developed specifically for this case study, the value should not be interpreted against external normative thresholds.

4.9 Current-State and Target-State Integration Gap

The principal current-to-target gaps concern standardized reusable interfaces, enterprise data and semantic standards, end-to-end process integration, authoritative GIS services, centralized identity and SSO, consistent governance enforcement, and completion of resilient shared infrastructure [10].

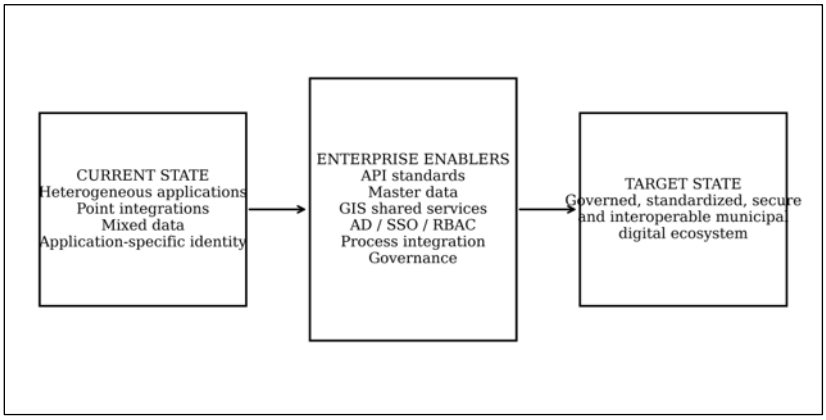

Figure 4: Enterprise integration transition framework for the Municipality of Rodriguez.

5 DISCUSSION

5.1 Enterprise Integration Readiness of the Municipality

The results indicate that the Municipal Government of Rodriguez is in a transitional stage between application-level integration and broader enterprise interoperability. Although 62.50% of the assessed system portfolio was reported as either fully or partially integrated, the multidimensional EIRI produced an overall score of 2.72/5, corresponding to Partially Integrated. The system inventory measures whether individual applications participate in integration, whereas the EIRI evaluates whether the broader organizational environment possesses the technical, semantic, process, governance, identity, and infrastructure capabilities required for sustained enterprise interoperability. This interpretation is consistent with enterprise interoperability literature, which distinguishes technical connectivity from wider interoperability capability [2, 3].

5.2 Application Integration Does Not Necessarily Indicate Enterprise Interoperability

Six systems were operationally classified as fully integrated and four as partially integrated, yet D1 received only 2.33. This is not a contradiction: the application inventory asks whether a particular application participates in integration, while the EIRI asks whether the municipality possesses standardized, reusable, enterprise-wide technical integration capability. The ICT Plan's API-first direction therefore represents an architectural transition from individual integration projects toward standardized mechanisms through which applications can expose and consume services [10]. The next challenge is not simply to connect more systems, but to standardize how systems are connected.

5.3 Data and Semantic Interoperability as a Critical Constraint

Data and Semantic Interoperability obtained 2.38, indicating that the ability to transfer information among applications has developed faster than the ability to ensure that information is represented and interpreted consistently across the enterprise. In a municipal environment, the same citizen, property, business, location, employee, or transaction may appear across several databases. If systems employ different identifiers, classifications, field structures, naming conventions, or validation rules, integration can propagate inconsistency. The ICT Plan's master-data direction and intended authoritative GIS spatial base are therefore important enterprise capabilities [10]. OECD analysis similarly emphasizes data interoperability and governance as foundations for coherent digital government [14].

5.4 Process Integration and End-to-End Service Design

Process and Organizational Interoperability received 2.50. Connecting applications does not necessarily redesign the underlying business process. Information may still require manual verification, re-entry, printing, transfer, or approval outside an integrated workflow. Future integration should increasingly ask which municipal service should operate as one end-to-end process regardless of how many departments or systems participate. This direction is consistent with the E-Governance Act's emphasis on integrated government systems and processes [9].

5.5 Governance Readiness as the Principal Strength

Governance and Institutional Readiness received 3.70, suggesting that many organizational prerequisites for further enterprise integration are already present. The ICT Plan identifies MITO ownership, executive sponsorship, RACI arrangements, business ownership, data-ownership provisions, interoperability requirements, and vendor-lock-in controls [10]. The score should nevertheless be interpreted as institutional readiness rather than complete implementation. The next stage requires converting governance intent into repeatable institutional practice.

5.6 The Governance-Implementation Gap

The 1.22-point Governance-Implementation Gap indicates that institutional and strategic readiness is approximately one maturity level ahead of technical and operational implementation. This may indicate that the municipality has created much of the organizational foundation required for the next stage of digital transformation but has not yet completed implementation across applications, data, processes, identity, and infrastructure. OECD's 2026 Digital Government Outlook identifies a comparable broader challenge: governments have often progressed further in strategies and foundations than in consistent operational adoption and integrated use [14].

5.7 Enterprise Enablers, GIS, and Strategic Implications

Shared identity and infrastructure should be treated as horizontal enterprise services rather than application-specific components. The ICT Plan identifies centralized identity through Active Directory, AD-backed authentication, SAML/OIDC-based SSO, centralized groups and role-based access, network segmentation, monitoring, resilient connectivity, and API-first applications [10]. Completing these capabilities would reduce fragmented credentials and provide a common control plane for municipal applications.

GIS is similarly important as an enterprise integration layer. Although the platform remains under development, the target architecture positions GIS as an authoritative spatial-information capability integrated with real-property and business functions [10]. Common spatial identifiers can connect properties, businesses, buildings, roads, facilities, infrastructure, markets, transport, health, environmental assets, and citizen-service locations across otherwise separate departmental databases.

The strategic implication is that Rodriguez should not prioritize integration simply by counting remaining standalone systems. Sustainable progress requires common data and identifier standards, authoritative systems of record, standardized APIs, shared identity, end-to-end process design, GIS services, governance, and measurable interoperability indicators. This case therefore contributes an applied municipal assessment showing that application integration and enterprise interoperability are not equivalent and that maturity can develop unevenly across governance, technology, data, process, identity, and infrastructure. The same distinction may be relevant to other Philippine LGUs as digitalization shifts from computerization toward interoperability under the E-Governance Act [9].

6 RECOMMENDATIONS AND PROPOSED ENTERPRISE INTEGRATION ROADMAP

6.1 Priority Enterprise Integration Interventions

The municipality should transition from application-by-application integration toward a governed enterprise integration architecture by operationalizing the direction already established in its ICT Plan [10]. Priority interventions are: (1) establish enterprise data governance, master-data domains, authoritative systems of record, common identifiers, validation rules, and an enterprise data dictionary; (2) adopt standardized API and integration requirements covering documentation, secure authentication, versioning, logging, testing, auditability, exportability, and vendor-independence; (3) implement shared enterprise identity through centralized accounts, standardized roles, RBAC, federation, SSO, provisioning/deprovisioning, and access auditing; and (4) redesign high-value services as end-to-end cross-departmental processes rather than isolated application workflows.

GIS should be developed as a shared spatial service using common geographic identifiers that can be reused across property, business, infrastructure, transport, health, environmental, and citizen-service applications. MITO should institutionalize enterprise integration governance through an application inventory, integration register, API/service catalog, master-data register, identity/access matrix, architecture standards, roadmap, and interoperability KPIs. Procurement should require LGU data ownership, documented integration interfaces where needed, standard exports, technical turnover, migration provisions, interoperability testing, acceptance criteria, and transition assistance. Integration priority should be based on enterprise value—including data-sharing frequency, departmental dependencies, citizen impact, duplicate encoding, transaction volume, regulatory importance, and feasibility—rather than on the number of standalone systems alone.

6.2 Proposed Enterprise Integration Roadmap

Implementation is recommended in five phases: (1) Standardize and Govern - confirm the application inventory, master-data domains, authoritative systems, data dictionary, API standards, procurement requirements, ownership, and interoperability KPIs; (2) Build Shared Enterprise Services - centralized identity, RBAC, SSO, reusable APIs, monitoring, resilient connectivity, GIS services, and shared validation; (3) Integrate Priority Processes - map end-to-end workflows, remove duplicate encoding, automate handoffs, integrate master data and GIS, and connect high-value standalone systems; (4) Expand Citizen and External Interoperability - integrate citizen/mobile services, transaction tracking, e-payments, relevant national platforms, and government data exchange; and (5) Optimize and Measure - monitor APIs, data quality, integration failures, access controls, architecture compliance, and periodically reassess EIRI.

6.3 Proposed Target Architecture

The proposed architecture progresses from Citizen and Employee Channels to an Enterprise Access Layer (identity, SSO, RBAC and authentication), an Enterprise Integration Layer (APIs, services, data exchange and logging), Shared Enterprise Information (citizen, business, property, GIS, finance and organizational master data), Municipal Systems, and Infrastructure and Security (network, cloud/servers, monitoring, backup/disaster recovery and cybersecurity).

6.4 Recommended Enterprise Integration Priorities

Priority interventions are: enterprise data and master-data standards; standardized API/integration architecture; centralized identity, RBAC and SSO; end-to-end process integration; GIS as a shared spatial service; institutionalized integration governance; procurement interoperability standards; connection of high-value standalone systems; external and national-government interoperability; and continuous EIRI monitoring. The sequence should remain flexible so that complementary initiatives can proceed concurrently when resources permit.

7 CONCLUSION

This study assessed the enterprise integration readiness of the Municipal Government of Rodriguez, Rizal through an exploratory case-study framework encompassing 16 major municipal information-system areas and five dimensions of enterprise interoperability. Six of the 16 assessed systems (37.50%) were reported as fully integrated and four (25.00%) as partially integrated; collectively, 62.50% of the assessed portfolio therefore demonstrated some level of integration.

However, the multidimensional EIRI produced an overall score of 2.72/5, corresponding to a Partially Integrated enterprise environment. Governance and Institutional Readiness was the strongest dimension at 3.70, while Application and Technical Interoperability (2.33), Data and Semantic Interoperability (2.38), Process and Organizational Interoperability (2.50), and Shared Infrastructure, Identity and Security (2.70) remained at developing or partially integrated levels. The resulting 1.22-point Governance-Implementation Gap indicates that institutional and strategic capacity has progressed ahead of technical and operational implementation.

Rodriguez does not need to begin enterprise integration from an entirely fragmented environment. It already possesses functioning integrations, significant ICT infrastructure, established governance mechanisms, and an ICT architecture that recognizes APIs, master data, centralized identity, GIS integration, interoperability, and vendor independence as strategic requirements [10]. The next stage should focus on converting these foundations into common enterprise capabilities.

Priority should be given to standardized APIs, authoritative master data, semantic consistency, shared identity and access management, end-to-end process integration, reusable GIS services, procurement interoperability requirements, and progressive integration of high-value standalone systems. The study concludes that the Municipality of Rodriguez is transitioning from system integration toward enterprise interoperability. Future maturity will depend less on the number of applications deployed and increasingly on whether those applications operate as components of a governed, standardized, secure, and interoperable municipal digital ecosystem.

STATEMENTS ON COMPLIANCE WITH ETHICAL STANDARDS

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Disclosure of conflict of interest

The author declares no conflict of interest.

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