

Developing an Ambidextrous Technology Architecture for AI-Enabled Lending Transformation at BankCo Using TOGAF 10

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Abstract—Banking organizations face increasing pressure to achieve digital transformation while maintaining operational stability, regulatory compliance, and service reliability. Although previous studies have explored enterprise architecture and TOGAF-based digital transformation, limited research has translated these approaches into technology architecture artifacts that simultaneously support governance and AI-driven innovation in banking. This study proposes a TOGAF-based ambidextrous technology architecture for BankCo's lending process using design science research methodology (DSRM). Unlike conventional TOGAF-based approaches, the proposed architecture integrates traditional and agile technology perspectives through governance mechanisms, technology modernization strategies, and architecture decision models to support continuous technology evolution. The resulting architecture captures technology principles, standards, governance readiness assessment, modernization strategy, an iterative implementation roadmap, and an ambidextrous decision model for AI-enabled lending transformation. The stakeholder-based architecture validation shows that the proposed architecture is feasible for supporting operational stability and enabling the controlled deployment of AI-driven lending capabilities. This research operationalizes ambidextrous enterprise architecture within the technology architecture domain. It provides banking organizations with a structured approach for introducing AI-driven lending capabilities while maintaining governance, regulatory compliance, and operational stability.

Index Terms—AI-driven lending, ambidextrous technology architecture, digital transformation, technology architecture, TOGAF 10.

I. INTRODUCTION

Digital transformation has become a strategic priority for

organizations to improve operational efficiency, service quality, and competitiveness through the adoption of digital technologies. Its successful implementation requires alignment between business strategy, organizational capabilities, and technology to generate sustainable business value rather than merely adopting new technologies [1]–[8]. Similar challenges are faced by banking organizations, which must continuously respond to technological disruption, evolving customer expectations, and increasingly complex regulatory requirements while maintaining operational stability and compliance [9], [10]–[12].

In response to these challenges, organizations need to develop dynamic capabilities that enable them to adapt to environmental changes while maintaining operational resilience continually [13]. Enterprise Architecture (EA) capabilities underpin these by aligning business objectives, information resources, applications, and technology assets. At the same time, ambidextrous IT governance complements EA by reconciling governance controls, risk management, and innovation-based mechanisms to ensure operational reliability and organizational agility [14]–[19].

Although governance mechanisms and enterprise architecture provide a foundation for digital transformation, their value depends on how they are translated into implementable architectural capabilities across the enterprise [14], [20], [21]. Among the enterprise architecture domains, technology architecture plays a critical role by operationalizing business and application requirements into deployable infrastructure, platform services, integration mechanisms, and technology standards that directly support operational stability, regulatory compliance, and continuous innovation [22]–[24]. In banking environments, where technology modernization must coexist with strict governance requirements, technology architecture becomes the primary enabler of sustainable AI-driven transformation.

Although previous studies have examined digital transformation, governance, enterprise architecture, and banking modernization from different perspectives, limited attention has been given to how these elements can be operationalized through technology architecture in banking

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environments that simultaneously require operational stability and continuous innovation [10], [14], [17]. The emergence of agile development environments and AI-enabled digital services has further increased the need for adaptive architectural practices that balance governance, innovation, and rapid experimentation with technology [25].

Previous research has demonstrated that dynamic capabilities enable organizations to adapt to environmental change. Ambidextrous IT governance provides mechanisms balancing governance oversight, risk management, and innovation initiatives [13], [14], [18], [19], [26]. These governance mechanisms are further implemented through Ambidextrous Enterprise Architecture, which allows traditional and agile architecture approaches to coexist within a unified enterprise environment [20], [21], [27]. However, limited research has translated these organizational, governance, and architectural perspectives into concrete technology architecture artifacts that simultaneously support operational stability, regulatory compliance, and continuous AI-driven innovation in banking environments [10], [14], [17], [28]. Therefore, this study presents a TOGAF-based Ambidextrous Technology Architecture for BankCo that translates Ambidextrous Enterprise Architecture into implementable technology architecture artifacts, illustrating how traditional lending capabilities and AI-driven lending initiatives can coexist within a governed, sustainable technology environment. In practice, the proposed architecture can provide banking organizations with a structured reference for modernizing lending technology ecosystems, while maintaining governance, regulatory compliance, and operational robustness during AI-enabled transformation programs. The study adds to the literature by operationalizing ambidextrous EA through the principles of technology architecture, focusing on architecture governance mechanisms, strategies for technology modernization, and architectural decision models that support exploitation—and the exploration of lending transformation initiatives.

II. RELATED WORK

In this section, a critical review of prior studies on digital Ambidextrous Enterprise Architecture, transformation, TOGAF 10, and technology architecture development in banking is presented. The theoretical foundation is outlined, limitations in existing research are identified, and the research gap this study addresses is highlighted.

A. Digital Transformation

Digital transformation has become a strategic initiative across both public and private sectors to improve efficiency, service quality, and organizational agility through the adoption of digital technologies [1]–[3]. In the public sector, digital transformation initiatives emphasize integrated governance, interoperability, and data-driven decision-making [6]–[8], while the banking sector focuses on enhancing customer experience, operational resilience, and digital service innovation [9]–[11]. The alignment of governance, business

capabilities, and technology resources is required for successful transformation, as noted in previous studies [1], [18], [29]. However, these studies primarily measure transformation outcomes or governance readiness without explaining how enterprise architecture artifacts operationalize these strategies into implemented technological capabilities, particularly in banking environments.

B. Ambidextrous Enterprise Architecture

Ambidextrous EA extends the concept of organizational ambidexterity to the enterprise architecture domain by enabling organizations to balance the exploitation of existing capabilities and the exploration of emerging innovations [14], [17]. The ambidextrous EA integrates ambidextrous IT governance and architecture practices to enable the coexistence of traditional and agile architectural pathways in a single enterprise environment [14], [17], [18]. While Agile Enterprise Architecture focuses mainly on rapid architectural adaptation and iterative delivery, Ambidextrous Enterprise Architecture aims to balance the exploitation of stable enterprise capabilities with the exploration of emerging technologies through coordinated governance and architectural mechanisms [14], [17], [18].

This integrated perspective embeds governance mechanisms into enterprise architecture practices to ensure both operational stability and continuous innovation. This integrated view embeds governance mechanisms within enterprise architecture practice to ensure both operational stability and continuous innovation. Previous research has demonstrated the importance of ambidextrous approaches in enabling digital transformation and organizational agility [14], but most discussions have focused on governance and organizational perspectives. However, introducing Ambidextrous Enterprise Architecture is difficult because organizations must align traditional and agile architectural practices with enterprise-level governance consistency [20], [21], [27]. Limited research has explored how these ambidextrous principles can be operationalized into concrete technology architecture artifacts that support both operational stability and continuous innovation, particularly in banking environments.

C. TOGAF 10

TOGAF 10 is one of the most widely adopted enterprise architecture frameworks because its Architecture Development Method (ADM) provides a structured methodology, governance support, and increased flexibility for modern digital transformation initiatives [23], [24], [30]. Its support for architecture governance, capability-based planning, iterative ADM cycles, and reusable architecture artifacts enables organizations to accommodate both stable operational environments and rapidly evolving digital initiatives [23], [24]. Previous studies have demonstrated the applicability of TOGAF 10 in supporting digital transformation and modernization initiatives within banking environments [10], [11], [31]. Nevertheless, limited studies have utilized TOGAF 10 to develop technology architecture artifacts that explicitly

support ambidextrous transformation strategies and AI-enabled innovation.

D. Technology Architecture in Banking

Technology Architecture defines the platforms, infrastructure, integration mechanisms, and technical standards required to support organizational capabilities [23], [24]. In banking, it enables the integration of core banking systems, digital channels, enterprise data platforms, and emerging technologies while ensuring interoperability, scalability, and compliance [11]. Recent studies highlight the growing adoption of AI in lending through customer acquisition, behavioral scoring, and predictive analytics [9]. The increasing adoption of AI-driven services also introduces new requirements for AI governance, cybersecurity, model transparency, and regulatory compliance to ensure that intelligent technologies remain trustworthy and aligned with banking regulations. Consequently, technology architecture must provide secure integration mechanisms, standardized technology services, and governance controls that support responsible AI deployment within lending processes [9], [11], [23], [24]. However, limited research has examined technology architecture designs that support the coexistence of traditional lending operations and AI-driven lending innovation within an ambidextrous EA framework.

E. Research Conceptual Framework

Dynamic capabilities enable organizations to adapt to environmental changes, while ambidextrous IT governance balances operational control and innovation initiatives [13]. These capabilities are operationalized through ambidextrous EA, which enables the coexistence of traditional and agile architectural approaches [17], [18]. This study realizes this concept through an ambidextrous technology architecture that integrates traditional and agile technology architecture to support AI-driven lending transformation. The conceptual relationship among these constructs is illustrated in Fig. 1.

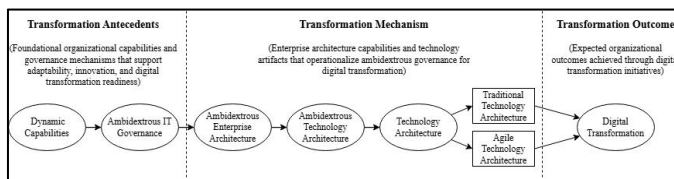


Fig. 1. Research conceptual framework.

Within this study, dynamic capabilities drive adaptation, ambidextrous IT governance balances operational control and innovation, and Ambidextrous Enterprise Architecture translates these mechanisms into technology architecture capabilities that enable AI-driven lending transformation. This sequential relationship illustrates the progression from organizational capabilities and governance mechanisms to architectural strategies and implementable technology capabilities.

III. RESEARCH METHOD

This study uses a qualitative approach to develop a technology architecture for AI-driven lending transformation at BankCo. The approach enables an in-depth understanding of organizational contexts, governance mechanisms, stakeholder requirements, and architectural challenges associated with digital transformation [32], [33].

This study follows the Design Science Research Methodology (DSRM) to design and evaluate an Ambidextrous TOGAF-based Technology Architecture artifact for AI-based lending transformation [34], [35]. As shown in Fig. 2, the research integrates organizational needs, theoretical foundations, the development, and the evaluation of architectural activities to ensure relevance and academic rigor.

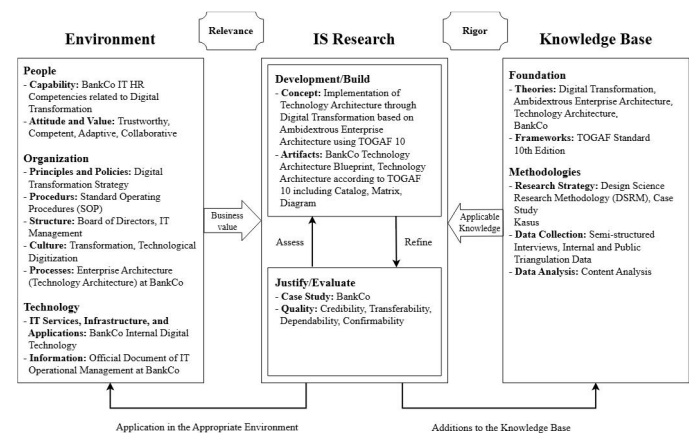


Fig. 2. Research on design science, adapted from Hevner.

The research follows six DSRM phases: problem explication, requirements determination, design and development, demonstration, evaluation, and communication [35]. As shown in Fig. 2, the study begins by identifying technology architecture challenges in BankCo, followed by requirements analysis through interviews, document reviews, and architecture assessments. To ensure traceability between research objectives, DSRM phases, TOGAF ADM activities, and resulting artifacts, their mapping is presented in Table 1.

Table 1.
Research Traceability Matrix

Research Question	DSRM Phase	TOGAF Artifact	Research Output
How can technology architecture problems and objectives for AI-driven lending transformation at BankCo be identified?	Problem explication	Preliminary preparation	Problem definition, research scope, research objectives
How can technology	Requirement determination	Preliminary phase,	Principle catalog, technology

Research Question	DSRM Phase	TOGAF Artifact	Research Output
architecture requirements for AI-driven lending transformation be determined?		architecture vision	architecture requirements, technology architecture requirements, solution concept diagram
How can a togaf-based ambidextrous technology architecture be developed?	Design & development	Technology architecture, agile ea adaptation, and ambidextrous ea	Traditional technology architecture, agile technology architecture, ambidextrous technology architecture artifacts
How can the proposed architecture be demonstrated and validated?	Demonstration	Architecture blueprint development	Enterprise architecture blueprint and architecture validation
How can the quality and trustworthiness of the proposed architecture be evaluated?	Evaluation	Architecture assessment	Credibility, transferability, dependability, & confirmability assessment
How can the resulting architecture and research contribution be communicated?	Communication	Research dissemination	Final research report and publication manuscript

Table 1 shows the traceability between the research questions, DSRM phases, TOGAF artifacts, and resulting research outputs. The implementation of these activities throughout the research process is illustrated in Fig. 3.

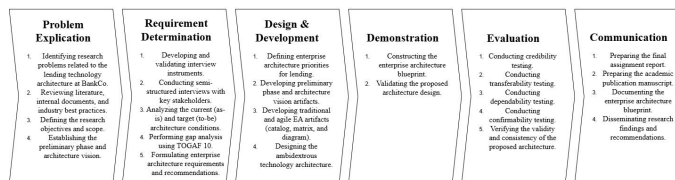


Fig. 3. Research process.

This study covers the preliminary phase, architecture vision, and technology architecture phases of TOGAF ADM, complemented by Agile EA mechanisms comprising enterprise strategic architecture governance, segment technology architecture governance, agile capability architecture, and ambidextrous technology architecture. The study focuses on technology architecture artifacts and excludes subsequent phases of the TOGAF ADM.

Table 2.
Primary Data

Respondent	Positions	Date
Respondent 1 (R1)	Business Partner Officer	April–June 2026
Respondent 2 (R2)	Enterprise Architecture Officer	
Respondent 3 (R3)	Lending Operations Officer	

Respondent 4 (R4)	External Auditor Consultant
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Primary data were collected through semi-structured interviews with four purposively selected stakeholders representing business, enterprise architecture, lending operations, and governance perspectives. Interview and document data were analyzed to identify organizational problems, requirements, governance constraints, and technology needs that informed architecture requirements and design inputs, as presented in Table 2.

Data collection continued until saturation was reached, as indicated by subsequent interviews that generated no new themes, requirements, governance constraints, or architecture needs. Trustworthiness was supported through source triangulation and stakeholder validation, and credibility was established through validation of the proposed architectural artifacts. At the same time, dependability and confirmability were strengthened through documented procedures and traceable evidence from interviews and secondary documents [32], [33]. Validation used a structured five-point Likert-scale form, with an expert assessing framework conformity and a BankCo stakeholder assessing organizational alignment. Stakeholder validation was conducted through structured assessment and feedback on the proposed architecture artifacts, with the results documented as part of the architecture evaluation.

Table 3.
Secondary Data

Secondary Data	Description
BankCo GCG & annual report 2025	Contains information on BankCo's governance policies, risk management, and strategic initiatives in 2025.
BankCo organizational structure	Contains the latest organizational structure, roles, and reporting relationships within BankCo.
BankCo architecture assessment document 2020	Contains the results of an architecture assessment conducted by an external consultant in 2020, including identified gaps and recommendations.
Regulatory documents	Contains regulations and guidelines issued by the Financial Services Authority (OJK), Bank Indonesia, and the Personal Data Protection Law (UU PDP) relevant to technology architecture design.

Secondary data were obtained from organizational and regulatory documents, including the BankCo GCG & annual report 2025 [36], [37], organizational structure documents [38], architecture assessment document 2020, and applicable regulatory documents [39], [40], [41], as presented in Table 3. These documents were used to support data triangulation, identify architecture requirements, and ensure alignment between the proposed architecture and organizational governance requirements [32].

IV. RESULT

A. Preliminary Phase

The architectural principles were developed based on stakeholder requirements for operational stability, regulatory

compliance, system integration, security, scalability, and AI-driven lending. These requirements are reflected in six technology principles, namely interoperability, technology standardization, modularity, infrastructure security, scalable infrastructure, and deployment flexibility, which guide the alignment of technology decisions with business objectives.

Table 4.

Principle Catalog

ID	Principle	Description
PC01	Interoperability	Technology infrastructure supports system and service integration, enabling seamless and reliable data exchange across the organization.
PC02	Technology Standardization	Technology implementation adheres to BankCo's established standards and frameworks to ensure consistency in technology management and governance.
PC03	Modularity	The technology architecture promotes a modular, flexible system design, including the adoption of microservices, to facilitate system changes and enhancements.
PC04	Infrastructure Security	The technology infrastructure incorporates security mechanisms to protect system access, server communications, and organizational assets from security threats and vulnerabilities.
PC05	Scalable Infrastructure	The infrastructure is scalable to accommodate evolving business needs and support gradual service expansion through container-based deployment and microservices architecture.
PC06	Deployment Flexibility	Technology supports flexible and incremental deployment processes, enabling solutions to be delivered progressively without requiring full-scale implementation.

Table 4 presents the principles that guide technology requirements, standards, and design decisions, while supporting operational stability and innovation within the proposed ambidextrous technology architecture.

B. Architecture Vision

The architecture vision translates organizational needs for lending modernization, operational stability, and AI-enabled innovation into a unified technology solution concept. The AI-driven loan acquisition and targeting and AI behavioral lending scoring use cases shape the required data, application, integration, and technology capabilities. Figure 4 connects these capabilities across business processes, application services, application components, and technology platforms to establish the target architecture for lending transformation.

C. Traditional Technology Architecture

To support the exploitation dimension of ambidextrous architecture, the proposed traditional technology architecture emphasizes governance-driven, relatively stable artifacts that establish technology requirements, standards, infrastructure configurations, and baseline technology capabilities. Consequently, it focuses on operational stability, regulatory compliance, security, reliability, and governance consistency across the lending ecosystem.

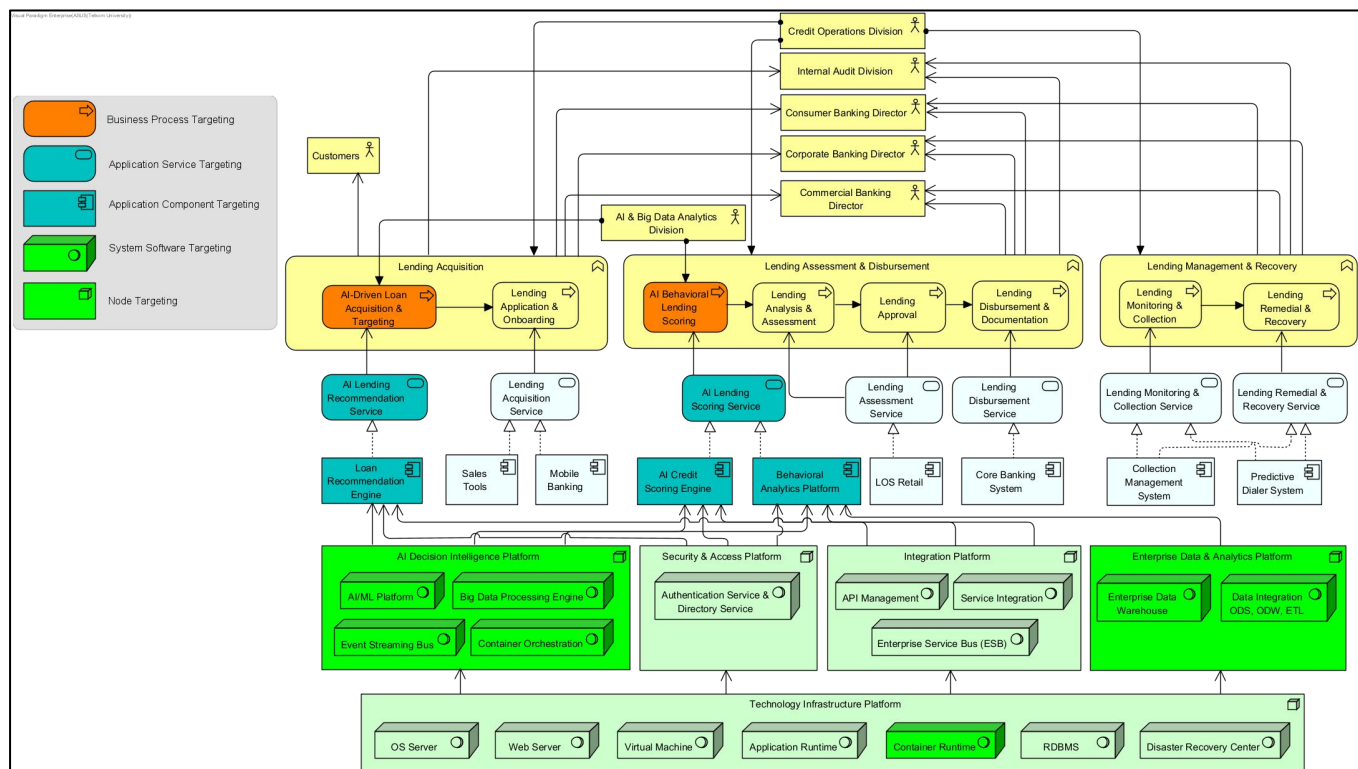


Fig. 4. Solution concept diagram.

Table 5.
Technology Architecture Requirement

ID	Requirement
TAR01	The technologies used shall be up to date to ensure better security patch management and protection against vulnerabilities.
TAR02	The technologies used shall be enterprise-grade; therefore, technologies that are solely freeware without adequate support are not permitted.
TAR03	If open-source technologies are utilized, they shall be deployed in their enterprise edition to ensure reliability, scalability, and vendor support.
TAR04	The technologies used shall have principal vendor support, ensuring that support is provided not only by local partners in Indonesia but also directly by the primary vendor.
TAR05	The technologies used shall minimize the risk of vendor lock-in. Therefore, an assessment shall be conducted to determine whether the technology may create dependency on a single vendor.
TAR06	General characteristics such as integration, flexibility, and security shall be fulfilled to ensure that the technology effectively supports the organization's business processes.
TAR07 (Targeting)	The technologies used shall support the scalable implementation of Artificial Intelligence (AI), Machine Learning (ML), and advanced analytics, and be integrated with the enterprise data and application ecosystem to enable data-driven decision-making.

Table 5 guides technology selection by prioritizing enterprise support, security, interoperability, scalability, AI enablement, and reduced vendor dependency. The standards do this by balancing operational reliability and the needs of future AI-driven lending. Key considerations include vendor dependency, technology lifecycle and support, interoperability with existing systems, and security and scalability implications of emerging technologies. Controlled adoption and periodic architecture reviews are required to minimize dependencies and disruptions to critical lending operations.

Table 6.
Technology Standards Catalog

Logical Technology Component	Physical Technology Component	
Platform	Technology Component	Standard/Provider
Server infrastructure	OS Server	Windows Server 2019, CentOS 7
	Web Server	IIS, Nginx
	Virtual Machine	VMware vSphere 8 Enterprise Plus
Application framework container platform (targeting) database	Application Runtime	.NET Core
	Container	Docker
	Runtime Relational Database Management System	Oracle 18c, SQL Server 2017
Integration services	API Management	Axway Amplify API Gateway
	Enterprise Service Bus (ESB)	IBM WebMethods Integration Server SOA
	Service Integration	
Data Management Service (Targeting)	Enterprise Data Warehouse	Teradata
	Data Integration ODS, ODW, ETL	IBM InfoSphere DataStage, IBM Db2 Warehouse, IBM Cloud Pak for Data

Logical Technology Component	Physical Technology Component	
Platform	Technology Component	Standard/Provider
Security & access platform	Authentication Service & Directory Service	LDAP
Recovery infrastructure	Disaster Recovery Center	HPE (Hewlett Packard Enterprise), SAN Switch Core & Edge by IBM, VMware Site Recovery Manager (SRM)
AI decision intelligence platform (targeting)	AI/ML Platform	Databricks AI
	Big Data Processing Engine	Apache Spark
	Event Streaming Bus	Apache Kafka
	Container Orchestration	Red Hat OpenShift

Table 6 maps logical technology components to selected physical technologies based on the requirements and standards defined in Table 5. The resulting technology portfolio combines stable enterprise platforms with modern data, integration, and AI capabilities to support scalability, innovation, and the evolution of future technologies.

Table 7.
Application/Technology Matrix

Application/Technology Matrix	Physical Application Component								
Physical Technology Component	Loan Recommendation Engine	Sales Tools	Mobile Banking	AI Lending Scoring Engine	Behavioral Analytics Platform	LOS Retail	Core Banking System	Collection Management System	Predictive Dialer System
OS Server	✓	✓	✓	✓	✓	✓	✓	✓	✓
Web Server	✓	✓	✓	✓	✓	✓	✓	✓	✓
Virtual Machine	✓	✓	✓	✓	✓	✓	✓	✓	✓
Application Runtime		✓	✓			✓			
Container Runtime	✓			✓	✓				
RDBMS	✓	✓	✓	✓	✓	✓	✓	✓	✓
API Management	✓	✓	✓	✓	✓	✓	✓	✓	✓
Enterprise Service Bus (ESB)	✓	✓	✓	✓	✓	✓	✓	✓	✓
Service Integration	✓	✓	✓	✓	✓	✓	✓	✓	✓
Enterprise Data Warehouse	✓			✓	✓		✓	✓	✓
Data Integration ODS, ODW, ETL	✓	✓	✓	✓	✓	✓	✓	✓	✓
Authentication Service & Directory Service	✓	✓	✓	✓	✓	✓	✓	✓	✓
Disaster Recovery Center	✓	✓	✓	✓	✓	✓	✓	✓	✓
AI/ML Platform	✓			✓	✓				
Big Data Processing Engine	✓			✓	✓				
Event Streaming Bus	✓			✓	✓				
Container Orchestration	✓			✓	✓				

Table 7 maps application components to supporting technologies and identifies dependencies across the lending

ecosystem. Shared services such as operating systems, databases, integration platforms, and security services support standardization and operational efficiency.

Fig. 5 illustrates the deployment environment and relationships among infrastructure, platform services, and lending applications, including integration, security, and recovery capabilities.

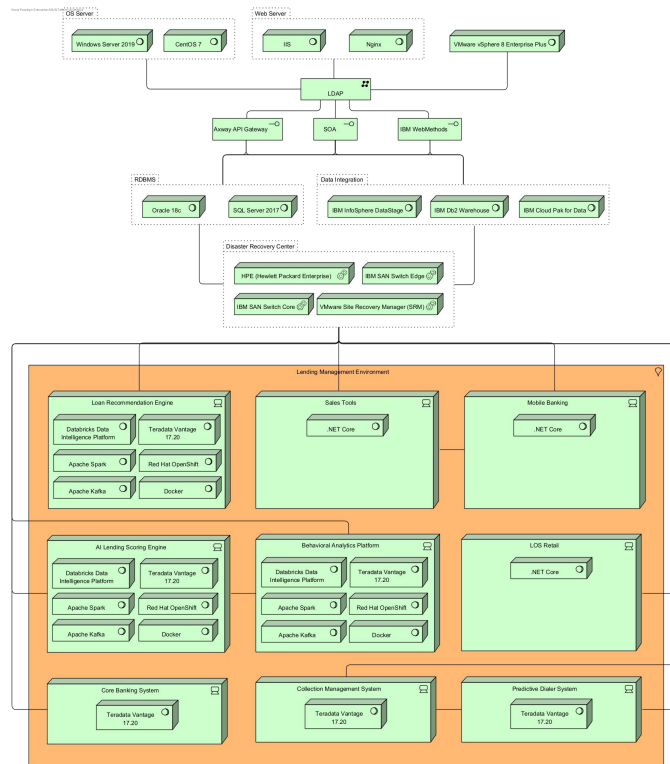


Fig. 5. Environments and location diagram.

Overall, the traditional technology architecture provides a stable, governed foundation for lending operations, while the identified technology gaps define priorities for controlled modernization without disrupting critical business capabilities.

Table 8.
Gap Analysis Technology Architecture

Requirement	Fulfillment			Keterangan
	N	P	F	
The technologies used shall be up to date to ensure better security patch management and protection against vulnerabilities.		✓		Several existing technologies such as Windows Server 2019, CentOS 7, Oracle 18c, and SQL Server 2017 are still in use and require a modernization roadmap.
The technologies used shall be enterprise-grade; therefore, technologies that are solely freeware without adequate support are not permitted.		✓		All technologies adopted are enterprise-grade solutions, including VMware, Oracle Database, SQL Server, IBM WebMethods, Axway, and Red Hat OpenShift.
If open-source technologies are utilized, they shall be deployed in their enterprise edition to ensure reliability, scalability, and vendor		✓		Docker Enterprise, Red Hat OpenShift Container Platform, and the selected AI technologies provide enterprise-grade support and

Requirement	Fulfillment	Keterangan
support. The technologies used shall have principal vendor support, ensuring that support is provided not only by local partners in Indonesia but also directly by the primary vendor. The technologies used shall minimize the risk of vendor lock-in. Therefore, an assessment shall be conducted to determine whether the technology may create dependency on a single vendor. General characteristics such as integration, flexibility, and security shall be fulfilled to ensure that the technology effectively supports the organization's business processes. The technologies used shall support the scalable implementation of Artificial Intelligence (AI), Machine Learning (ML), and advanced analytics, and be integrated with the enterprise data and application ecosystem to enable data-driven decision-making.	✓ ✓ ✓ ✓	governance capabilities. Core technologies are supported by principal vendors such as Microsoft, Oracle, IBM, VMware, Red Hat, Databricks, and Axway. The architecture adopts a multi-vendor approach; however, some dependencies remain on key vendors such as Oracle and Microsoft. Supported through API Management, Enterprise Service Bus, LDAP, SOA, and an integrated architecture that enables interoperability across systems. The target architecture introduces Databricks Data Intelligence Platform, Apache Spark, Apache Kafka, and Red Hat OpenShift to enable AI-Driven Lending and AI Behavioral Lending Scoring capabilities.

Table 8 identifies gaps in technology currency and vendor dependency, which are addressed through modernization priorities, enterprise-grade standards, standardized integration, security controls, and emerging AI capabilities, while maintaining alignment with existing governance and operational requirements.

D. Agile Technology Architecture

The agile technology architecture represents the exploration dimension of the proposed architecture, focusing on adaptive artifacts that support technology modernization and the adoption of emerging technologies. It is enabled by enterprise strategic architecture governance, segment technology architecture governance, and agile capability architecture, allowing for controlled AI-driven lending innovation while maintaining alignment with company objectives. Enterprise strategic architecture governance establishes the basis for balancing architectural control and technological innovation by evaluating organizational readiness, governance mechanisms, architecture repositories, technology standards, and the enablement of emerging technologies.

Table 9.
Governance Readiness Analysis Technology Architecture

Aspect/Area	Current State (Traditional Technology Governance)	Target State (Agile Technology Governance)	Improvement/ Recommendation

Aspect/Area	Current State (Traditional Technology Governance)	Target State (Agile Technology Governance)	Improvement/ Recommendation
People, organizational structure	Technology governance is managed through centralized IT and architecture functions with hierarchical decision-making.	Cross-functional collaboration is required to support AI-driven lending initiatives and rapid technology innovation.	Establish cross-functional architecture teams involving business, data, AI, and technology stakeholders.
People, competency	Technology competencies focus on enterprise infrastructure, core banking systems, and operational technologies.	Additional competencies in AI/ML, analytics, containerization, and cloud-native technologies are required.	Develop structured training, certification, and knowledge-sharing programs for emerging technologies.
Process, architecture governance process	Governance emphasizes compliance, risk control, and standardized technology adoption.	Governance should support iterative experimentation while maintaining architectural oversight.	Implement agile architecture review and decision-making processes for innovation initiatives.
Process, technology standards management (strategy & architecture mechanism)	Technology standards prioritize mature and proven enterprise technologies.	Standards should accommodate controlled adoption of emerging technologies without compromising compliance.	Introduce adaptive technology standards for AI, event streaming, and container-based platforms.
Technology, architecture repository (strategy & architecture mechanism)	Repository primarily supports architecture documentation and compliance activities.	The repository should enable collaborative architecture management and rapid technological evolution.	Enhance repository capabilities to support architecture knowledge sharing and agile governance.
Technology, emerging technology enablement (development & operations mechanism)	The existing technology environment mainly supports traditional enterprise applications and historical analytics.	The technology environment should support AI/ML, real-time analytics, event streaming, and containerized deployment.	Implement AI/ML platforms, event-streaming technologies, and cloud-native infrastructure to support AI-driven lending.

Table 9 presents the governance readiness assessment based on organizational structure, competency, governance processes, technology standards, architecture repository, and emerging technology enablement. Readiness is assessed by comparing current governance conditions with target capabilities required to support agile technology initiatives and identifying the resulting improvement needs. The assessment identifies improvements in governance, repository, and technology enablement to support AI-driven lending across strategy and

architecture, development, and operations.

Segment technology architecture governance defines the modernization strategy for transitioning lending technology from traditional to agile capabilities through data management, containerization, and AI decision intelligence, as illustrated in Fig. 6, thereby supporting technology evolution, architecture convergence, and governance alignment.

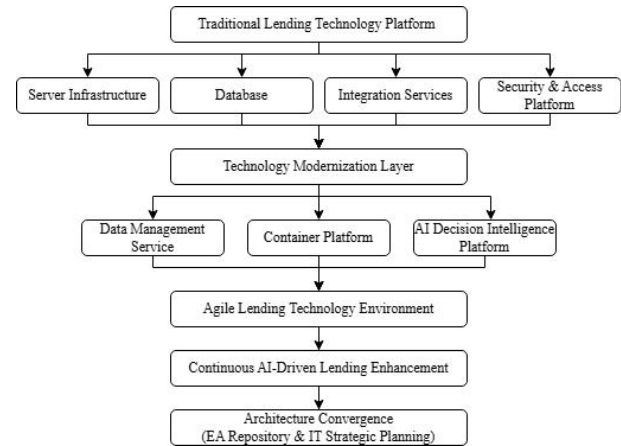


Fig. 6. Technology modernization strategy model.

The technology modernization strategy provides a foundation for the future adoption of open banking, advanced cybersecurity, and hyper-personalized lending, aligned with organizational priorities and technology readiness. To implement this strategy, an iterative roadmap progressively deploys the required technological capabilities.

Table 10.
Agile Technology Architecture Iteration Roadmap

Iteration	Architecture Increment	Technology Capability Realization	AI-Driven Lending Outcome
Iteration 1	Data Management Service	Enterprise data integration, ODS/ODW management, and lending data processing capabilities are established.	Integrated lending data becomes available for analytics and AI-driven decision support.
Iteration 2	AI Decision Intelligence Platform	AI/ML platform, predictive analytics, and decision intelligence capabilities are deployed.	AI-driven lending intelligence capabilities are enabled through a centralized decision platform.
Iteration 3	Container Platform	Containerized deployment, orchestration, and scalable runtime capabilities are implemented.	AI and analytics services can be deployed, scaled, and managed efficiently.
Iteration 4	Agile Lending Technology Environment	Data management, AI decision intelligence, and container platform capabilities are integrated into a unified technology environment.	AI-driven lending capabilities operate within an agile and scalable technology environment.
Iteration 5	Continuous	Continuous	Technology

Iteration	Architecture Increment	Technology Capability Realization	AI-Driven Lending Outcome
	AI-Driven Lending Enhancement	technology optimization, architecture review, and capability improvement mechanisms are established.	capabilities are continuously improved and incorporated into the EA repository and IT strategic planning process.

Note: Each iteration is subject to governance and architecture review before proceeding to the next iteration.

Table 10 presents iteration priorities based on a capability-dependency sequence, beginning with data management as the foundation for AI utilization, followed by AI decision intelligence, scalable, containerized deployment, integrated AI-driven lending, and continuous enhancement. This sequence enables incremental modernization while maintaining alignment with the architecture vision and minimizing disruption to existing lending operations. The modernization approach also requires organizational adaptation, particularly through cross-functional collaboration, emerging technology competencies, adaptive architecture governance, and continuous repository management.

Overall, the agile technology architecture provides a controlled mechanism for progressively introducing AI-enabling capabilities without requiring immediate replacement of existing lending technologies. The dependency-based iteration sequence reduces modernization disruption while enabling governance and technology capabilities to evolve in step with AI-driven lending requirements.

E. Ambidextrous Technology Architecture

The ambidextrous technology architecture integrates traditional and agile technology pathways to balance operational stability and continuous innovation within the lending ecosystem (Table 11). Traditional capabilities remain the stable operational pathway, while agile capabilities provide a controlled pathway for technology modernization and AI-driven innovation. Both pathways are coordinated through common architecture governance, technology standards, and decision mechanisms to enable technology evolution without disrupting critical lending operations.

Table 11.
Ambidextrous Technology Architecture Strategy

Strategy	Description	Implementation
Traditional Technology Architecture Strategy	Maintain stability, security, compliance, and operational reliability of existing lending technology platforms.	Govern server infrastructure, database, integration services, security & access platform, and recovery infrastructure through standardized technology governance and operational controls.
Agile Technology Architecture Strategy	Enable rapid technological innovation and AI-driven lending capabilities through adaptive, scalable	Adopt a data management service, a container platform, and an AI decision intelligence platform to support iterative development and

Strategy	Description	Implementation
Ambidextrous Technology Architecture Strategy	technology platforms. Balance the exploitation of existing technologies with the exploration of emerging technologies to support the sustainable lending transformation.	experimentation. Integrate traditional and agile technology domains while maintaining alignment with business objectives and regulatory requirements.
Integrated Technology Governance Strategy	Establish a unified EA governance process to coordinate decision-making, standards management, and architecture oversight across traditional and agile environments.	Implement common technology standards, conduct architecture reviews, obtain governance approval, manage repositories, and provide implementation oversight across both technology domains.
Continuous Technology Evolution Strategy	Support continuous enhancement of technology capabilities while aligning architecture evolution with future technology planning.	Carry out incremental technology improvements through iterative architectural implementation, continuous evaluation, updates to the EA repository, and technology planning activities.

Table 11 defines the strategic directions for maintaining stable traditional capabilities while introducing agile technology capabilities through controlled modernization. The strategies provide the basis for technology operation, architectural decision-making, and governance across both pathways. The dual-operating technology architecture model in Fig. 7 was derived from Table 11. It demonstrates the simultaneous, convergent operation of traditional and agile technology pathways within a shared modernization environment to facilitate ambidextrous lending capabilities. The integration is achieved by maintaining traditional technology capabilities as the stable operational pathway while introducing agile capabilities through a controlled modernization pathway, with both pathways subject to common architecture governance, standards, and decision mechanisms.

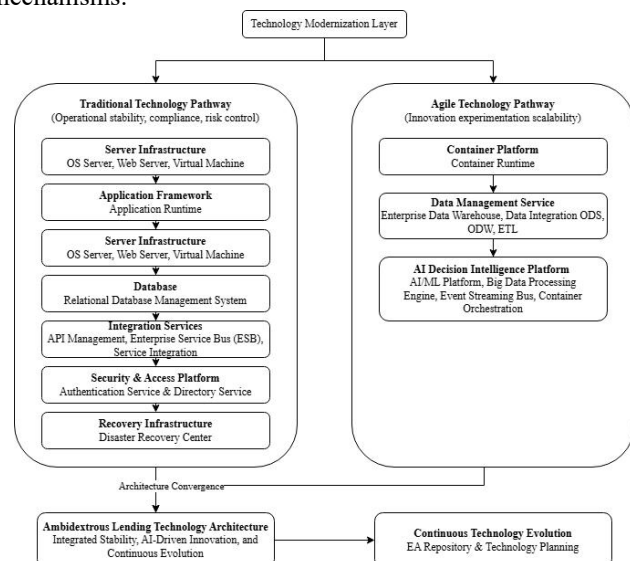


Fig. 7. Dual operating technology architecture model.

While Fig. 7 shows the coexistence of traditional and agile technology pathways, a structured mechanism is needed to determine the appropriate pathway for each initiative. Figure 8 presents the ambidextrous EA decision model, which evaluates risk, regulatory impact, business urgency, technology complexity, and organizational impact to direct initiatives to traditional, agile, or ambidextrous pathways. The selected pathway is then reviewed through architecture and governance processes to support controlled technology evolution.

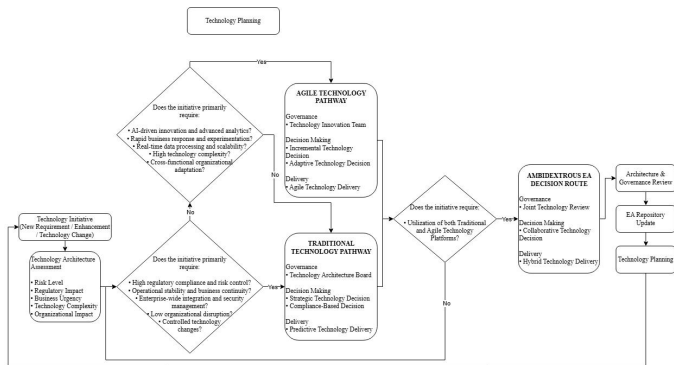


Fig. 8. Ambidextrous enterprise architecture decision model.

Table 12 details the decision model in Figure 8 by defining criteria for selecting traditional, agile, or ambidextrous technology pathways. The criteria cover primary objectives, technology scope, change frequency, risk tolerance, regulatory impact, business urgency, technology complexity, organizational impact, decision focus, and representative initiatives.

Table 12.
Ambidextrous Enterprise Architecture Decision Model

Decision Criteria	Traditional Technology Pathway	Agile Technology Pathway	Ambidextrous Technology Architecture
Primary Objective	Stability, compliance, and operational reliability	Innovation, experimentation, scalability, and AI-driven capability development	Balance operational stability and technology innovation
Technology Scope	Server infrastructure, database, integration services, security & access platform, and recovery infrastructure	Data management service, AI decision intelligence platform, and container platform	Integration of traditional technology platforms and AI-driven technology platforms
Change Frequency	Planned and controlled technology changes	Iterative and adaptive technology changes	Coordinated evolution across traditional and agile technology domains
Risk Tolerance	Low risk with strict governance and compliance control	Moderate risk to support innovation and experimentation	Balanced risk through coordinated governance and technology review
Regulatory Impact	High regulatory dependency	Moderate regulatory dependency with	Mixed regulatory and innovation requirements

Decision Criteria	Traditional Technology Pathway	Agile Technology Pathway	Ambidextrous Technology Architecture
Business Urgency	Medium-term operational requirement	innovation flexibility Rapid response and innovation requirement	Balance between operational continuity and innovation urgency
Technology Complexity	Enterprise-scale technology complexity	High technology complexity	Integration of legacy and emerging technologies
Organizational Impact	Limited organizational change	Significant organizational adaptation	Cross-functional organizational impact
Decision Focus	Operational continuity, compliance, security, and enterprise technology standards	AI enablement, advanced analytics, scalability, and rapid capability delivery	Integration of operational lending technology and AI-driven lending capability
Example Initiative	Database upgrade, integration enhancement, security hardening, disaster recovery improvement	AI lending scoring engine enhancement, behavioral analytics platform enhancement, loan recommendation engine enhancement	Integration of AI lending scoring engine technology with core banking and LOS platforms technology

As shown in Table 12, the proposed architecture selects technology pathways according to risk, regulatory impact, business urgency, technology complexity, and organizational impact. For example, integrating the AI lending scoring engine with core banking and LOS platforms requires an ambidextrous approach, as it introduces AI-driven innovation while remaining dependent on stable, governed lending systems. To ensure consistent implementation and architectural alignment, an EA governance process is established across the architecture lifecycle.

Table 13.
Enterprise Architecture Governance Process

Governance Activity	Purpose	Output
Technology architecture assessment	Assess lending technology initiatives based on risk, regulatory impact, business urgency, technology complexity, and organizational impact.	Recommended technology pathway
Architecture & governance review	Validate pathway selection and ensure alignment with architecture principles, banking regulations, and technology standards.	Approved architecture decision
Technology implementation oversight	Monitor the implementation of lending technology capabilities across traditional and agile technology domains.	Implementation review report
EA repository update	Maintain architecture decisions, technology artifacts, and implementation outcomes.	Updated EA repository
Technology planning	Incorporate implementation outcomes into future technology initiatives and architecture evolution activities.	Technology planning recommendations

Table 13 summarizes the governance activities for managing technology initiatives throughout the architecture lifecycle to ensure alignment with enterprise objectives, governance requirements, and technology standards. Governance outputs, including architectural principles, standards, decisions, and technology artifacts, are maintained in the EA repository to support traceability, knowledge reuse, and future architectural evolution. Implementation requires cross-functional collaboration, appropriate technology competencies, adaptive governance, and continuous alignment between traditional operations and emerging technology initiatives, particularly when emerging technologies interact with critical lending systems. The completed architecture was validated by an expert and a BankCo stakeholder to assess its conformity with the framework and alignment with organizational requirements. The validation results are presented in Table 14.

Table 14.
Architecture Validation Results

Criteria	Evidence	Evaluator	Result
Framework conformity	Completed validation form	Expert	4.8/5
Organizational requirement alignment	Completed validation form	BankCo stakeholder	4.6/5

The results indicate strong alignment with the adopted framework and BankCo's organizational requirements, with scores of 4.8/5 and 4.6/5, respectively. Traditional TOGAF focuses on structured architecture development and stability, while Agile EA supports adaptability and iterative change. Ambidextrous governance brings these perspectives together by balancing stability and innovation, which in this study is applied through traditional and agile technology pathways, pathway-based decisions, and shared governance mechanisms for AI-driven lending. Overall, the proposed ambidextrous technology architecture enables operational stability and innovation through the coordinated traditional and agile pathways. Shared governance, technology standards, and pathway-based decisions allow AI capabilities to develop without disrupting critical lending operations or regulatory requirements. This means that for banking organizations, AI adoption needs to be supported by scalable technological capabilities and governance mechanisms that ensure regulatory compliance, security, and operational continuity, while allowing for controlled innovation. This study is limited to the technology architecture domain. It focuses. It focuses on AI-driven lending transformation within the BankCo context, which may limit the generalizability of the proposed architecture to other banking contexts. In addition, the proposed architecture emphasizes design and stakeholder validation, while its long-term effectiveness can only be confirmed through implementation and operational evaluation.

V. CONCLUSION

This study developed a TOGAF 10-based ambidextrous technology architecture for AI-driven lending transformation in

BankCo. The architecture integrates traditional and agile technology pathways through architecture principles, technology standards, modernization strategies, pathway-based decision mechanisms, and governance processes. Stakeholder validation indicates that the proposed architecture aligns with organizational needs and provides a structured foundation for balancing operational stability, regulatory compliance, and ongoing technological innovation.

From an academic perspective, this research contributes to the literature on ambidextrous enterprise architecture by operationalizing its principles within the domain of technology architecture. In practice, the proposed architecture provides banking organizations with a governed manner to introduce AI-driven lending capabilities while maintaining interoperability, security, scalability, and operational continuity. These benefits can be assessed using implementation metrics such as technology adoption progress, system availability, deployment cycle time, integration effectiveness, and compliance outcomes. Future research should validate the architecture through real-world implementation and longitudinal assessment using these measures to evaluate its effectiveness and adaptability. Further studies may also examine its applicability across other banking functions and organizational contexts.

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