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Implementing TOGAF Enterprise Architecture in Indonesia's Merchant Acquiring Industry: A Framework for Digital Transformation

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Abstract: The digital transformation of Indonesia's merchant-acquiring industry, accelerated by regulatory initiatives, fintech innovations, and changing consumer behavior, has created significant technological and organizational challenges. Fragmented legacy systems and complex regulatory requirements hinder seamless digital payment adoption. This study investigates the strategic implementation of The Open Group Architecture Framework (TOGAF) to systematically manage these challenges. Through an extensive literature review and case studies of major industry players—including BRI, BCA, Mandiri, BNI, and GoPay—this research uniquely explores TOGAF's specific applicability to merchant acquiring in Indonesia. The proposed TOGAF-based framework aligns closely with Bank Indonesia's Payment System Blueprint 2025, emphasizing enhanced interoperability, regulatory compliance, and sustainable growth. Findings suggest that enterprise architecture can unify fragmented technologies, bridge gaps in merchant activation, and strengthen cybersecurity, ultimately driving innovation in digital payment services. By providing a structured implementation roadmap tailored to Indonesia's regulatory environment, this research not only addresses current industry needs but also sets a foundation for future technological advancement and financial inclusion in Indonesia's merchant acquiring landscape.

Keywords: Merchant Acquiring, TOGAF, Digital Transformation, Fintech

INTRODUCTION

Indonesia's merchant-acquiring industry is rapidly digitalizing, driven by innovations such as mobile wallets and QR-based payments. Bank Indonesia's Quick Response Code Indonesian Standard (QRIS), introduced in 2019, has significantly accelerated the adoption of cashless payments (Tullah & Naim, 2024). By August 2024, QRIS users reached 52.5 million and merchants increased to 33.8 million, predominantly MSMEs, with transaction volumes consistently tripling annually (International Trade Administration & U.S. Department of Commerce, 2024); (Perbanas, 2024)).

Established banks (e.g., BRI, BCA, Mandiri, and BNI) expanded electronic data capture (EDC) networks and QRIS acceptance, positioning Indonesia as the ASEAN leader with over 22.4 million merchants, a number projected to nearly double by 2024 (International Trade Administration & U.S. Department of Commerce, 2024). Simultaneously, fintech companies such as GoPay, OVO, DANA, and ShopeePay rapidly onboard merchants through mobile technology, challenging banks to innovate or partner strategically. GoTo's ecosystem alone reported 20.1 million merchants and 50.8 million active users, integrating payments, e-commerce, and ride-hailing (Goto Gojek Tokopedia, PT., Tbk., 2024).

The entry of fintech has transformed merchant acquisition into a dynamic and competitive landscape previously dominated by traditional banks. This shift is driven by increased consumer expectations for omnichannel experiences, diverse digital payment methods, government policies promoting cashless transactions, and a COVID-19-induced increase in digital transactions. Bank Indonesia reported that digital banking transaction volumes reached IDR 58,478 trillion and e-commerce transactions reached IDR 454 trillion in 2023 (Afifa, 2024). Traditional banks have responded by launching digital initiatives or establishing separate subsidiaries to remain competitive amid fintech disruptions.

The regulatory landscape, guided by Bank Indonesia (BI) and the Financial Services Authority (OJK), has shaped the industry's evolution in Indonesia. BI's Indonesia Payment System Blueprint 2025 emphasizes interoperability (QRIS, GPN cards), security, and financial inclusion. The OJK and BI are collaboratively exploring open

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banking frameworks, such as the National Open API standards (SNAP), balancing fintech innovation with consumer protection, cybersecurity, and AML compliance (International Trade Administration & U.S. Department of Commerce, 2024)

However, this rapid growth has brought about technological and organizational challenges. Incumbent banks struggle with outdated legacy systems and siloed channels, which limit their agility. According to Bank Indonesia (2019), none of the surveyed banks fully achieved digital maturity because of legacy systems. Conversely, despite their modern architecture, fintech firms face challenges in terms of scalability, security, and regulation. To address these complexities, Enterprise Architecture (EA) frameworks, such as TOGAF, provide holistic solutions that align IT with business objectives. This study uniquely examines TOGAF's targeted application for merchant acquiring in Indonesia, proposing a strategic implementation roadmap to manage complexity, accelerate digital transformation, and improve industry compliance.

This research aims to develop a TOGAF-based enterprise architecture framework tailored specifically to address challenges of interoperability, security, scalability, and compliance faced by merchant-acquiring institutions in Indonesia. The outcomes include proposing a structured roadmap for digital transformation aligned with regulatory requirements and industry needs.

LITERATURE REVIEW

Recent research and industry reports highlight the convergence of digital payment innovation and enterprise architecture in the financial services sector. The shift towards cashless payments is a global phenomenon but is particularly pronounced in emerging markets such as Indonesia. Modern transactions are steadily moving from cash to electronic-based channels, enabled by ubiquitous connectivity (Khando et al., 2023). Khando et al. (2023) note that digital payment technologies, including mobile wallets, e-payments, and real-time transfers, are foundational to financial inclusion but also bring challenges around security, user adoption, and interoperability(Khando et al., 2023). Similarly, Pisoni et al. (2021) emphasized the role of enterprise architecture in managing big data and technology integration in finance. They argue that frameworks such as TOGAF or Zachman help financial institutions design target architectures that leverage data lakes, AI, and customer-centric innovations(Pisoni et al., 2021). These studies underscore that, in the digital era, banks must evolve their architectures to be more agile and data-driven.

In the Indonesian context, several studies and industry analyses have addressed digital transformation and payment systems issues. Saputra and Rahmania (2022) discuss how Industrial Revolution 4.0 and fintech competition pressure banks to adopt the latest IT or face disruption(Saputra & Rahmania, 2022). They highlight that many banks that fail to innovate have lost ground to tech-savvy entrants (Saputra & Rahmania, 2022). The emergence of fintech has prompted banks to invest in digital banking and payments. A Baker McKenzie analysis (2024) observed that traditional banks in Indonesia have evolved by incorporating digital products and online payments to remain competitive (McKinsey & Company, 2022). This is in line with the OJK's push for banks to partner with or emulate fintech to broaden financial inclusion.

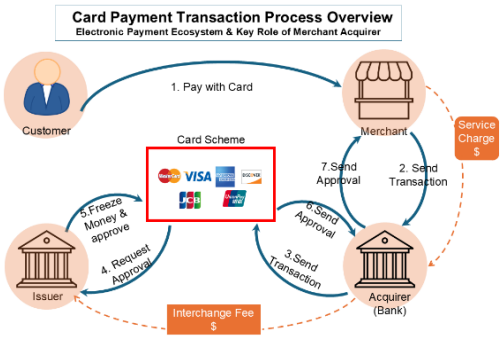

Figure 1. Transaction Process Overview Using Chip-Card as One of The Electronic Payment Technology

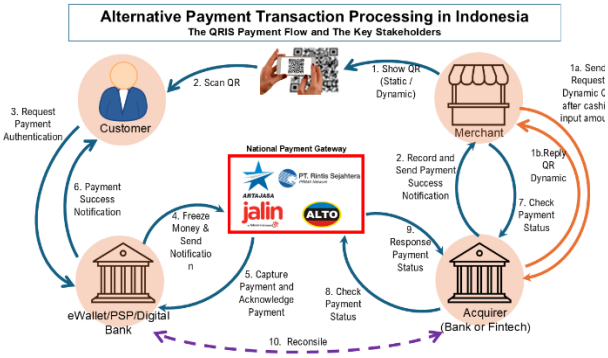

Figure 2. The Digital Payment Technology QRIS Payment Transaction Processing in Indonesia

A key theme in the literature is the need for interoperability and standards in payment system architecture. The ASEAN Payment Council (2024) outlines a regional integration framework, recognizing efforts such as QRIS as models for standardization. Interoperability ensures that various payment providers (banks or fintech) can connect, which requires a well-defined architecture at the industry level (McKinsey & Company, 2022). McKinsey (2022) notes that merchant-acquiring businesses are globally reinventing themselves through software and platform-based

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models rather than pure processing (McKinsey & Company, 2022). Acquirers are providing omnichannel solutions, analytics, and even financing to merchants, which demands the integration of previously siloed systems (payments, data, and credit). For Indonesia, this means that acquirers should build architectures that can handle card payments, QRIS, mobile wallets, and upcoming innovations such as real-time transfers (BI-FAST) in a unified manner. Studies such as Zilnieks and Erins (2023) suggest that heterogeneous payment platforms strain traditional IT, and adopting an enterprise architecture perspective is necessary to manage multiple payment channels cohesively (Zilnieks & Erins, 2023).

Security and compliance have also been widely discussed. As digital transactions increase, so do the risks of fraud and data breaches. Globally, frameworks such as PCI-DSS for card security and ISO 27001 for information security are standard; however, banks require an overarching architecture to embed security at every layer. Tavana et al. (2020) and Wang et al. (2021) (cited in Saputra, 2022) indicate that consumers will only embrace fintech solutions if security and trust are maintained(Saputra & Rahmania, 2022). In Indonesia, regulatory policies, such as the OJK's cybersecurity guidelines and Bank Indonesia's risk management regulations, mandate robust controls. Thus, the literature points to enterprise architecture as a means to ensure that security is systematically addressed; for example, TOGAF includes risk management and architecture governance as part of its methodology.

Finally, prior studies highlight the importance of aligning IT initiatives with business strategies and regulatory requirements. One practical insight is that banks successful in digital payments align their innovations with clear business goals (such as improving merchant convenience or expanding SME lending) and with regulators' directions. For instance, a case in point: Bank Central Asia (BCA) achieved high digital transaction volumes and near-99% system uptime by explicitly linking its IT upgrades (such as developing a merchant onboarding app, and enhancing payment infrastructure) to both customer needs and compliance standards (Bank Central Asia, 2025). This reflects the core of TOGAF's promise: ensuring that every technology component traces back to business objectives and external requirements. In summary, the literature provides a foundation for TOGAF and EA to serve as a "critical structure for managing complexity" in Indonesia's fast-growing payment ecosystem, helping to unify various initiatives under a common vision and set of standards. This study builds on these insights, focusing on how TOGAF can be applied in Indonesia's merchant-acquiring industry.

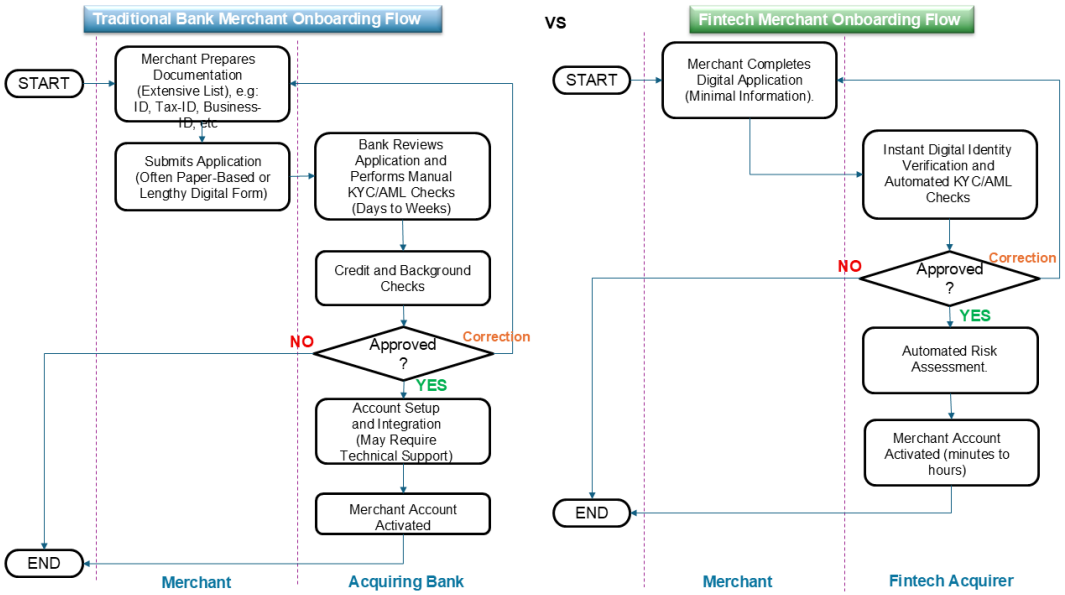

Fig.3 Merchant Onboarding, Traditiional Acquiring Bank vs Fintech Acquirer

In conclusion, this literature review highlights the critical intersection of digital payment innovation and enterprise architecture in the financial services sector, particularly in emerging markets such as Indonesia. The shift towards cashless transactions, driven by technological advancements and changing consumer preferences, necessitates a robust and adaptable enterprise architecture framework. Studies have emphasized the importance of interoperability, security, and alignment with business strategies and regulatory requirements in developing effective payment systems. The adoption of enterprise architecture methodologies, such as TOGAF, emerges as a potential solution to manage the complexity of evolving payment ecosystems, ensure seamless integration of various payment channels, and address security concerns. As Indonesia's financial landscape continues to evolve, the application of enterprise architecture principles in the merchant-acquiring industry presents an opportunity to enhance operational efficiency, foster innovation, and ultimately contribute to broader financial inclusion goals.

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METHOD

This study employs a qualitative approach guided by TOGAF's Architecture Development Method (ADM). The research consists of three main phases aligned with ADM principles: (1) Literature and Document Review—establishing a preliminary analysis involving an inventory of existing systems and identifying architecture gaps; (2) Case Study Analysis—examining current architecture practices, regulatory compliance, and digital strategies among selected Indonesian merchant acquirers; and (3) Synthesis into Framework—developing comprehensive target architectures covering Business, Data, Application, and Technology layers, followed by incremental implementation guidance and recommendations for ongoing governance, compliance, and training. The qualitative methodology supports an exploratory purpose: to formulate a tailored enterprise architecture framework rather than testing specific hypotheses. These three phases are described in more detail below.

Literature and Document Review: First, we gathered secondary data from a range of sources, including academic journals, industry reports, regulatory blueprints, and company financial reports. Key references included Bank Indonesia's Payment System Blueprint 2025 and 2023 Payment System Report, OJK's Blueprint for Digital Transformation in Banking, and high-impact research on digital payments and EA (such as Khando et al. 2023; Pisoni et al. 2021; and various Indonesian journal publications). We also reviewed annual reports and investor presentations from major acquiring banks (BRI, BCA, Mandiri, and BNI) and a leading fintech acquirer (GoTo Financial). This provided qualitative data on each institution's digital transformation initiatives, IT architecture, and any mention of TOGAF or EA practice. The literature review (summarized above) established the theoretical context and key variables: the drivers of digital payment innovation, challenges (legacy systems, competition, security), and the proposed benefits of using TOGAF as an EA framework for the banking industry.

Case Study Analysis: In the second phase, we conducted an in-depth analysis of five case studies – four incumbent banks (BRI, Mandiri, BCA, and BNI) and one fintech-based acquirer (the GoPay/GoTo ecosystem). For each case, we examined evidence of digital strategy (e.g., introduction of merchant apps, API platforms), TOGAF or architecture adoption, regulatory compliance efforts, and outcomes (such as growth in merchant numbers or transaction volume). The data for the cases came primarily from banks' 2023–2024 annual reports and press releases, and for the fintech case from GoTo's 2023 annual report and media coverage. We performed a comparative assessment, for example, comparing BRI's approach to MSME onboarding via BRILink agents and QRIS with BCA's approach via its Merchant App or Mandiri's compliance programs with BNI's fintech partnerships. This phase helped identify patterns and differences, such as success factors like top management support or early adoption of open APIs, versus challenges like lingering legacy systems or merchant activation gaps.

Synthesis into Framework: In the final phase, we synthesized the findings to develop a TOGAF implementation framework tailored to Indonesian merchant acquiring. We mapped the observed industry challenges and initiatives to the TOGAF Architecture Development Method (ADM) phases. For instance, issues around QRIS integration and MSME onboarding were mapped to Business Architecture considerations; data silo and security issues to Information Systems and Technology Architecture; and regulatory requirements to the Preliminary and Requirements Management phases. We formulated step-by-step recommendations as part of this framework, ensuring alignment with known regulatory frameworks (e.g., ensuring that the EA vision aligns with BI's Blueprint goals for interoperability and OJK's guidelines on digital resilience). Throughout this synthesis, we validated that our recommendations were consistent with the best practices noted in the literature or analogous implementations globally. The outcome is a proposed roadmap that merchant acquirers in Indonesia can follow to implement a TOGAF-based enterprise architecture in a compliant yet forward-looking manner.

The data analysis in this study was qualitative and interpretive. We used content analysis to code the document data (e.g., flagging each mention of "QRIS," "API," "legacy core," "TOGAF adoption, " etc.) and then grouped these codes into themes corresponding to TOGAF domains or common industry challenges. Triangulation was achieved by cross-referencing regulatory data with company reports and academic insights; for example, confirming a bank's claim of QRIS merchant growth with BI's published statistics. By following this methodology, we ensure that our framework and recommendations are grounded in both the reality of Indonesia's market (practical case evidence) and sound theoretical principles from the enterprise architecture and digital transformation literature. The next section presents the results of our analysis, detailing the state of TOGAF implementation (or lack thereof) in the case study institutions and identifying the gaps and opportunities.

RESULT

Industry Overview: Analysis of the collected data confirms that Indonesia's acquiring banks have made significant strides in digital transformation, although their enterprise architecture maturity varies. All four major banks studied (BRI, Mandiri, BCA, and BNI) embraced BI's QRIS standard and reported strong growth in digital payment volumes. For instance, BRI – traditionally Indonesia's largest MSME bank – has aggressively expanded its merchant network: in 2024, BRI achieved a 118% year-over-year increase in active QRIS merchants (and +53% in EDC terminals) as it focused on acquiring "high-quality" merchants across urban and rural areas (Bank Rakyat

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Indonesia (Persero), PT., Tbk., 2025). BRI's annual report highlights that providing simple QRIS onboarding (including self-onboarding via its BRImo app) and collaborating with ecosystem partners were key to this growth (Bank Rakyat Indonesia (Persero), PT., Tbk., 2025). This indicates that BRI's digital strategy, while not explicitly labeled as EA, addresses Business Architecture (merchant acquisition processes) and Technology Architecture (scalable QR infrastructure) concerns. However, the BRI also faces challenges in aligning its vast branch/agent network with new digital systems, an area where an EA approach could streamline.

Bank Mandiri: Mandiri's reports showcase a bank in transition. It has launched its Livin' super-app for consumers and the Kopra platform for businesses. In acquiring, Mandiri has grown its QRIS merchant base substantially, but one finding stood out: Mandiri noted that "many MSMEs have not yet transacted digitally even though they are registered for QRIS" (Bank Mandiri (Persero), PT., Tbk., 2024). This suggests a gap between onboarding and the active use of the app. From an EA perspective, this is a business/information gap; the processes and incentives to drive utilization were insufficient. Mandiri also pointed to rising fraud risks, mentioning instances of social engineering and data theft in e-commerce that affect its merchants (Bank Mandiri (Persero), PT., Tbk., 2024). This highlights the need for a stronger Security Architecture. Mandiri's compliance efforts are strong (as a state-owned bank, it closely follows BI/OJK regulations), but its challenge is more on execution: how to unify its legacy card-acquiring systems with new digital channels and ensure that merchants not only sign up but also regularly use the services. Mandiri's case underscores the importance of including change management and user education in the EA; technology rollout alone does not guarantee adoption.

Bank Central Asia (BCA): BCA is often seen as a market leader in payment technology among Indonesian banks. Our analysis found evidence of relatively high EA maturity, even if not explicitly credited to TOGAF. BCA has focused on the end-to-end digitization of merchant acquisition. In early 2024, it launched the BCA Merchant mobile application to digitize merchant onboarding and servicing (From Easy Onboarding to Seamless Payments, BCA Continues to Innovate to Support MSME Growth, 2025). The impact was clear: in 2024, BCA acquired 380,000 new individual merchants, and around 75% of these were onboarded digitally via the app (From Easy Onboarding to Seamless Payments, BCA Continues to Innovate to Support MSME Growth, 2025). This high rate of digital onboarding (nearly double the industry average) aligns with McKinsey's noted best practice of providing "rapid onboarding [with] simple, highly integrated systems" to scale in a low-margin business (McKinsey & Company, 2022). Additionally, BCA leveraged technology to improve settlement times and reportedly moved to offer multiple same-day settlements for QRIS transactions, improving merchants' cash flow (Bank Central Asia, 2025). BCA also introduced an Android-based smart EDC (named "aposBCA") that supports all payment types (cards, contactless, QRIS) and connectivity options(Bank Central Asia, 2025). These innovations required significant integration on the backend, suggesting that BCA has built a unified payment architecture. Indeed, a twofold increase in QRIS transaction value with 112% YoY growth in transaction count in 2024 was recorded(Bank Central Asia, 2025). BCA's case shows that aligning Technology Architecture (apps, devices, APIs) with business goals (more merchants, more transactions) and regulatory mandates (e.g., supporting national QRIS) yields tangible results. Although we did not obtain public confirmation that BCA uses TOGAF, the structured nature of its approach (launching an architecture for omni-channel acquisition) is in line with EA principles.

Bank Negara Indonesia (BNI): BNI, another state-owned bank, has also pushed into digital acquisition, albeit a bit more conservatively. BNI's 2024 report highlighted that its merchant network now accepts a wide range of payments from global card schemes (Visa, MasterCard, JCB) to domestic QRIS from any provider (Bank Negara Indonesia (Persero), PT., Tbk., 2024). Achieving this required backend integration so that a merchant's single device or software could handle multi-source payments and the merchant would receive a unified settlement report. In other words, BNI needed to integrate card payment systems with QRIS systems, which is a clear Enterprise Application Integration challenge. BNI also actively collaborates with fintech and participates in various ecosystems (education, government bill payments, etc.) to drive QRIS usage(Bank Negara Indonesia (Persero), PT., Tbk., 2024). Notably, BNI spearheaded cross-border QRIS pilots, enabling Indonesian QRIS payments in countries such as Singapore, Malaysia, and Thailand ahead of others(Bank Negara Indonesia (Persero), PT., Tbk., 2024). This strategic positioning required upgrades to support multi-currency and connectivity with foreign networks, reflecting changes at the Technology Architecture layer (e.g., adherence to regional standards and BI's cross-border QR framework). Although BNI's adoption of TOGAF is not documented, we observed that BNI's challenges revolve around integrating new capabilities (Open API partnerships, cross-border payments) into an existing architecture. BNI appears to be aligning with the national architecture vision (e.g., being an early mover in QRIS cross-border, which is a Blueprint 2025 objective).

Fintech Acquirer (GoTo/GoPay): The fintech case provides a contrast to the banks. GoPay, as part of GoTo Financial, grew organically through the Gojek and Tokopedia platforms rather than through a traditional bank's merchant network. By 2023, GoTo reported over 20 million merchants in its ecosystem (Goto Gojek Tokopedia, PT., Tbk., 2024)– including gig merchants like Gojek drivers and warungs, as well as e-commerce sellers on Tokopedia. The strategy has been bundling payments with other services: every Gojek transport or food merchant automatically accepts GoPay, and Tokopedia sellers have integrated these payments. This "ecosystem approach"

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led to a massive scale without a bank-like field salesforce. However, to integrate with the wider payment ecosystem, GoPay had to connect to QRIS. It was one of the first fintechs to adopt QRIS, so that any GoPay QR code can be paid by funds from any other QRIS-supporting app and vice versa. In terms of EA, fintechs such as GoPay built a fresh architecture on cloud infrastructure, microservices, and APIs from the start. This provided them with agility, but they now face new requirements: ensuring high reliability and meeting banking-grade security as their user base grows. Moreover, fintechs must navigate evolving regulations; for example, an e-money license has IT system requirements set by BI. Our findings show that banks are responding to fintechs by emulating their ecosystem models (BCA and Mandiri building super-apps, BRI integrating with e-commerce platforms, etc.). Thus, the line between bank and fintech acquirers is blurred. The implication is that a common EA framework, such as TOGAF, could benefit both: fintechs could use TOGAF to introduce more rigor and align with regulatory standards, while banks could use it to inject more agility and innovation into their traditionally siloed environments.

Table 1: Comparison of Digital Transformation Initiatives by Major Acquirers in Indonesia

Institution	Digital Onboarding	Payment Methods Supported	QRIS Adoption	API Integrations	Security Features
BRI	Yes (via BRImo, agents)	QRIS, Cards, E-Wallets	High, 118% YoY growth	Limited (partner-driven)	Standard AML, Fraud Detection
Mandiri	Yes (via Livin')	QRIS, Cards, Bank Transfers	Moderate, needs activation	Some (fintech partnerships)	Basic, improving fraud controls
BCA	Yes (BCA Merchant App)	QRIS, Cards, Contactless	Very High, doubled transactions	Extensive (merchant APIs)	High, AI-based fraud monitoring
BNI	Yes (via web & mobile)	QRIS, Cards, Cross-border	High, expanding internationally	Moderate (for ecosystems)	Moderate, cross-border focus
GoPay	Yes (ecosystem-based)	QRIS, E-Wallets	Standard, fully interoperable	High (open API-first)	High, cloud-native security

Cross-Case Insights: Several common success factors and challenges emerged from the cases: (1) Omnichannel integration – All players recognized the need to handle many payment types (cards, QR, e-wallets, etc.) seamlessly. Those who invested in integration (e.g., BNI's one-stop solution, BCA's all-in-one devices) are ahead of the competition. (2) Digital onboarding and scale – Banks that digitized merchant onboarding (BCA's 75% digital statistic) or leveraged third parties (BRI's agents, fintech partnerships) onboarded merchants faster and cheaper. McKinsey's recommendation to focus on rapid onboarding and scalable platforms is clearly being heeded in Indonesia (McKinsey & Company, 2022). (3) Merchant activation and value-added services: Simply signing up merchants is not enough; driving active usage is crucial. Mandiri's inactive MSMEs exemplify this gap (Bank Mandiri (Persero), PT., Tbk., 2024). Leading banks are starting to offer value-adds: BCA linking with POS systems(Bank Central Asia, 2025), BRI providing merchant education via its agents, etc., to ensure merchants see continued value. (4) Security and reliability: As transactions increase, even minor downtimes or security incidents can erode trust. BCA's ability to process ~98 million transactions per day with high uptime (Bank Central Asia, 2025)sets a benchmark. Banks are investing in fraud detection (AI-based monitoring, two-factor authentication for merchant portals) to tackle social engineering and data theft attempts noted across the industry. (5) Regulatory compliance vs. innovation – There is evidence that compliance can be turned into an advantage. For example, being an early adopter of BI's SNAP open API standards can allow banks to attract fintech partners quickly. Our analysis suggests that institutions that proactively align with regulatory blueprints (e.g., adopting QRIS, implementing open APIs, participating in BI-FAST real-time transfers) not only avoid penalties but often capture new market opportunities (such as BNI with cross-border QR payments(Bank Negara Indonesia (Persero), PT., Tbk., 2024)).

Despite positive strides, none of the banks have explicitly reported a complete TOGAF-aligned enterprise architecture implementation. EA efforts tend to be internal and partial; for example, a bank might use TOGAF for a specific project (such as core banking modernization) but not across the entire acquiring business line. This represents a significant opportunity. The next section discusses how these findings can inform a set of recommendations for more coordinated, industry-wide EA adoption using TOGAF, which could help resolve persistent issues (legacy integration, siloed data, inconsistent security) and meet both business and regulatory demands more effectively.

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DISCUSSION

Enterprise Architecture as a Complexity Management Tool: One key insight is that Indonesia's acquiring industry has reached a level of complexity where ad hoc approaches may no longer suffice. The rapid onboarding of millions of merchants, integration of multi-channel payments, and explosion of transaction data create operational complexity that demands a structured approach. TOGAF's phased methodology (Architecture Development Method) is well-suited to bring order to this complexity(Using the TOGAF® Standard in the Digital Enterprise, 2021). For example, TOGAF encourages starting with an Architecture Vision, a stage where stakeholders agree on the target state and objectives. In Indonesia's context, that vision could be something like: "An interoperable, secure merchant payment ecosystem that supports all digital payment methods and scales to 50+ million merchants." Having an industry-wide EA vision aligned with BI's cashless society goals ensures that each player's efforts contribute to common outcomes. The success of QRIS (a unified standard) shows the power of a coordinated architecture: when everyone coalesced around QRIS, interoperability issues dropped, and adoption soared. TOGAF can extend this unification beyond QR codes to the entire system, including data formats, APIs, and security protocols, across banks and fintechs. Essentially, EA provides the "critical structure for managing complexity" so that each innovation (be it BCA's merchant app or Mandiri's Livin' platform) fits into an overall coherent architecture rather than becoming another silo (Bank Indonesia, 2019).

Alignment of IT Initiatives with Business and Regulatory Goals: The case studies suggest that the most successful outcomes occurred when technological initiatives clearly supported business needs and complied with regulatory directions. BCA's merchant app was successful because it directly addressed a business need (mass onboarding) and was implicitly aligned with BI's drive for digital payments (it proliferated QRIS). In contrast, less successful examples (like Mandiri's inactive QRIS merchants) reveal a misalignment: technology was deployed (merchants got QR codes) but business follow-through (driving usage) lagged. TOGAF emphasizes that every component in the architecture should be traced to a business function or requirement. Adopting TOGAF industry-wide would encourage each acquirer to ask, for every new system, how it helps acquire or serve more merchants. Does it improve reliability or security? Does it meet regulatory requirements or principles? If it does not clearly map to those, it may be an unnecessary complexity. For instance, a bank might consider implementing a fancy blockchain solution for payments; an EA review might reveal that it does not align with any immediate business or regulatory need (hence, resources are better spent elsewhere). Conversely, EA can highlight underaddressed needs; our findings indicate that data analytics for MSME merchants is one such need (banks have tons of transaction data that could be mined to offer credit or incentives, but few are doing so). TOGAF's Business and Information Systems Architecture phases would surface this gap and guide the development of an analytics component. Moreover, aligning with EA regulations means mapping regulatory requirements to architectural requirements. The OJK digital banking blueprint calls for principle-based compliance – in TOGAF terms, that means setting architecture principles like "Security by Design" or "Interoperability" that architects must follow. For example, if BI's Blueprint 2025 calls for open banking, the EA should include an Open API Architecture as a component, rather than treating an open API solely as a compliance checkbox. Compliance becomes an enabler for innovation (as one expert said, by being the first to comply with an open API standard, a bank can partner with fintechs faster, turning compliance into a competitive advantage)(Bank Indonesia, 2019).

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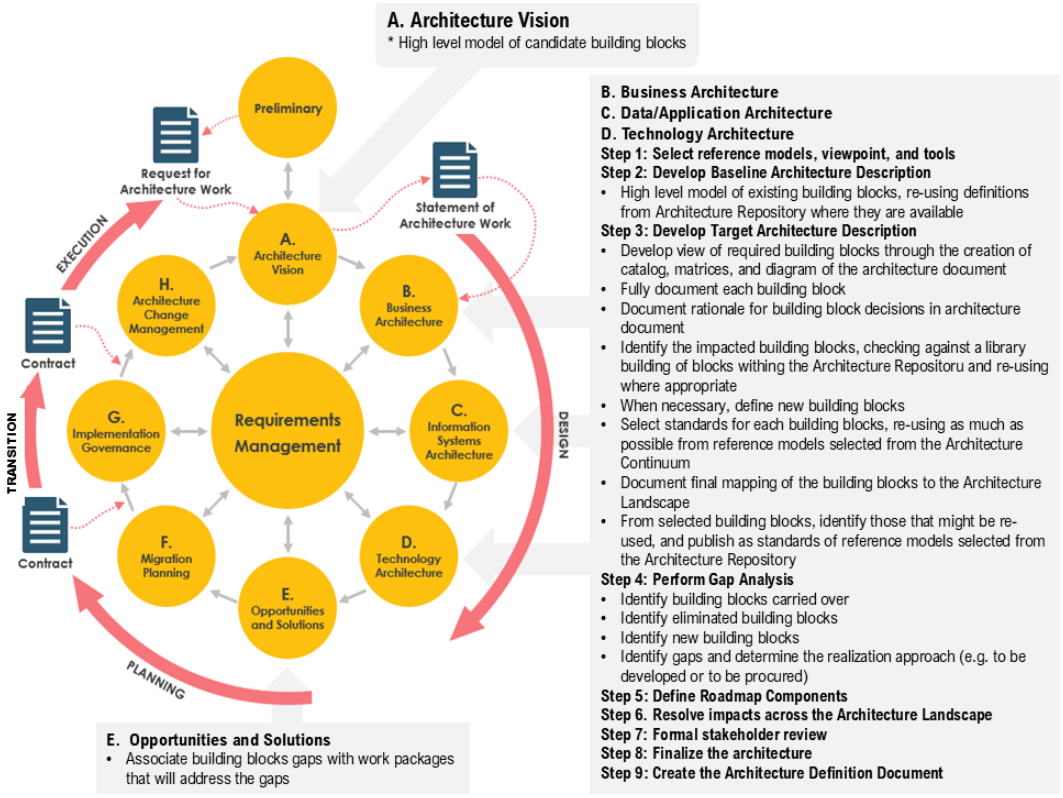

Figure 4. TOGAF-Based Implementation Framework – Architecture Development Method

Mapping regulatory frameworks to The Open Group Architecture Framework (TOGAF) domains: Indonesia's regulators have provided blueprints that essentially outline what should be achieved (e.g., inclusion, innovation, security) without dictating how. TOGAF can serve as the "how" by mapping these high-level goals to concrete architectural components. An effective practice is to create a matrix that maps regulatory objectives to TOGAF domains. For instance, the BI's Payment Blueprint pillars of interoperability, security, innovation, and inclusion can be mapped as follows: interoperability aligns to Application Architecture (standardized APIs, compatibility with BI-FAST, QRIS, GPN) (Bank Indonesia, 2019); Security & resilience align to Technology Architecture (cybersecurity frameworks, robust infrastructure)(Bank Indonesia, 2024); Inclusion & innovation align to Business and Data Architecture (processes for onboarding MSMEs, data strategies for new services)(Bank Indonesia, 2019); Cross-border integration & future technology aligns to Opportunities & Migration planning (architecting for regional integration, digital currency readiness)(Bank Indonesia, 2024). By explicitly mapping these, as we propose, each institution can ensure that it is not only ticking off compliance requirements but also capitalizing on them; for example, designing an architecture that makes adding a new payment method (say, CBDC in the future) relatively easy, thus being ahead of the curve. Our analysis noted that BNI's early move in cross-border QR was likely facilitated by having an adaptable architecture.

Table 2 Mapping of Regulatory Frameworks to TOGAF Components

	TOGAF Component	Implementation Action
BI Payment Blueprint 2025 (Interoperability)	Application Architecture (Standardized APIs)	Ensure QRIS & API compatibility with BI standards
BI Payment Blueprint 2025 (Security)	Technology Architecture (Security by Design)	Embed fraud detection & encryption in payment flows
OJK Digital Transformation (Open Banking)	Business & Information Architecture (Data Sharing)	Adopt Open API architecture in compliance with SNAP
BI Regulation on Merchant Activation	Business Architecture (Merchant Lifecycle)	Design merchant engagement and reactivation strategies
ISO 27001 Compliance (Cybersecurity)	Technology & Security Architecture (Risk Mgmt)	Implement secure cloud-based storage and real-time monitoring

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Closing the Gaps – Activation and Security: Two persistent challenges identified were low active usage among some merchants and rising fraud threats. These are as much business/domain issues as they are technical. An EA approach does not end at deploying systems; it also encompasses what TOGAF calls the Architecture Change Management phase, ensuring that the architecture achieves the desired outcomes.

For merchant activation, EA could help by integrating systems with engagement processes, for example, linking the merchant management platform with an automated training or loyalty system. If TOGAF is implemented in the Business Architecture definition for an acquirer, one could include a function for "Merchant Engagement" tied to the IT systems (CRM, notification systems). Thus, when a merchant is onboarded in the system, the architecture triggers appropriate follow-ups (training modules, periodic check-ins). This type of alignment was missing in Mandiri's case, but the EA could institutionalize it. As noted in the previous discussion, the architecture must embed security from the outset. TOGAF supports this via its Architecture Governance and requirement management – security requirements (PCI-DSS compliance, data encryption standards, BI's risk management rules) should be formally included in the architecture requirements, and every project should be reviewed against them. Banks, such as BCA, that maintained very high uptime and security likely did so by having strong IT governance, which the EA would reinforce. The TOGAF framework can also facilitate industry-wide forums (an idea we recommend), for example, a shared reference architecture for fraud detection that multiple banks and fintechs can adopt, much like how QRIS was a shared solution for payments.

Strategic Positioning through TOGAF: Implementing TOGAF industry-wide could help each player carve a clearer strategic role. For example, BRI's strength is its micro-merchant reach; a TOGAF approach could help BRI formalize an architecture centered on MSME services (such as integrating loan offerings into the payments app, since EA highlights linking payments data to lending systems – something BRI can excel at given its microfinance focus). BCA's strength is technology deployment; EA could push BCA further into offering Banking-as-a-Service (since their architecture is advanced, they could expose more services via APIs to smaller banks or fintechs, an opportunity aligned with open banking). Fintech acquirers, guided by EA, might choose strategic niches (perhaps focusing on specific verticals or customer experience layers) rather than trying to build everything independently. In essence, while TOGAF is typically used within a single organization, our discussion posits that an industry-coordinated EA (through an association or regulatory initiative) could create a foundation in which each participant's architecture is compatible and complementary. This is not trivial, but Indonesia has a precedent of successful public-private collaborations, such as the National Payment Gateway and QRIS. EA could be the next collaborative effort, ensuring that all acquirers support standard APIs, share certain data for fraud prevention, and adopt modular, upgradable systems.

In summary, the discussion highlights that applying TOGAF would not be a compliance burden but rather a strategic enabler. It addresses the fragmentation we still see (siloed legacy vs. new fintech systems) by promoting a holistic redesign. It also prepares the industry for the future: whether that is central bank digital currency, AI-driven services, or regional integration, a flexible architecture is the bedrock for adaptation. The findings from the cases support this: those who effectively managed architecture (even informally) are leading, and those who did not fell behind in either usage or security. The next section provides concrete recommendations – a step-by-step guideline – for merchant acquirers to implement TOGAF in alignment with Indonesian regulatory frameworks and global best practices, distilled from both case insights and EA principles.

RECOMMENDATION (TOGAF IMPLEMENTATION ROADMAP FOR ACQUIRERS)

Based on the analysis, we propose a five-step framework for digital transformation in Indonesia's merchant-acquiring industry. This framework is presented as a TOGAF Enterprise Architecture (EA) implementation roadmap that aligns enterprise architecture initiatives with regulatory requirements and industry best practices. Rather than treating compliance as a box-ticking exercise, the framework leverages regulatory guidelines as design principles to build a robust and innovative architecture..

Step 1: Establish an EA Governance Team and Common Vision – Each major acquirer (bank or fintech) should start by forming an Enterprise Architecture team or working group, drawing members from IT, business, and compliance units. The team's first task is to define a clear Architecture Vision that aligns with both the company's strategy and the national payment vision. For example, the vision might be "Seamless digital payment access for MSMEs with bank-grade security and interoperability." This vision should echo elements from BI's and OJK's blueprints (e.g., inclusion, innovation, and resilience). It is crucial that top executives endorse this vision and communicate it across the organization so that all stakeholders understand the end goal of the EA initiative. A centralized EA governance structure also liaises with regulators and industry bodies. We recommend that an industry EA forum be established under the Indonesian Payment System Association (ASPI) or BI's guidance, where architects from different firms meet quarterly to ensure that their visions and standards do not conflict. This collaborative approach will help create an industry-wide architecture alignment (similar to how all parties aligned with the QRIS). Governance from the outset ensures that as we move through the TOGAF phases, decisions remain consistent with the agreed vision and principles.

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Step 2: Perform Preliminary Analysis – Inventory and Gap Assessment – Using TOGAF's Preliminary Phase, acquirers should take stock of their current architectures and identify gaps relative to their vision. This involves cataloguing existing systems (merchant management systems, EDC networks, mobile apps, payment switches, fraud systems, etc.) and mapping out how transactions flow today at a high level. Simultaneously, relevant regulatory requirements are cataloged. BI's regulations on Payment Service Providers (PBI 23/6 2021, etc.) impose certain capabilities (such as reporting and anti-money laundering checks), while OJK's digital bank guidelines stress API openness and resilience. Identify where current systems fall short: for example, perhaps the current merchant onboarding process is partly manual (paper-based contracts) – that is a gap in Business Architecture; or legacy core banking limits how quickly new e-money products can be launched – a gap in Technology Architecture. Mandiri's case, for instance, discovered a gap in merchant engagement processes, and BNI might find a gap in API management capability. It is helpful to score the maturity of architecture domains (we can adapt OJK's maturity model or use TOGAF maturity models). The Preliminary analysis sets the baseline and priorities for what the target architecture must achieve. Importantly, compliance officers should be involved in this phase so that every gap is also viewed through a regulatory lens; for example, "legacy system X cannot produce the new BI-required report Y easily" is noted as a gap.

Step 3: Develop Target Architectures (Business, Data, Application, Technology) – Following TOGAF's ADM, the next steps are to design the target state for each architecture layer, incorporating the identified regulatory best practices and business needs.

Business Architecture: Defines how merchant acquisition, onboarding, transaction processing, settlement, and support processes should function in an ideal digital state. For example, target business processes might include 100% digital onboarding for all merchant segments, real-time settlement for e-wallet and QRIS transactions, automated merchant risk scoring, and integrated customer support systems. Embed regulatory processes here: for example, a process for periodic merchant due diligence (as required by AML rules) should be part of the business architecture. Use BI's and OJK's guidelines as reference: BI's blueprint calls for inclusive onboarding, so ensure processes for rural/remote merchants via agents or self-service are in the design.

Data (Information) Architecture: Design a data architecture that consolidates siloed data and enables insights. We recommend creating a central merchant data repository that stores merchant profiles, transactional data, risk metrics, etc., which are accessible by relevant systems. This aligns with the OJK's principle of "one single customer view" in digital banking. Plan for data sharing via secure APIs in line with SNAP standards (so third-party fintech partners can, with consent, access certain merchant data to offer value-added services). Data governance should also be incorporated to ensure compliance with data privacy laws (PDP Law) by design, for example, by classifying sensitive data that must be encrypted or consent-protected. A well-defined data architecture will help launch analytics, such as MSME credit scoring or personalized merchant marketing, turning raw payment data into business value responsibly.

Application architecture: The target application landscape is laid out. This likely includes a unified Merchant Management System, a payment switching system that handles multi-channel payments, mobile apps or web portals for merchants, fraud detection systems, and APIs for integration. The key here is to design for interoperability – all applications should communicate through an integration layer (middleware or API gateway) using standard protocols (perhaps ISO 20022 for payments messaging, REST/JSON APIs for fintech integrations, etc.). Additionally, plan for modularity: for example, if a new payment method arises (such as an ASEAN regional wallet), the architecture can accommodate plugging it in without a massive overhaul. One practical recommendation is to adopt an Open API Gateway conforming to BI's SNAP framework as a core part of the app architecture, so that exposing and consuming services with partners is standardized(Bank Indonesia, 2024). Another is ensuring that the merchant app or portal is omnichannel – possibly one front end for merchants to see all transactions (card, QRIS, etc.), which requires a back end that aggregates those feeds.

Technology architecture: This defines the supporting technology infrastructure. This includes decisions on cloud versus on-premises, network design, databases, and security infrastructure. Given the need for scalability (tens of millions of users), leveraging cloud or hybrid cloud with elastic capacity is recommended, while ensuring BI/OJK approvals for any cloud usage (as they require certain certifications for financial data). Plan a robust cybersecurity architecture, such as implementing multi-factor authentication for merchant logins, end-to-end encryption for transaction data, and real-time monitoring tools. BI's resilience guidelines and OJK's IT risk management rules should inform the tech architecture; for instance, BI might require dual data centers for critical payment systems, so design active-active or active-passive data center setups for high availability. Additionally, consider adopting containerization and microservices to allow faster deployment of updates (this aligns with the "agile architecture" mentioned in BI's blueprint(Bank Indonesia, 2019)). Document technology standards (for example, all new applications must be containerized, and all APIs must implement OAuth2 security). The goal is to create a technology environment that can "plug and play" new innovations and handle surges (like peak shopping seasons or big promo days) without any downtime.

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Step 4: Incremental Implementation (Phased Roadmap) – With target architectures defined, a detailed implementation roadmap is created that breaks the transformation into manageable phases or projects. TOGAF's Opportunities & Solutions phase comes into play here: identify quick wins versus longer-term projects. For example, a quick win might be consolidating multiple merchant databases into one (medium complexity but high benefit for data analysis) or implementing the API gateway to open up a few services to partners within a year. Another relatively quick win could be enabling e-KYC and digital contracts for onboarding to eliminate paperwork (some banks have partially done this). Higher complexity projects might include replacing a legacy core acquiring system or migrating to cloud infrastructure, which might be phased over to 2-3 years. We recommend phasing by priority: address critical pain points first (if security gaps are glaring, those projects get top priority; if manual onboarding is the bottleneck, focus there first, etc.). It is also crucial to schedule compliance-related deliverables in the roadmap; for example, if BI is mandating ISO 20022 messages by a certain date for QRIS, ensure that the upgrade is a specific milestone. Throughout the phased implementation, agile methodologies should be applied where possible (as our findings suggest that combining TOGAF with agile works well(Bank Indonesia, 2019)). This means delivering in sprints, obtaining feedback from actual merchants or internal users, and iterating. For instance, after rolling out the merchant portal in one region, gather merchant feedback on usability and adjust in the next sprint for a nationwide rollout. Each phase should be measured against KPIs tied to the EA vision (e.g., phase 1 might target "onboarding time reduced from 7 days to 1 day" or "X% increase in active merchants"). By phasing, the organization can demonstrate progress, secure continued buy-in, and reduce risk by not doing a "big bang" overhaul.

Step 5: Ensure Architecture Governance and Training – As new systems and processes are rolled out, establishing ongoing governance is vital to sustain alignment. This involves creating an Architecture Review Board (which could be the same EA team evolving) that evaluates any new technology initiative or purchase against the target architecture. For example, if a business unit wants to deploy a new CRM for merchants, the board checks whether it integrates via the API gateway. Does it adhere to the data standards? This prevents the creep of new silos. Governance also entails regular compliance checks – mapping the implemented architecture to OJK/BI guidelines to ensure nothing has drifted (for instance, if a new regulation on data localization comes, the team addresses it proactively in the architecture). We also recommend industry governance: sharing progress with regulators via sandboxes or consultations. In recent years, BI and OJK have opened regulatory sandbox programs; acquirers can enter their new innovative solutions (such as BCA's merchant app or a joint bank-fintech payment platform) into such sandboxes to obtain early feedback and ensure regulatory comfort. Additionally, they should invest in training and change management. TOGAF implementation requires a mindset shift for both IT staff and business users. Provide TOGAF training workshops for IT architects and key developers so that they understand the framework and how to apply it. Likewise, business units should be educated on the new processes, for example, training relationship managers to use the new merchant onboarding system and training risk officers to interpret the new data dashboards. A well-governed and well-understood architecture will be maintained, whereas one that is delivered and left undocumented might erode over time. Thus, governance and capacity building form the glue that holds the new enterprise architecture together and is responsive to future changes.

By following these steps, Indonesia's merchant acquirers can systematically implement TOGAF in a way that not only meets compliance (i.e., "built-in" rather than "bolt-on" compliance) but also enhances their competitive capabilities. This roadmap turns the lessons from our case studies into actionable guidance: bridging the gap from QRIS adoption to active usage, from fragmented IT to integrated platforms, and from reactive upgrades to proactive architectural evolution. In doing so, acquirers will be better positioned to support Indonesia's booming digital economy while safeguarding its stability and security.

CONCLUSION

Indonesia's merchant-acquiring industry is at a pivotal moment in its digital transformation journey. In just a few years, it has onboarded millions of new merchants to electronic payments and embraced innovations like QRIS, developments that have become a model for inclusive payment adoption worldwide. This study examined how implementing the TOGAF enterprise architecture framework on an industry-wide basis can support and accelerate this transformation. Through a structured analysis of the literature and detailed case studies, several key insights and contributions have emerged.

First, the study demonstrated that enterprise architecture (EA) can provide the necessary structure to manage the increasing complexity of the payment ecosystem. The rapid growth of digital payments, with tens of millions of merchants now accepting e-money or QR payments, has introduced challenges that cannot be effectively addressed by siloed systems or piecemeal upgrades (ASPI, 2024). The success of the unified QRIS standard illustrates the power of a coordinated architectural approach. By extending a similar coordinated EA approach (via TOGAF) to all layers of the acquiring industry's systems, stakeholders can ensure interoperability and a common direction beyond QR codes. Our findings support the notion that TOGAF's holistic methodology, from setting a

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vision through governance, is well-suited to Indonesia's context, where multiple banks and fintechs must collaborate and compete in harmony.

Second, aligning technology initiatives with business objectives and regulatory mandates is not just a theory but a practical determinant of success. Banks that achieved superior outcomes in our case studies (such as BCA with high digital transaction volumes and near 24/7 uptime in services) were those clearly aligning IT innovations (merchant apps, omni-channel payment platforms) with concrete business goals (improving merchant convenience, increasing SME outreach) and regulators' strategic directions (open APIs, financial inclusion targets)(Bank Central Asia, 2025). When adopted, TOGAF inherently enforces this alignment by requiring that every architectural requirement trace back to business and regulatory requirements. The study's recommendations leveraged this by mapping Indonesian regulatory frameworks into the TOGAF process, thereby ensuring that an acquirer's EA efforts simultaneously advance its market strategy and comply with the OJK/BI principles. This approach shifts the perspective from viewing regulations as external constraints to seeing them as integral design input for enterprise architecture, which ultimately leads to more sustainable and compliant innovation.

Third, the expanded case studies shed light on the critical success factors and common pitfalls of current transformation efforts. We documented how banks such as BRI and Mandiri have aggressively grown their merchant networks but need to focus on activation and security, whereas BCA and BNI have invested in integration and partnerships to broaden payment options. We also observed how fintech entrants achieved scale through ecosystem strategies but now encounter the challenges of integration with the broader financial system. These insights inform a balanced approach to EA: one that is not one-size-fits-all but allows each institution to play to its strengths within a common framework. For example, an EA framework could allow a fintech to focus on agile customer-facing innovations while relying on standardized interfaces to connect with bank infrastructure and allow a bank to focus on robust processing and risk management while outsourcing certain front-end innovations to fintech partners. Our discussion highlights that EA can facilitate this convergence of models, with banks becoming more platform-oriented and fintechs adopting more robust architectures, ultimately leading to an "ecosystem" architecture for the industry.

Finally, this study contributes academically by bridging enterprise architecture theory with a real-world, emerging market scenario. Prior studies have often studied EA in isolated organizational contexts; here, we considered an industry-wide application in a highly dynamic environment, which is novel. We integrated references from high-impact journals on digital payments and EA to lend credence to our approach (e.g., aligning with global trends in omnichannel payments(McKinsey & Company, 2022) and data-driven services (Pisoni et al., 2021)). The proposed TOGAF roadmap for Indonesian acquirers is grounded in both theory and practice, making it a useful reference for practitioners and an example for researchers of how EA frameworks can be localized to specific industry and country settings. The dual version preparation (one following a standard template and an alternative view) further ensures that the knowledge can be flexibly consumed by different audiences, whether academic or professional.

In conclusion, implementing TOGAF in Indonesia's merchant-acquiring industry is both feasible and beneficial. It provides a common language and method to address the fragmentation and legacy barriers that currently exist, while steering the industry towards the shared goals of innovation, inclusion, and security set by the stakeholders. The recommendations, from establishing EA governance, leveraging regulatory blueprints as guides, standardizing APIs and data, to phasing technology modernization, are aimed at building a "digital payment backbone" for Indonesia that is robust, interoperable, and adaptable (Bank Indonesia, 2024). Such an architecture will not only benefit payments but also unlock broader value, for instance, by feeding merchant data into better access to credit and other financial services for MSMEs, thus fulfilling the wider vision of regulators and the industry for an integrated and advanced digital economy. The journey to this future state will require coordination and commitment; however, the evidence and analysis presented in this study make a strong case that the TOGAF enterprise architecture framework can be the cornerstone of that journey.

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