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Optimizing Application Portfolios Through TIME Analysis in an Indonesian Telecommunications Company

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Abstract

Background: Digital transformation has increased the strategic importance of application portfolios as key enablers of organizational performance; however, many organizations continue to operate legacy and redundant applications, which reduce efficiency and increase operational and maintenance costs.
Objective: This study examines application portfolio optimization in an Indonesian telecommunications company by applying *Enterprise Architecture* principles through *Application Portfolio Management* (APM).
Methods: APM employs the *TIME* (*Tolerate, Invest, Migrate, Eliminate*) Analysis framework. A case study methodology was adopted by combining stakeholder interviews, *Focus Group Discussions* (FGDs), direct observations, and architectural repository data covering 553 enterprise applications. Each application was assessed based on *Business Value* and *Technical Value* using a four-point Likert scale.
Results: *TIME* Analysis revealed that 269 applications were positioned in the *Invest* quadrant, reflecting strong business relevance and satisfactory technical conditions, while 85 applications were categorized under *Eliminate*, indicating significant potential for application rationalization. The analysis classified 269 applications (48.6%) as *Invest*, 125 applications (22.6%) as *Tolerate*, 73 applications (13.2%) as *Migrate*, and 85 applications (15.4%) as *Eliminate*, resulting in a *Portfolio Health Index* of 71.2%.
Conclusion: These findings confirm that *TIME* Analysis, operationalized through an *Enterprise Architecture* repository, provides an objective and data-driven basis for application portfolio decision-making, extends the *Application Portfolio Management* literature by linking architecture repositories with portfolio rationalization, and strengthens *Business–IT alignment* in telecommunications organizations.

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INTRODUCTION

Application systems that were once considered to support organizational operational performance have now become burdens because they are unable to adapt to business process transformations and stakeholder expectations (Emita et al., 2025; Sinulingga et al., 2026; Josiah, 2026). Digital transformation has increased the strategic role of application portfolios in supporting corporate objectives. However, many organizations still rely on legacy systems maintained due to historical practices, long-term contractual commitments, or perceived operational stability, even though their relevance to current business needs continues to decline

(Hendra & Fahlevi, 2024). Global information technology spending reached USD 5.26 trillion in 2024 and increased to USD 5.43 trillion in 2025, indicating accelerated digital investments across sectors (Gartner, 2024). This growth in spending is accompanied by rising costs associated with legacy application ownership. Industry surveys indicate that organizations increasingly allocate a substantial portion of their IT budgets to maintaining outdated or duplicated applications rather than pursuing new investments, while legacy-driven technical debt has a measurable negative impact on data infrastructure and delivery speed (Dive, 2024). These figures reinforce the urgency of implementing a structured Application Portfolio Management (APM) approach capable of systematically identifying which applications should be tolerated, invested in, migrated, or eliminated.

This misalignment is widely recognized as a source of operational inefficiencies, functional redundancies, and increased maintenance costs, highlighting the gap between technology investments and the realization of strategic value. Recent academic and industry literature emphasizes the importance of integrated managerial approaches, such as Enterprise Architecture (EA), to ensure alignment between business strategies and information systems. Mendes-da-Silva and Albertin (2024) discuss the need for EA-based approaches to achieve alignment between business strategy and information systems. Their study found that IT–Business Strategic Alignment positively influences operational effectiveness and digital transformation optimization in pre-digital organizations transitioning toward digital business models (Mendes-da-Silva & Albertin, 2024). Similarly, Alwadain (2020) emphasized that systematic implementation of Enterprise Architecture can generate measurable business value through three primary stages: converting technology resources into competitive assets, ensuring their efficient utilization in operational processes, and creating organizational competitive advantage (Alwadain, 2020; Hafner & Mira da Silva, 2026). This EA approach plays a crucial role in strengthening the relationship between business strategy and information technology through comprehensive and integrated architectural planning. However, previous studies have not sufficiently demonstrated the specific mechanisms used to translate architectural alignment into application-level optimization decisions. Both studies indicate that alignment between technological architecture and business strategy is an essential foundation for achieving organizational efficiency and competitiveness in the digital era.

Within this context, Application Portfolio Management (APM) emerges as a fundamental discipline for assessing and optimizing the value, impact, and performance of organizational applications. APM enables structured evaluation of business value, technical conditions, costs, and risks, thereby supporting data-driven decisions regarding whether applications should be retained, enhanced, migrated, or retired. The TIME Analysis framework, which classifies applications into Tolerate, Invest, Migrate, or Eliminate categories, has gained prominence due to its methodological clarity and effectiveness in guiding application rationalization initiatives (GmbH, 2024). Empirical evidence from various global organizations demonstrates that integrating EA, APM, and TIME Analysis can significantly contribute to cost reduction, improved system integration, and enhanced portfolio transparency.

Research conducted by Chitrada (2025) explains that Application Portfolio Management functions as a strategic component within the EA framework because it provides a structured approach for managing the efficiency, risks, impacts, and value of organizational application investments (Kiran Kumar Chitrada, 2025). These findings align with the study by Syamfithriani et al. (2024), which identifies four key roles of EA in supporting digital transformation: enabler, governance mechanism, capability developer, and organizational facilitator (Syamfithriani et al., 2024). Both studies support the argument that structured application portfolio management through EA strengthens organizational strategic direction by improving business value realization and controlling technology resources. Integrating APM into EA expands organizational capabilities to determine investment priorities and supports effective application rationalization decisions.

The relevance of structured application portfolio management becomes increasingly evident in organizations facing ongoing challenges such as application duplication, weak architectural governance, and limited data integration. These issues hinder operational performance and obstruct strategic objectives. Therefore, a structured evaluation mechanism is

required to assess application relevance, alignment with business processes, and contribution to overall organizational goals. Beyond these contextual challenges, previous studies have not extensively explored integrated and quantitative evaluation mechanisms for application portfolios within EA frameworks. Research by Chitrada (2025) and Alghamdi (2024) acknowledges the importance of portfolio management but does not explain objective system evaluation processes using approaches such as TIME Analysis. This limitation indicates the need for a model that connects EA with application condition assessment so that strategic alignment between business and IT can be measured more systematically. Therefore, this study addresses this gap by applying EA and TIME Analysis as analytical frameworks for optimizing application efficiency and strategic fit within organizations.

In summary, the research gap addressed by this study is the absence of an integrated quantitative Application Portfolio Management mechanism that operationalizes Enterprise Architecture repository data into actionable rationalization decisions. Chitrada (2025) and Alghamdi (2024) confirm the strategic relevance of APM and EA but do not provide a replicable scoring method for classifying applications, while Mendes-da-Silva and Albertin (2024) establish the relationship between IT–business strategic alignment and organizational performance without translating this alignment into application-level treatment decisions. The novelty of this study lies in combining EA repository data with the TIME Analysis scoring method (Tolerate, Invest, Migrate, Eliminate) to produce a quantifiable and decision-ready classification of a large-scale application portfolio consisting of 553 applications within a telecommunications environment, a combination that has not been extensively demonstrated in previous literature.

Theoretically, this study contributes to the Enterprise Architecture Management literature by demonstrating how architecture repositories can be operationalized as decision-support mechanisms for application portfolio rationalization, extending previous research that has primarily focused on architectural modelling and capability planning. Practically, this study provides telecommunications organizations with an evidence-based and replicable scoring method for determining whether applications should be tolerated, invested in, migrated, or eliminated. This approach supports more efficient IT budget allocation, reduces technical debt, and improves Business–IT alignment.

Therefore, limited evidence exists regarding how TIME Analysis can be applied as a structured application portfolio optimization approach within the telecommunications industry to support application rationalization and investment decision-making. Previous studies on application portfolio management have primarily focused on identifying redundant applications, reducing operational costs, and supporting IT modernization initiatives. However, many of these studies emphasize technical evaluation or application inventory analysis without providing a structured mechanism for determining future treatment strategies for each application within the portfolio. In the telecommunications industry, where organizations frequently operate numerous interconnected applications supporting diverse business functions, decisions regarding application retention, enhancement, migration, or retirement remain significant challenges. This condition indicates a research gap in implementing systematic portfolio optimization approaches that not only assess the current state of applications but also generate actionable recommendations aligned with business and technology objectives.

To address this gap, this study adopts TIME Analysis (Tolerate, Invest, Migrate, Eliminate) as a decision-support framework for application portfolio optimization. Unlike conventional portfolio assessment approaches that primarily focus on application categorization or maturity evaluation, TIME Analysis provides clear strategic direction for each application by determining the most appropriate treatment option based on business value and technical condition. The contribution of this study lies in implementing TIME Analysis within the context of a telecommunications company, where application complexity, integration dependencies, and rapid technological evolution require a structured portfolio rationalization process. By translating assessment results into concrete portfolio actions, this study demonstrates how TIME Analysis can support more effective application lifecycle management and technology investment decisions.

Based on the application portfolio data of Telecom Enterprise Company, a telecommunications enterprise, several duplicated applications were identified across business

units, including IBCO (EIAS), TIBCO BW5, TIBCO EMS, and TIBCO Mashery. These findings confirm the need for objective portfolio evaluation mechanisms to identify applications that remain relevant and strategically valuable.

This study aims to analyze the existing application portfolio, apply TIME Analysis to classify applications based on business value and technical fit, assess their relationship with core business processes, and provide strategic recommendations grounded in Enterprise Architecture principles.

METHOD

The methodology used in this study consists of four main components, which are the conceptual framework, the working framework, data collection methods, and data analysis methods. This study adopts a qualitative single case study design conducted within one Indonesian telecommunications company, using the TOGAF Architecture Development Method (ADM) as the working framework that structures the sequence of business architecture, application architecture and technology architecture phases relevant to application portfolio assessment. The conceptual framework employed focuses on scientific development through the creation of relevant and solution to oriented artifacts for the case study of the Application Portfolio. Meanwhile, the working framework for conducting assessments and defining workflow follows the TOGAF ADM lifecycle. Njanka explain that IT and Business Alignment has tangible impacts on operational efficiency, enhanced cross-functional collaboration, and overall organizational performance (Muis et al., 2026; Njanka et al., 2021; Maulana et al., 2023). These studies conclude that top management support and integrated organizational structures are key elements in sustaining successful strategic alignment between business and technology.

Data collection in this study was carried out through an Indonesia telecommunication company case study using interviews with stakeholder, observations using direct exploration through EA Tools, and Focus Group Discussions (FGD). The interview and FGD data were transcribed and qualitatively processed to identify stakeholder needs and to answer the results derived from the application portfolio evaluation method. In the data collection process, analysis is required to determine which data aligns with the goal of optimizing the application portfolio. This is crucial to ensure the data analyzed is valid and aligned with the goal, thus avoiding errors in data collection.

Once the assessment results are released, validation is conducted for verification purposes. This step is to reduce subjectivity. Score discrepancies were discussed until consensus was reached. This approach was adopted to improve assessment consistency and reduce individual evaluator bias. Each application was first scored independently by the relevant evaluator category; scores were then reconciled in a plenary FGD session, where discrepancies exceeding one point on the four-point scale were discussed and re-rated until consensus was reached. Content validity of the Business Value and Technical Value indicators was adopted using SAP method via expert review against the TOGAF Business Value Assessment and Technical Reference Model prior to data collection; a formal statistical reliability test (e.g., Cronbach's alpha or inter-rater agreement coefficient) was not performed and is acknowledged as a limitation of this study.

For both data collection and data analysis, the method used to evaluate the Application Portfolio is TIME Analysis. TIME Analysis is a framework that combines the business value and technical value of an application, resulting in classification into four quadrants: Tolerate, Invest, Migrate, and Eliminate. Through this classification, organizations can determine whether an application should be retained, enhanced, migrated, or retired so that investments become more rational and measurable (Mendes-da-Silva & Albertin, 2024).

The Tolerate category is used for applications that still have high business value despite declining technological conditions, while Invest applies to applications with strong long-term strategic potential (Alghamdi, 2024). Applications with high business value but low technical support are categorized as Migrate, whereas applications with both low business and technical value fall under Eliminate, as they no longer provide value and may burden company resources (Mendes-da-Silva & Albertin, 2024).

The data used in this study consists of application data supporting business processes within a telecommunications company in Indonesia, totaling 553 applications. The data was obtained through asset management and architecture processes, collected directly from the architectural repository. As a source of data to be processed, this data is the result of data that has been analyzed to determine the suitability of the application portfolio definition in enterprise

architecture, where the application in question is an application that directly supports business processes, not an interface, backend engine or other supporting technology.

To obtain business and technical value, the following questionnaires were provided to stakeholders and converted into a scale of 1–4.

Business Value

Dimension and areas to assess the business value is based on three areas. This area is based on the Business Value Assessment from TOGAF that an assessment used to measure the performance or business of a particular company or organization (Alhari et al., 2022). The areas was adjusted using enterprise company familiarisation to see application utilization. The areas are:

1) Fit for Purpose: the extent to which the application meets current business needs.
2) Revenue Generation: the level of contribution the application provides toward company revenue.
3) Regulatory Compliance: the contribution of the application toward fulfilling local or global regulatory requirements.

In collecting data to determine the relationship between business and applications, the aspect sought is the implication between the application and company revenue, whether there is a contribution in it. Then you have to find out whether this application can help businesses in carrying out their activities so that it provides convenience, practicality and acceleration in completing each task

Technical Value

Technical Value was assessed based on technical viewpoint. It combines based on the Application Architecture and Technology Architecture from TOGAF ADM. The areas are:

1) Integration: How easily the application can integrate with other systems.
2) Changes: The application's ability to quickly and easily accommodate dynamic business requirements.
3) Maintainability: The ease of upgrading or refreshing the application's technology.
4) Technical Support: The extent to which principal or internal engineering support meets expectations.

Technical values are assessed by a party who truly understands (For in-house development: assessed against internal engineers. For external development: assessed against the principal vendor). In the data collection section, we also examine the technology aspect to determine the technical value of an application. The parameters examined are the application's ability to adapt to new technologies and its ability to technically upgrade. Then the next parameter is whether this application has ease and smoothness in the maintenance, care and repair process which makes the application able to be maintained to continue functioning. Then, the crucial point in technical assessment is when an application is supported by the latest technology such as more sophisticated programming languages, newer operating systems, then can be used on all devices and applies modern deployment principles. This is important because it determines whether the application can be used technically safely, reliably and in line with current developments

These questionnaire results produce values for each application portfolio item within the TIME Analysis quadrants, converted as follows:

1) Business Value plotted on the **X-axis**
2) Technical Value plotted on the **Y-axis**

Together, these produce coordinate points that place each application into a specific TIME quadrant as the final evaluation outcome. For example, see Figure 1

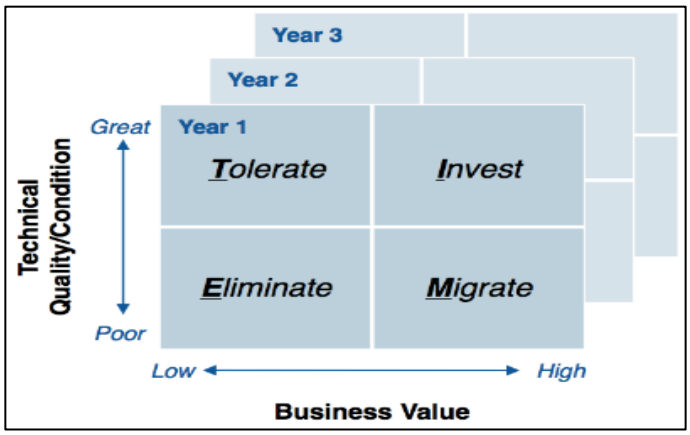

Figure 1. TIME quadrant

Measurement Scale and Scoring Method

All assessment criteria were measured using a four-point Likert scale to avoid neutral responses and encourage clearer stakeholder judgment. Each criterion was evaluated using the following operational definitions:

1) Score 1 (Very Low): The application provides minimal support to the assessed criterion and exhibits significant deficiencies.
2) Score 2 (Low): The application partially supports the assessed criterion but requires substantial improvement.
3) Score 3 (High): The application adequately supports the assessed criterion and meets most organizational expectations.
4) Score 4 (Very High): The application fully supports the assessed criterion and demonstrates strong performance with minimal limitations.

For Business Value assessment, respondents evaluated Fit for Purpose, Revenue Generation, and Regulatory Compliance. For Technical Value assessment, respondents evaluated Integration, Changes, Maintainability, and Technical Support. The score for each dimension was calculated as the arithmetic mean of all indicators within the corresponding dimension.

Aggregation Method

To ensure transparency and reproducibility, Business Value and Technical Value scores were calculated using a simple averaging approach. Each indicator was assigned equal weight because no empirical evidence suggested that one indicator was more important than another within the scope of this study.

Business Value was calculated using Equation (1):

$$BV = (FP + RG + RC) / 3$$

where:
BV = Business Value score
FP = Fit for Purpose
RG = Revenue Generation
RC = Regulatory Compliance

Technical Value was calculated using Equation (2):

$$TV = (IN + CH + MA + TS) / 4$$

where:
TV = Technical Value score
IN = Integration
CH = Changes
MA = Maintainability
TS = Technical Support

The resulting scores ranged from 1.00 to 4.00 and were used as coordinate values in the TIME Analysis matrix, with Business Value plotted on the X-axis and Technical Value plotted on the Y-axis.

TIME Quadrant Classification

The classification of applications into TIME quadrants was performed using the midpoint value of 2.00 as the threshold separating low and high scores. This threshold was selected because it represents the midpoint of the 1–4 assessment scale. The use of a four-point, even-numbered scale without a neutral midpoint response was a deliberate methodological choice intended to avoid neutral or non-committal ratings from evaluators, consistent with guidance on itemized rating-scale design (Taufique et al., 2026). Equal weighting was applied to all Business Value and Technical Value indicators because no prior empirical evidence within this organizational context indicated that one indicator should be weighted more heavily than another; this assumption is treated as a study limitation, and a sensitivity check using alternative weighting schemes is recommended for future research. The classification rules were defined as follows:

1) Invest: Business Value ≥ 2.00 and Technical Value ≥ 2.00
2) Migrate: Business Value ≥ 2.00 and Technical Value < 2.00
3) Tolerate: Business Value < 2.00 and Technical Value ≥ 2.00
4) Eliminate: Business Value < 2.00 and Technical Value < 2.00

Applications classified as Invest were considered strategically important and technically sustainable. Migrate applications remained valuable to the business but required modernization. Tolerate applications were technically acceptable but delivered limited strategic value. Eliminate applications exhibited low value from both business and technical perspectives and were therefore considered candidates for retirement or consolidation.

RESULTS AND DISCUSSION

Results

The application portfolio data was obtained from the architecture repository of Telecom Enterprise Company. This data contains or includes a list of applications across various business units and domains. Also, the data already contains the attributes and relation to the business process, because of using EA Tools. This repository serves as the main reference for building the application inventory, including attribute information such as the application name, primary function, owning unit, business process domain, and supporting technologies. Based on the initial inventory, the number of registered applications indicates a large portfolio with potential redundancy.

Business Value Assessment

The assessment results indicate a wide range of business value scores across applications. Applications supporting core processes and customer service generally have high business value, as they directly influence operations and service quality. Conversely, applications that are rarely used or have functions that can be replaced by existing systems show low business value. These tend to be initial candidates for the Tolerate or Eliminate categories.

After all 553 applications from the Telecom Enterprise Company were assessed, the mean Business Value score was 2.32 (SD = 0.68, min = 1.00, max = 4.00), indicating considerable variation in business relevance across the portfolio.

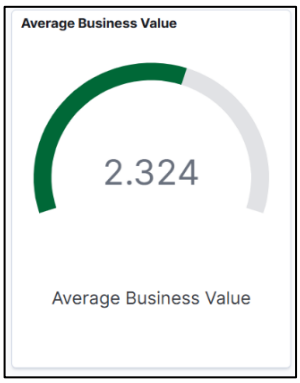

Figure 2. Average Business Value

Technical Value Assessment

The results show that some applications have low technical fit due to outdated technologies, lack of integration capability, or high maintenance effort. Applications with high technical fit typically utilize modern, stable technology and are easier to maintain or enhance.

Technical Average Value for all 553 applications from Telecom Enterprise Company is 2,399. Expressed to two decimal places, the mean Technical Value score was 2.40 (SD = 0.71, min = 1.00, max = 4.00), indicating that technical condition also varies considerably across the portfolio.

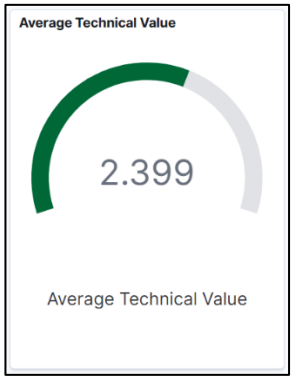

Figure 3. Average Technical Value

These findings illustrate that portfolio evaluation must consider both the business and technical aspects of applications, as poor technical conditions can result in operational risk, even for business-critical systems.

TIME Result

Mapping using values from business value assessment and technical value assessment will produce a time quadrant that shows the position of the application so that strategic decisions can be made on the application. This will optimize the use of applications on an enterprise scale by reducing maintenance costs, determining the purpose of an application, and the appropriate treatment for the application.

The result consists of:

1) 85 applications in Eliminate Quadrant
2) 269 applications in Invest Quadrant
3) 73 applications in Migrate Quadrant
4) 125 applications in Tolerate Quadrant

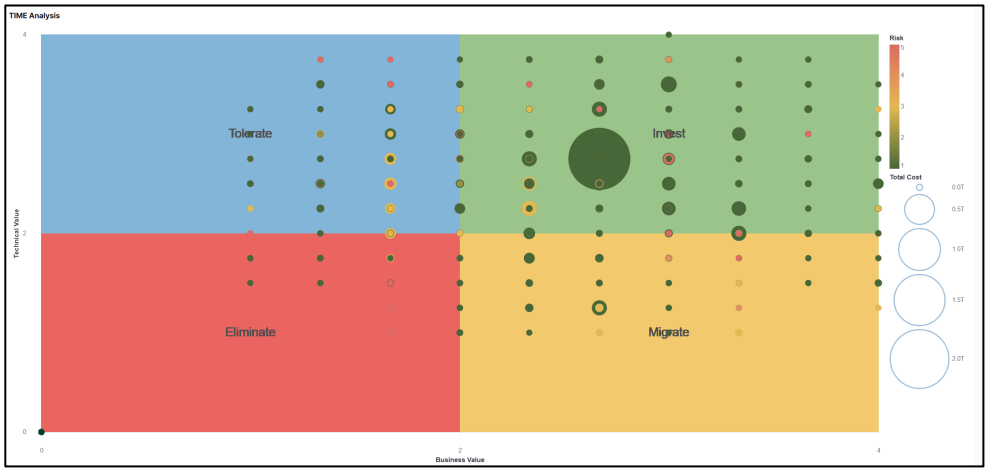

Figure 4. Time Analysis Result

The TIME Analysis results indicate that 48.6% (269 applications) are classified in the Invest quadrant, 22.6% (125 applications) in the Tolerate quadrant, 13.2% (73 applications) in the Migrate quadrant, and 15.4% (85 applications) in the Eliminate quadrant.

The distribution demonstrates that almost half of the application portfolio remains strategically valuable and technically sustainable. However, 28.6% of applications (Migrate and Eliminate categories combined) require either modernization or retirement actions. This finding suggests that more than one quarter of the portfolio may contribute to increased maintenance costs, technical debt, and operational complexity.

To provide a quantitative overview of portfolio condition, a Portfolio Health Index (PHI) was calculated. The PHI, adapted from portfolio rationalization practice in Enterprise Architecture Management (GmbH, 2024), classifies applications in the Invest and Tolerate quadrants as retained assets because both categories meet or exceed the Business Value or Technical Value threshold, whereas Migrate and Eliminate applications fall below the threshold on at least one dimension and therefore represent candidates for intervention.

PHI = (Invest + Tolerate) / Total Applications
PHI = (269 + 125) / 553 = 71.2%

This result indicates that approximately seventy-one percent of the portfolio remains relevant for current business operations, while the remaining twenty-nine percent requires strategic intervention through modernization or retirement initiatives.

From a portfolio optimization perspective, the identification of 85 applications in the Eliminate quadrant represents a significant opportunity for reducing operational complexity. Assuming that each retired application removes associated licensing, infrastructure, maintenance, and support activities, the organization can potentially reduce portfolio management overhead while improving architectural transparency.

Similarly, the identification of 73 applications in the Migrate quadrant provides a prioritized modernization roadmap. Rather than modernizing all applications simultaneously, the organization can focus investments on applications that still deliver business value but suffer from technical limitations. This enables a more efficient allocation of technology investment and reduces modernization risk.

Validation

The assessment results were validated through Focus Group Discussions involving Assisstant Vice President IT Digital Technology Research. The validation process confirmed that the resulting TIME classification reflected the actual operational condition of the applications and was considered suitable for supporting portfolio decision-making activities. Consensus was reached through open discussion of quadrant placements that participants considered inconsistent with actual operating conditions, with re-scoring applied where warranted.

Discussion

Based on these results, it can be concluded that the application portfolio in this company is quite good, with almost half of the applications in the invest quadrant. This means that the use of applications that are in accordance with the objectives and the use of supporting technology is adequate. Although there are still applications that need to be considered in relation to their use on the business side, because there are quite a lot of applications that are not being utilized optimally, and applications in the eliminate quadrant must be discussed regarding future strategies, whether it is better not to use them again. Based on these results, the Portfolio Health Index of 71.2% indicates that a majority of the application portfolio, driven mainly by the 48.6% share in the Invest quadrant, remains aligned with current business objectives and technical requirements. At the same time, the 28.6% of applications positioned in the Migrate and Eliminate quadrants represents a non-trivial share of the portfolio that carries continuing maintenance cost and integration risk, and therefore warrants prioritized rationalization rather than indefinite retention. Alghamdi (2024), through a meta-analysis, explains that consistent implementation of EA improves organizational efficiency and enhances system integration involving modern technologies such as Artificial Intelligence, Internet of Things, and Blockchain (Alghamdi, 2024). The study underscores that Enterprise Architecture functions as a strategic foundation enabling organizations to sustain operational effectiveness and long-term digital resilience (Möhring et al., 2023). Enterprise Architecture Management is an existing approach for companies to align IT

resources and corporate strategy; it also helps them to gain more transparency regarding the use of their resources.

Dashboard for all the identification, result and analysis are already put in one single page of view to review. Based on these dashboard, Telecom enterprise company will be able to analyze to optimize their application portfolio with systematic view based on comprehensive methodologies.

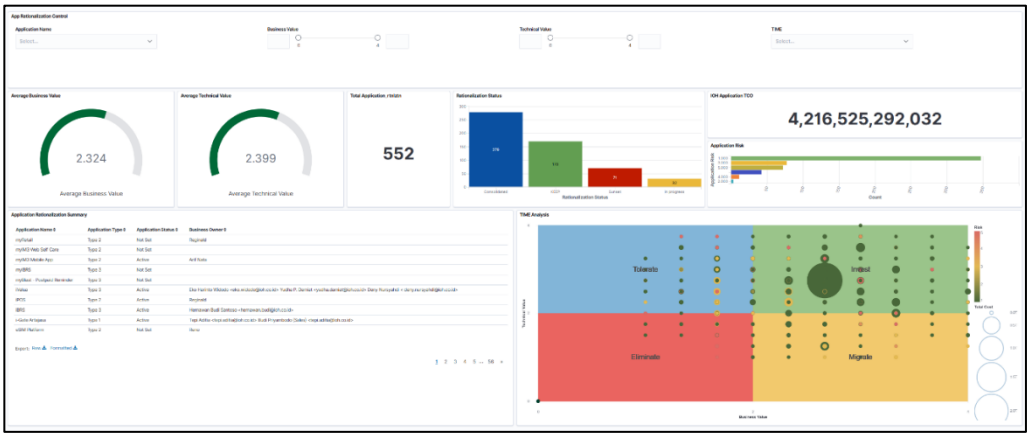

Figure 5. *Optimization Application Portfolio Dashboard*

The dashboard allows Business Value and Technical Value scores, as well as TIME quadrant membership, to be filtered by defined ranges, enabling systematic identification of applications within each quadrant. This functionality supports the empirical monitoring of portfolio composition over time rather than constituting a decision-making recommendation in itself.

The dominance of applications within the Invest quadrant suggests that the organization has historically maintained reasonable alignment between business requirements and technology investments. However, the existence of 198 applications classified within the Tolerate, Migrate, and Eliminate quadrants indicates that portfolio growth has occurred faster than portfolio governance mechanisms. This finding is consistent with Enterprise Architecture literature, which argues that large organizations frequently accumulate redundant and obsolete systems as a consequence of decentralized technology acquisition and evolving business requirements.

The results also highlight the importance of evaluating business value and technical value simultaneously. Several applications demonstrated acceptable technical conditions but limited business contribution, while others remained business-critical despite technical deficiencies. This observation supports the core principle of TIME Analysis that application portfolio decisions should not be based solely on technical condition or business importance in isolation. Organizations that evaluate only one dimension risk either retaining technically sound but unnecessary applications or prematurely retiring strategically important systems.

From a theoretical perspective, this study demonstrates that TIME Analysis can be operationalized as a practical application portfolio assessment mechanism within an Enterprise Architecture context. While previous Enterprise Architecture studies have primarily focused on architectural modeling and capability planning, this research extends the discussion by showing how architecture repositories can be leveraged as a decision-support foundation for portfolio rationalization. The findings therefore contribute to the growing body of knowledge linking Enterprise Architecture Management with application lifecycle management and technology investment governance.

These findings can further be situated within Enterprise Architecture Governance, Technology Investment Management, and IT Governance theory. EA Governance provides the accountability structures through which TIME-based classifications are translated into approved rationalization actions, while Technology Investment Management supplies the criteria for prioritizing which Migrate and Eliminate candidates receive funding first. IT Governance, in turn, ensures that these decisions remain traceable to the organization's broader risk and compliance obligations. Consistent with this view, Fuentes-Quijada et al. (2025) show that combining Enterprise Architecture with structured IT Governance mechanisms improves the traceability and business alignment of technology decisions, reinforcing the argument that TIME Analysis outputs

are most effective when embedded within a formal governance and investment-prioritization process rather than used as a standalone classification exercise.

Several limitations should be acknowledged. First, TIME Analysis assumes equal weighting across Business Value and Technical Value indicators, which may not reflect their true relative importance in every organizational context. Second, because the study relies on a single case and on FGD-based consensus scoring without a formal inter-rater reliability test, some residual subjectivity in scoring cannot be ruled out. Third, TIME Analysis, unlike more granular Application Portfolio Assessment methods that incorporate cost-of-ownership or risk-adjusted return metrics, does not itself quantify the financial impact of rationalization; this study estimates directional cost and complexity implications but does not measure realized cost savings, technical-debt reduction, or Business–IT Alignment improvement quantitatively following implementation of the recommendations, which represents an important avenue for future longitudinal research.

CONCLUSION

The research results indicate that XYZ Company's application portfolio remains highly complex due to the large number of applications, and the emergence of similar application functions across multiple business areas. Enterprise Architecture Repository indicate that applications such as Simponi, TIBCO, Siebel, Verint, and ESB are examples of system groups that require further analysis due to the potential for overlapping functions. Enterprises are complex systems with several social, technical, and infrastructural elements and components. Organizations need to be able to adapt to changes quickly to stay competitive in the digital age that is characterized by a fast-pacing environment.

These results indicate that XYZ Company's existing application portfolio is not yet fully efficient in terms of application structure, system integration, and support for business processes. These findings indicate that application rationalization needs to be directed at areas that have functional similarity, high maintenance costs, or business contributions that are no longer strong. The application of TIME Analysis resulted in the mapping of applications into the Tolerate, Invest, Migrate, and Eliminate quadrants based on the business value and technical condition of each application. Applications in the Invest quadrant represent systems that are still strong enough to be maintained or developed, while applications in the Migrate quadrant require modernization because they still have business value but face technical limitations. LeanIX explains that TIME Analysis helps organizations determine application actions based on a combination of business value and technical fit. This research also demonstrates that Enterprise Architecture can serve as an analytical framework for linking business processes, applications, technology, costs, and risks to better inform portfolio decisions . In answer to the research objective, this study demonstrates that TIME Analysis, applied to Enterprise Architecture repository data covering 553 applications, provides an objective and replicable basis for classifying applications into Tolerate, Invest, Migrate, and Eliminate categories and for prioritizing rationalization actions within an Indonesian telecommunications company.

Future research could extend this study in several directions: applying TIME Analysis to application portfolios in other industry sectors (e.g., banking, manufacturing, or public administration) to test the generalizability of the classification thresholds used here; integrating Artificial Intelligence or machine-learning-based scoring to reduce reliance on FGD-based subjective judgment; and conducting longitudinal evaluations that track realized cost savings, technical-debt reduction, and Business-IT Alignment improvement following the implementation of TIME-based recommendations, which the present cross-sectional design could not measure.

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AUTHOR CONTRIBUTION STATEMENT

Muhammad Faudzan Khairunasi Dzisyauqi contributed to the conceptualization, research design, data collection, analysis, interpretation of findings, and preparation of the original manuscript. Astari Retnowardhani contributed to supervision, methodology validation, theoretical refinement, and critical review of the manuscript. Both authors collaboratively contributed to the development of the research framework, discussion of results, manuscript revision, and final approval of the submitted version.

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