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Enterprise Architecture Design for a Human Resource Information System in a Tire Manufacturing Company

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Abstract: Large manufacturing companies run many human resource (HR) procedures to manage a sizeable workforce, from recruitment and onboarding to attendance, leave, career changes, and training. In practice, these procedures are often supported by a mix of manual steps and several separate applications that are added over time without a single architectural plan. The result is duplicated data entry, fragmented records across departments, and limited traceability between HR objectives and the systems that support them. This study designs an enterprise architecture (EA) for the human resource information system (HRIS) of a large tire manufacturing company, kept anonymous for confidentiality, using the TOGAF Architecture Development Method (Preliminary Phase through Phase F) and ArchiMate 3.1 within a design science research approach. Guided by eight contextualised architecture principles, eighteen official internal HR work-procedure documents were analysed and structured into six core business capabilities across the motivation, business, application, and technology layers, followed by an as-is versus to-be gap analysis. The resulting reference architecture resolves four critical architectural gaps: establishing a single governed employee data repository, unifying multi-level approval workflows, digitising manual administrative forms, and replacing manual multi-plant attendance reconciliation with a scheduled interface between biometric devices and the HRIS Core linked to payroll. Evaluated against four design science criteria—consistency, completeness, traceability, and applicability—the architecture provides end-to-end traceability from managerial drivers to database infrastructure and defines an actionable four-stage, twelve-month migration roadmap. The study contributes a validated, reusable EA model for enterprise HRIS in a labour-intensive manufacturing environment, addressing an empirical gap in prior TOGAF-based case literature.

Keywords: Enterprise Architecture; TOGAF ADM; ArchiMate; Human Resource Information System; Digital Transformation.

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1. Introduction

Manufacturing remains one of the largest sources of employment in Indonesia, and labour-intensive industries such as tire and rubber-products manufacturing rely heavily on effective workforce management. The human resource (HR) function in such organisations carries out a wide range of procedures across the employee life cycle: workforce and job planning, recruitment and onboarding, employee data administration, attendance and shift management, leave, career transition, discipline, and training (Ondřík & Jankal, 2025; Prihandono *et al.*, 2024). Each procedure involves distinct actors, administrative forms, business rules, and supporting systems. In many established enterprises, these procedures were digitised incrementally rather than systematically. Some steps operate within a core human resource information system (HRIS), others run inside specialised tools such as a biometric fingerprint attendance application, and several still rely on paper forms and physical approvals. Over time, this incremental adoption creates a fragmented systems landscape where identical employee data are re-entered across multiple platforms, attendance anomalies must be reconciled manually between biometric devices and the central database, and strategic HR objectives become decoupled from operational systems (Hamidani & Ali, 2025; Maulana *et al.*, 2023). Consequently, organisations encounter three operational bottlenecks: tracing how strategic HR objectives are realised by concrete processes and applications, identifying shared capabilities that could be consolidated, and incorporating new procedures in a repeatable manner. Enterprise architecture (EA) provides an established approach to resolve these structural inefficiencies. By establishing explicit relationships among organisational strategy, business processes, application services, and technology infrastructure, EA enables business–IT alignment and mitigates architectural complexity (Hamidani & Ali, 2025; Lankhorst, 2017; Maulana *et al.*, 2023; Zachman, 1987). Among existing architecture frameworks, the TOGAF Architecture Development Method (ADM) offers an iterative, phase-based lifecycle extending from architecture vision to migration planning (Dumitriu & Popescu, 2020; The Open Group, 2018). ArchiMate, an open standard modelling language, complements TOGAF by representing architectural elements and dependencies through layered, mathematically rigorous, and analysable visual models (The Open Group, 2019).

Prior enterprise architecture case studies have applied TOGAF ADM and ArchiMate across diverse domains, including real estate (Widjaja *et al.*, 2025), hospital systems (Purnama *et al.*, 2026), the cruise sector (Watasendjaja *et al.*, 2025), general retail (Hengky *et al.*, 2024), heavy-equipment rental (Safrianto, 2025), electronic government (Darsono *et al.*, 2026), agribusiness ecosystems (Hamdani *et al.*, 2026), and civic technology (Prawira *et al.*, 2023). Within the human resource domain, scholars have primarily examined HRIS adoption, user satisfaction, and system success (Srivastava *et al.*, 2021), the optimization of enterprise human resource systems via IoT concepts (Li, 2021), human-capabilities-conscious architecture principles (Kassa & Mentz, 2021), and the broader influence of digital HR management on digital transformation performance (Zhao *et al.*, 2026). However, labour-intensive manufacturing HR has received limited architectural attention. An enterprise HRIS in this environment presents a rigorous architectural challenge because its procedures are voluminous, dispersed across head offices and regional manufacturing plants, and characterised by hybrid manual and automated execution modes. This study develops an enterprise architecture for the HRIS of a large tire manufacturing company, kept anonymous for commercial confidentiality, using TOGAF ADM (Preliminary Phase through Phase F) and ArchiMate 3.1. Guided by a design science research methodology, the proposed architecture is evaluated as a purposeful artefact for consistency, completeness, traceability, and applicability (Adwan, 2025; Hevner & Chatterjee, 2010). The investigation addresses three research questions: how can a manufacturing company's complex HR procedures be structured into a coherent architecture across the motivation, business, application, and technology layers; what consolidation and data-sharing opportunities emerge when these procedures are analysed as an integrated portfolio; and what phased roadmap can transition the enterprise from fragmented systems to a unified HRIS environment? The primary novelty lies in formulating eighteen operational HR procedures into a unified enterprise architecture with an explicit motivation layer and end-to-end traceability, avoiding the siloed application perspectives prevalent in earlier studies.

2. Related Work

Enterprise architecture (EA) originated from the operational necessity to establish an explicit, holistic representation of organisational strategy, operational processes, and supporting technologies. Zachman (1987) formulated the seminal matrix framework that classified architectural representations according to stakeholder perspectives. Ross *et al.* (2006) subsequently framed EA as an institutional foundation for execution, establishing that shared business and IT services reflect architectural maturity. Lankhorst (2017) advanced the formal modelling perspective, demonstrating that layered representations in a standardized syntax enhance inter-stakeholder communication and system analysis. Recent empirical studies confirm that

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EA drives business–IT alignment (Maulana *et al.*, 2023), reinforces organisational resilience under market disruption (Hamidani & Ali, 2025), and, when integrated with IT governance mechanisms, underpins reliable digital operations (Fuentes-Quijada *et al.*, 2024). The TOGAF Architecture Development Method (ADM) operationalises EA engineering through a cyclical, iterative process: the Preliminary Phase sets principles and governance scope, followed by Phase A (Architecture Vision), Phase B (Business Architecture), Phase C (Information Systems Architecture), Phase D (Technology Architecture), Phase E (Opportunities and Solutions), and Phase F (Migration Planning) (The Open Group, 2018). Comparative evaluations show that TOGAF exhibits superior governance structures, method configurability, and cross-industry adaptability relative to other frameworks (Dumitriu & Popescu, 2020). ArchiMate 3.1 serves as the standard companion modelling language, specifying notation across the motivation, business, application, and technology layers (The Open Group, 2019). Design science research provides the epistemological and methodological framework to evaluate these graphical architecture models as functional artefacts (Hevner & Chatterjee, 2010). Cross-layer traceability within ArchiMate relies on defined structural and dependency relationships: *influence* links external drivers and assessments to strategic goals; *realization* connects business processes and application services to the objectives they fulfill; *serving* establishes how application services support concrete business processes; *assignment* allocates human actors and hardware nodes to operational roles; and *access* indicates how business processes and software components manipulate underlying data objects (The Open Group, 2019). Chaining these semantic relationships establishes a traceable lineage from executive motivation down to server infrastructure.

Prior case studies demonstrate the broad applicability of TOGAF ADM across diverse domains, including real estate brokerage (Widjaja *et al.*, 2025), hospital radiology system integration (Purnama *et al.*, 2026), cruise operations (Watasendjaja *et al.*, 2025), commercial retail (Hengky *et al.*, 2024), heavy-machinery leasing (Safrianto, 2025), electronic government services (Darsono *et al.*, 2026), smart agribusiness ecosystems (Hamdani *et al.*, 2026), and civic-technology platforms (Prawira *et al.*, 2023). While these investigations substantiate the cross-domain utility of the framework, none addresses an enterprise HRIS within manufacturing. Furthermore, most existing implementations conclude at Phase D, omitting both the strategic motivation layer and the Phase E–F migration planning necessary for execution. Table 1 synthesises these representative studies and highlights the specific gap addressed in this investigation.

Table 1. Summary of Representative Enterprise Architecture Studies

No.	Reference and Focus	Key Contribution	Identified Architectural Gap
1	Widjaja *et al.* (2025) – Real estate	TOGAF ADM across three core layers	Non-manufacturing domain; omits Phase E–F migration planning
2	Purnama *et al.* (2026) – Hospital integration	TOGAF ADM with targeted gap analysis	Healthcare clinical focus; does not examine enterprise HRIS
3	Hengky *et al.* (2024) – Retail	TOGAF ADM and ArchiMate process modelling	Generic retail operational workflows; excludes HR functions
4	Safrianto (2025) – Equipment rental	EA planning with TOGAF ADM	Asset-rental domain; omits human resource architecture
5	Hamdani *et al.* (2026) – Agribusiness	Design-science enterprise architecture	Sectoral ecosystem focus; does not model internal HR workflows
6	Hamidani & Ali (2025) – SME resilience	Empirical evaluation of EA supporting resilience	Conceptual resilience survey; lacks a concrete HRIS design artefact

As evidenced in Table 1, existing literature lacks a validated, TOGAF-based reference model for an enterprise HRIS in labour-intensive manufacturing that covers comprehensive HR procedures with an explicit motivation layer, verified cross-layer traceability, and actionable Phase E to Phase F migration roadmaps. This research directly resolves that architectural deficit.

3. Methodology

This study adopts a design science research (DSR) approach (Hevner & Chatterjee, 2010), which is suited to enterprise architecture development because it produces and evaluates a purposeful artefact through iterative cycles between business problem formulation, architectural design, and analytical evaluation. Figure 1 delineates the end-to-end research workflow: a literature synthesis frames the operational challenge, internal documentary data capture the empirical HR procedures, TOGAF ADM structures the multi-layered architectural design, an as-is versus to-be gap analysis and multi-criteria evaluation assess the artefact, and the procedure concludes with an actionable migration plan.

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Figure 1. Research Flow Based on the Design Science Research Cycle

The empirical object of this study is the HRIS of a large-scale tire manufacturing enterprise, designated as the Company to preserve commercial confidentiality. The primary empirical data comprised eighteen official internal HR standard operating procedure (SOP) documents spanning the end-to-end employee life cycle. These procedures encompass recruitment requests and applicant-data entry, onboarding and new-employee registration, employee profile updates, career transitions (rehire, acting appointments, demotion, resignation, and termination), attendance processing via a biometric fingerprint system, shift-group reassignments, leave and dispensation administration, employee discipline, job-description drafting, training management, and core HRIS governance tasks, including database modifications, approval-workflow reconfigurations, and annual work-calendar publishing. Each procedure was analysed systematically to identify participating actors, sequential execution steps, input and output data entities, and supporting systems, which were subsequently modelled in Archi, an open-source ArchiMate 3.1 modelling environment.

Because these operational documents are proprietary, corporate identifiers and the commercial names of internal systems are anonymised: the central administrative software is designated as the HRIS Core and the plant-level attendance tracking software as the biometric fingerprint system. Anonymising case organisations is an established convention in enterprise architecture inquiry (Purnama *et al.*, 2026; Widjaja *et al.*, 2025) that preserves data confidentiality while ensuring that structural process analysis and architectural findings remain unbiased and generalisable. The underlying ArchiMate models and derived architectural catalogues are available from the corresponding author upon reasonable request. Architectural synthesis follows the TOGAF ADM sequence: the Preliminary Phase formalises governance principles and architectural scope; Phase A develops the architecture vision and motivation model; Phase B formalises business actors and process workflows; Phase C defines data objects and application services; Phase D maps the server nodes and hosting topology; Phase E conducts the as-is versus to-be gap analysis; and Phase F establishes the phased migration plan. Finally, the resulting reference architecture was verified against four design science evaluation criteria adapted from Hevner and Chatterjee (2010) and Adwan (2025): consistency, completeness, traceability, and applicability.

4. Results and Discussion

4.1 Results

4.1.1 Preliminary Phase: Principles

The Preliminary Phase establishes the architectural governance framework and operational boundary for the enterprise. Eight architecture principles, adapted from the TOGAF standard catalogue (The Open Group, 2018) and tailored specifically to the operational realities of a multi-plant manufacturing HR function, guide the entire design process (Table 2). These principles are essential because human resource data are highly confidential and legally protected, HR operational procedures are shared across geographically dispersed manufacturing plants and the corporate head office, and data governance, access privileges, and system consistency must be enforced uniformly across the enterprise.

Table 2. Architecture Principles for the Human Resource Function

No.	Principle	Rationale
1	Principles apply to all plants and HR units	Ensures consistent HR operational standards and data quality across corporate headquarters and regional factories
2	Common applications, minimal duplication	Prevents redundant software acquisition and eliminates duplicated data entry across operational systems
3	Data is a shared asset	Establishes a single authoritative source of truth for all employee master records across the enterprise
4	Legal and regulatory compliance	Ensures adherence to national labour statutes, collective bargaining agreements, and personal data protection regulations
5	Least-privilege access	Mitigates unauthorized disclosure or misuse of confidential workforce, disciplinary, and payroll data
6	Standard process pattern	Enables predictable, repeatable integration of new or revised operational HR procedures

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7	Clear IT ownership	Guarantees accountable change governance, maintenance, and technical stewardship of HRIS platforms
8	Strategy-to-execution traceability	Directly aligns enterprise HR strategic objectives with operational business processes, application services, and infrastructure

4.1.2 Phase A: Architecture Vision

Phase A articulates the strategic context and business drivers of the HR function. The overarching vision is an integrated, digitally enabled HR operational ecosystem delivering consistent, timely, and verified services across all manufacturing sites. This architectural intent is formally specified in the ArchiMate motivation layer as an interconnected chain extending from stakeholders and drivers to goals and target outcomes. Human resource executive management, as the primary stakeholder, responds to operational drivers demanding heightened administrative efficiency, regulatory compliance, and pristine data integrity. In response, leadership pursues the core goal of unifying, automating, and integrating HR services enterprise-wide, expecting concrete outcomes such as reduced manual reconciliation cycles, accelerated service turnarounds, and elevated employee self-service satisfaction. Formulating an explicit motivation model ensures that all subsequently defined business processes, software services, and hardware infrastructure maintain unambiguous traceability to validated strategic objectives.

4.1.3 Phase B: Business Architecture

The business architecture models each operational procedure as a discrete ArchiMate business process comprising structured sub-processes, sequential event flows, and explicit assignments of organisational actors to the specific activities they execute. Applying a uniform modelling pattern across all workflows ensures architectural legibility, semantic coherence, and cross-process comparability, following the standardised business process patterns established in earlier enterprise architecture studies (Hengky *et al.*, 2024; Widjaja *et al.*, 2025). The eighteen empirical HR procedures were classified into six coherent business capabilities based on three systematic criteria: the corresponding employee life-cycle stage, the primary data entity created or updated by the workflow, and the commonality of supporting systems and actors involved (Table 3). Figure 2 and Figure 3 depict representative business architecture viewpoints. The recruitment workflow (Figure 2) illustrates how selection results are recorded in the central platform, distinguishing internal promotions from external candidates before provisioning active personnel files. The attendance-handling workflow (Figure 3) captures the interaction among plant-floor employees, local HR administrators, and operational supervisors, demonstrating how the core platform and the plant biometric fingerprint system interact to validate and rectify attendance anomalies.

Table 3. Classification of Human Resource Procedures into Core Capabilities

Capability	Procedures	Main System
Organisation and job design	Job-description creation; procedure and form creation	HRIS Core and manual processing
Recruitment and onboarding	Recruitment request; applicant-data entry; onboarding; registration	HRIS Core
Employee administration	Employee-data change; career transition (rehire, acting, demotion, resignation, termination)	HRIS Core
Time and attendance	Attendance handling; shift-group change; annual work calendar	HRIS Core and biometric fingerprint system
Leave and discipline	Dispensation and annual leave; leave-balance maintenance; discipline	HRIS Core and manual processing
Training and HRIS management	Training; database change; approval-workflow change; system development	HRIS Core

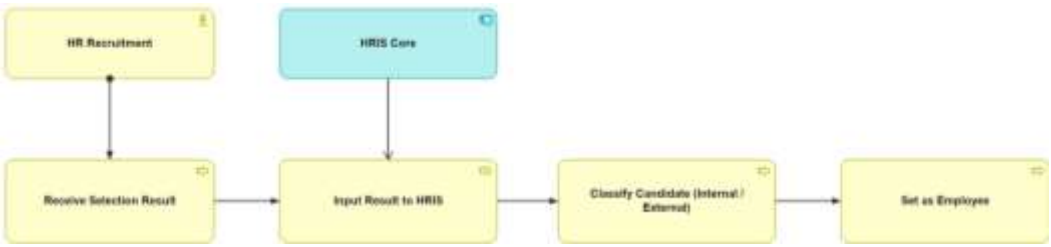


Figure 2. Business Architecture Viewpoint of the Recruitment Procedure

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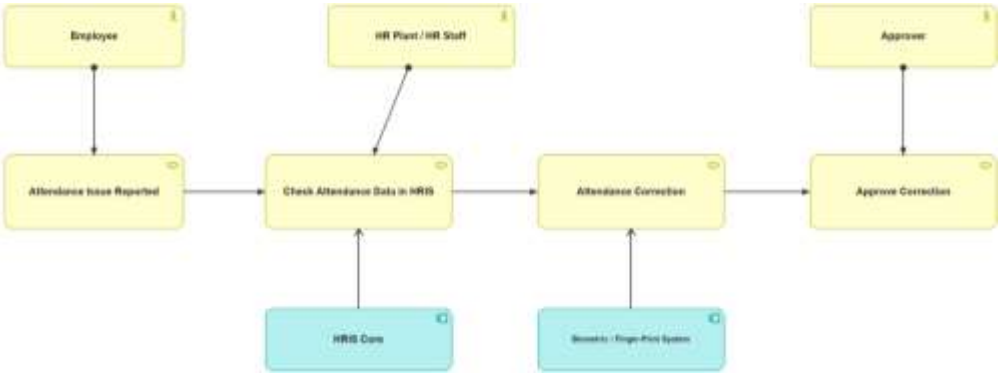


Figure 3. Business Architecture Viewpoint of the Attendance-Handling Procedure

4.1.4 Phase C: Application Architecture

The application architecture defines the application components, software services, and conceptual data objects required to operationalise the business capabilities. Four major internal software systems support the operational portfolio. The HRIS Core serves as the central administrative backbone supporting most transactional workflows. A dedicated biometric fingerprint system captures local attendance data across plant gates. A centralized workflow and approval engine coordinates multi-tiered digital sign-offs for attendance reconciliations and employee master data changes. A payroll system consumes processed time and personnel records, and a shared work-calendar service provides operational scheduling rules. Because the HRIS Core and the central employee data store recur across virtually all procedures, they represent prime targets for service consolidation. Table 4 presents the systematic mapping between capabilities, supporting applications, and manipulated data entities. Furthermore, Figure 4 illustrates the application cooperation viewpoint, documenting how these disparate software components exchange operational data.

Table 4. Mapping of Applications and Data Entities across Human Resource Capabilities

Capability	Applications	Data Entities
Recruitment and onboarding	HRIS Core; workflow and approval engine	Applicant records; employee master records
Employee administration	HRIS Core; workflow and approval engine	Employee master records; career status records
Time and attendance	HRIS Core; biometric fingerprint system; work calendar	Attendance punch logs; shift allocations; calendar data
Leave and discipline	HRIS Core; workflow and approval engine	Leave balances; disciplinary records
Payroll interface	Payroll system; HRIS Core	Payroll line items; consolidated employee records
HRIS management	HRIS Core	System configuration data; workflow parameters

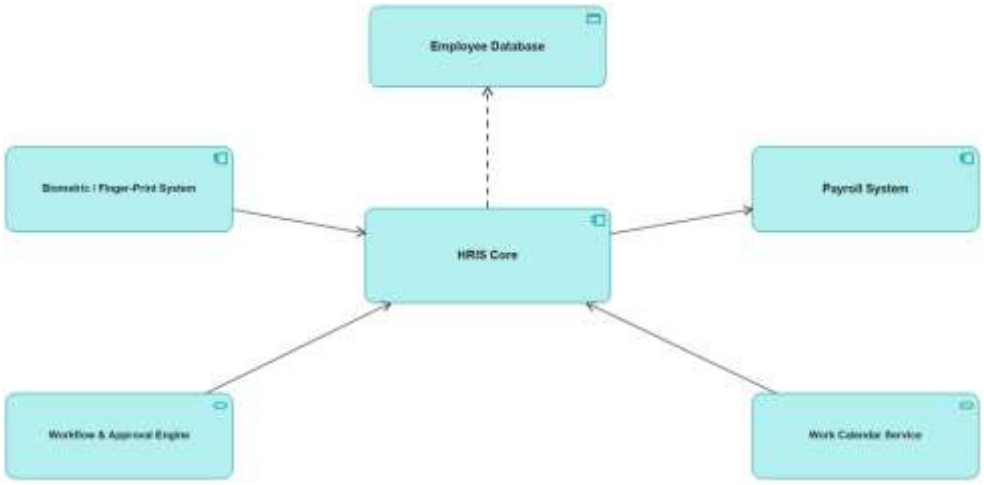


Figure 4. Application Cooperation Viewpoint of the Enterprise HRIS Environment

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4.1.5 Phase D: Technology Architecture

The technology architecture specifies the hardware nodes, system software, and communication topologies required to host the application services and data stores. The HRIS Core and its underlying relational database operate on dedicated internal application and database server nodes within a virtualised enterprise server environment. Biometric fingerprint terminals are physically deployed across factory entrances, recording employee punches locally and transmitting batch event logs to the central database server via a scheduled synchronization interface. Consolidating personnel records onto a single governed database server establishes the prerequisite foundation for unified data stewardship, role-based access controls, and cross-application data integration proposed in the target architecture. Table 5 outlines the primary technology nodes and infrastructure roles.

Table 5. Technology Components and Infrastructure Roles

Component	Element Type	Architectural Role
Application server	Node	Hosts the core HRIS platform and workflow execution services
Database server	Node	Hosts the centralized relational employee master database
Biometric devices	Device	Captures biometric employee attendance punches locally at plant facilities
Integration interface	System software	Coordinates scheduled data synchronization between attendance units, HRIS Core, and payroll

4.1.6 Phase E: Opportunities and Solutions

Phase E conducts a gap analysis comparing the baseline (as-is) architecture with the target (to-be) environment, following the analytical gap-evaluation methods outlined by Widjaja *et al*. (2025) and Purnama *et al*. (2026). As detailed in Table 6, four primary structural interventions emerge. First, establishing a unified employee master repository eliminates redundant manual re-entry across separate HR, timekeeping, and payroll databases. Second, implementing an automated scheduled interface between the biometric attendance devices and the HRIS Core eliminates the labour-intensive manual reconciliation currently required to adjust punch records. Third, introducing a unified digital approval engine standardises complex multi-tiered approvals that are presently handled through paper routing. Finally, digitising remaining paper-based workflows, such as physical leave forms and administrative memoranda, establishes end-to-end digital lifecycle governance across the HR service portfolio.

Table 6. Gap Analysis between Baseline (As-Is) and Target (To-Be) Architectures

Layer	Baseline (As-Is) State	Target (To-Be) State	Architectural Gap and Solution
Business	Partially manual; physical paperwork and manual routing	Standardised, fully digitized HR operational workflows	Standardise workflow patterns; replace manual forms with self-service modules
Application	Disconnected HR, biometric, and payroll systems; duplicate data entry	Integrated HRIS ecosystem sharing common data repositories and approval services	Establish a single employee data store; integrate system APIs
Technology	Attendance logs reconciled manually from local device memories	Automated, scheduled synchronization interface linking devices to the central database	Implement secure communication interface; apply data protection controls
Motivation	Informal, unmapped operational goals across departmental units	Explicit, verifiable stakeholder-driver-goal-outcome motivation model	Formalise motivation layer; map strategic HR goals directly to business processes

4.1.7 Phase F: Migration Planning

To realise the target architecture systematically, a four-stage, twelve-month migration roadmap is formulated (Table 7), sequenced logically by technical dependencies and implementation risk. The transition begins by establishing the shared data foundation and automated system interfaces upon which subsequent operational modules depend. The roadmap then proceeds to standardise core personnel procedures, deploys automated workflow and leave management modules, and culminates in enterprise reporting, analytics, and comprehensive access governance. This phased sequence mirrors established migration strategies in enterprise architecture implementations (Safrianto, 2025; Widjaja *et al*., 2025), preventing stranded IT investments and ensuring operational continuity across manufacturing operations.

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Table 7. Twelve-Month Phased Migration Roadmap

Stage	Timeline	Strategic Focus	Primary Architectural Deliverables
1: Foundation	Months 1–3	Shared data repository and critical interfaces	Single employee master database; automated HRIS–biometric synchronization interface
2: Core procedures	Months 4–6	Workforce administration and career tracking	Standardised digital procedures for recruitment, onboarding, and personnel changes
3: Workflow and leave	Months 7–9	Approvals and leave automation	Enterprise digital workflow engine; automated leave balance and dispensation tracking
4: Reporting and control	Months 10–12	Analytics, auditability, and governance	Executive HR dashboard; granular role-based access control (RBAC); complete audit logging

4.1.8 Layered View and Evaluation

Figure 5 presents the consolidated layered architecture viewpoint, integrating the business, application, and technology layers into a unified structural model. This view illustrates how core business processes and employee self-service capabilities are directly served by the HRIS Core and central database, which are deployed across dedicated application and database server nodes.

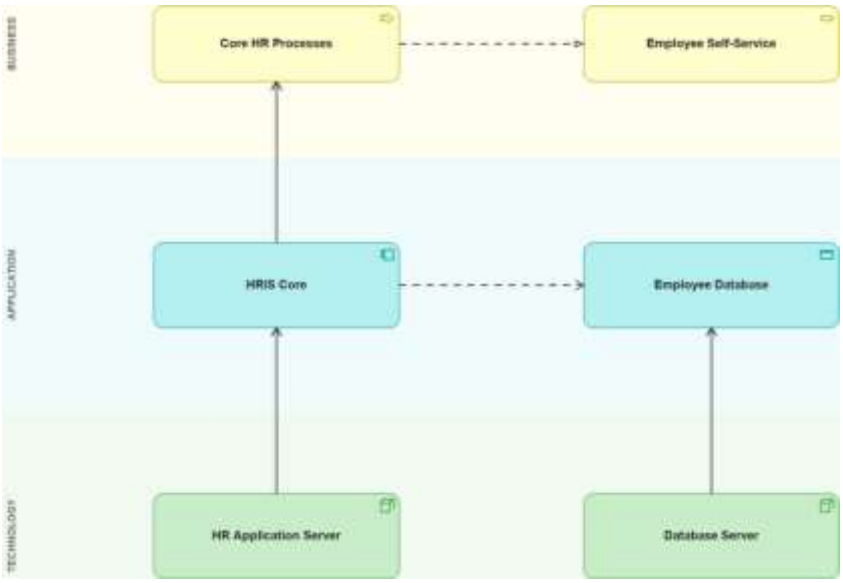


Figure 5. Consolidated Layered Architecture Viewpoint of the Target HRIS

Following design science research guidelines (Adwan, 2025; Hevner & Chatterjee, 2010), the synthesized architecture was evaluated as a purposeful artefact against four formal design science criteria (Table 8). Consistency was validated by verifying that all ArchiMate relationships connect semantically compatible structural endpoints without dangling links. Completeness was verified by confirming that all six business capabilities and eighteen underlying procedures are represented systematically across all four architectural layers. Traceability was evaluated by following continuous relational paths from executive motivation elements down to physical hosting nodes. Applicability was demonstrated by the actionable, phased migration plan mapping every identified gap to a funded implementation stage. The evaluation was executed by the primary researcher utilizing a structured criteria checklist and subsequently audited independently by a co-author, with any discrepancies resolved through formal joint review. Each criterion was assigned an explicit failure threshold: consistency failed if mismatched endpoints or duplicate structural concepts occurred; completeness failed if any capability or procedure was omitted from any layer; traceability failed if any sampled path from stakeholder driver to physical infrastructure was broken; and applicability failed if any gap documented in Table 6 lacked an associated migration work package. The built-in semantic validator within the Archi software corroborated the internal consistency check, and iterative refinements were conducted until the entire model satisfied all four evaluation criteria.

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Table 8. Evaluation of the HRIS Reference Architecture against Design Science Criteria

Criterion	Evaluation Focus and Verification Procedure	Validation Result
Consistency	Validated relationship endpoints and structural rules using the Archi model validator and an evaluation checklist; failed if dangling links or duplicated elements were present	Passed; zero dangling relationships, no duplicate components
Completeness	Verified comprehensive coverage of all capabilities across the motivation, business, application, and technology layers; failed if any capability or procedure was omitted	Passed; all six capabilities and eighteen procedures systematically represented across all layers
Traceability	Audited end-to-end navigational paths connecting stakeholder drivers down to infrastructure nodes; failed if any sampled path was discontinuous	Passed; unbroken stakeholder-to-server semantic chain verified across all portfolios
Applicability	Confirmed whether the migration plan provides an actionable implementation path; failed if any identified architectural gap lacked an executable transition activity	Passed; comprehensive four-stage roadmap resolving all documented gaps

4.2 Discussion

Developing a unified enterprise architecture across eighteen operational HR procedures demonstrates that TOGAF ADM is effective for standardising complex, procedure-intensive administrative domains. This study broadens the empirical application of TOGAF and ArchiMate beyond previously researched sectors such as commercial retail, healthcare systems, and real estate brokerage (Hengky *et al.*, 2024; Purnama *et al.*, 2026; Widjaja *et al.*, 2025) into the human resource domain of manufacturing enterprises, directly addressing the first research question. The gap analysis revealed that the HRIS Core and the central employee database recur across nearly every operational workflow, confirming that establishing a governed, single source of truth is the most critical foundation for enterprise consolidation. This observation aligns directly with the architectural maturity model posited by Ross *et al.* (2006), which emphasizes that shared institutional services and unified data models characterise mature IT execution environments. Furthermore, identifying the manual reconciliation between local plant attendance devices and the central HR database as the primary source of administrative friction resolves the second research question, demonstrating that data-sharing opportunities lie primarily in eliminating boundary gaps between local edge devices and core enterprise platforms. Treating timekeeping and payroll as integrated operational services that exchange governed data with the HRIS Core—rather than treating them as disconnected software silos—accurately reflects the complex operational environment of multi-plant industrial companies. This structural integration supports broader empirical evidence that strategic alignment between business processes and supporting information systems enhances overall organisational performance and operational resilience (Hamidani & Ali, 2025; Maulana *et al.*, 2023). In addition, incorporating an explicit ArchiMate motivation layer establishes a verifiable rationale linking executive HR priorities to underlying technology components, addressing an architectural omission noted in earlier case studies. The formulated migration plan answers the third research question, establishing a stable architectural foundation that accommodates future digital initiatives, including advanced workforce analytics, predictive scheduling, and automated self-service portals (Zhang *et al.*, 2025).

Nonetheless, integrating distributed biometric fingerprint terminals with the central HRIS Core presents tangible technical complexities. Because fingerprint units operate locally across regional factory entrances to record high-volume employee punches during shift handovers, the synchronization mechanism must accommodate scheduled batch processing rather than relying purely on real-time network calls. The interface architecture must remain resilient against temporary wide-area network disruptions, accommodate local clock drift across hardware units, and implement automated validation rules to flag, de-duplicate, or reconcile conflicting punch timestamps before transferring verified records into the payroll pipeline. Prioritising this scheduled attendance interface alongside the single employee database during the foundation stage of the migration roadmap ensures that business validation rules are enforced centrally rather than through fragmented, error-prone manual interventions. This study has several methodological boundaries. The investigation is design-oriented and situated within a single anonymous tire manufacturing enterprise; consequently, the reference architecture was evaluated through analytical DSR criteria and static model validation rather than through post-implementation empirical testing or external expert Delphi panels, representing the primary threat to construct and external validity. Furthermore, the operational scope encompasses the Preliminary Phase through Phase F; implementation governance (Phase G) and architecture change management (Phase H) are reserved for future work. Subsequent research should deploy and evaluate the reference architecture within an active production environment while incorporating explicit ArchiMate business and application service elements to facilitate microservices adoption.

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5. Conclusion and Recommendations

This study has developed an enterprise architecture reference model for the human resource information system (HRIS) of a large-scale tire manufacturing enterprise, kept anonymous for commercial confidentiality, using the TOGAF Architecture Development Method (Preliminary Phase through Phase F) and ArchiMate 3.1 within a design science research approach. Starting from an explicit ArchiMate motivation layer, the investigation structured eighteen empirical HR operating procedures into six core business capabilities, systematically mapping their corresponding application services, conceptual data objects, and hosting infrastructure into a unified model with verified cross-layer traceability. The primary deliverables comprise a reusable HRIS reference architecture tailored to procedure-heavy manufacturing environments, an as-is versus to-be gap analysis that prioritises establishing a single employee data repository and automating biometric-to-HRIS attendance integration, and a validated four-stage, twelve-month phased migration roadmap. Future research should extend the architectural scope to include implementation governance (Phase G) and architecture change management (Phase H), while empirically validating the reference model through a live enterprise deployment and formal practitioner evaluations.

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