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Reviewing the Transformation of Enterprise Systems in Indonesia through Integrated Design and Operations Management

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Abstract: This literature review aims to examine the transformation of enterprise systems in Indonesia through the integrated approach of design and operations management. The study investigates how enterprises in Indonesia are leveraging integrated design and operations management to enhance efficiency, quality, productivity, and competitive advantage in a rapidly evolving market. This study employs a Systematic Literature Review (SLR) methodology to conduct an in-depth analysis of academic journal articles pertaining to topics. The review encompasses articles published and indexed in Scopus databases from 2019 to 2025. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) method is employed as the framework in this study. Through meticulous screening, data extraction, and synthesis of findings, this study aims to provide comprehensive insight into integrated design and operations management. However, the study also discusses the positive outcomes of successful integration, including improved decision-making and enhanced organizational flexibility. This study presents a novel approach by focusing specifically on Indonesian enterprises and their unique context, offering a deeper understanding of how integrated design and operations management. The contribution of this research lies in providing actionable insights for practitioners and policymakers in Indonesia to refine their strategies for implementing integrated enterprise systems. By synthesizing various perspectives, the study contributes to both academic knowledge and practical applications in the field of enterprise system transformation in the Indonesian context.

Keywords: Enterprise Systems, Integrated Design, Integrated Operations Management, Literature Review

A. Introduction

The transformation of enterprise systems has become a defining characteristic of contemporary organizational competitiveness. Over the past few decades, enterprise systems have evolved from basic transaction-processing platforms into sophisticated, integrated solutions supporting diverse corporate functions including supply chain,

finance, human resources, and customer relationship management (Baiyere et al., 2020; Imran et al., 2021; Swanson, 2020; Stroumpoulis & Kopanaki, 2022). In the context of emerging economies like Indonesia, these systems are increasingly being adopted to enhance productivity, streamline operations, and enable data-driven decision-making (Harno et al., 2024; Solano & Cruz, 2024). A central enabler of this transformation is integrated design and operations management, which fosters alignment between technological implementation and business strategy to optimize performance across organizational units.

Despite the widespread implementation of enterprise systems globally, there remains limited understanding of how integrated design and operations management specifically contributes to enterprise system transformation in Indonesia. Most of the literature focuses on experiences from industrialized countries, with little attention to the socioeconomic, cultural, and technological complexities unique to Indonesian enterprises (Ji & Singh, 2023). Furthermore, there is a notable lack of empirical studies investigating the synergy between design and operations management in enterprise system integration within the Indonesian context (Ye & Dela, 2023). This underexplored area presents a critical gap in the literature and a valuable opportunity for deeper inquiry.

Recent studies have advanced the field by emphasizing the state-of-the-art approach to enterprise system transformation through strategic integration of IT, business processes, and organizational structures. Ellström et al. (2022) argue that such integration must align with broader business goals to be effective. Research from developed markets supports this view, highlighting the need for a unified framework that incorporates operational workflows and technology management (Wang et al., 2021). However, very few studies provide a contextualized perspective for Indonesia, thereby creating a knowledge vacuum regarding context-specific challenges and solutions.

This study introduces a novelty by focusing on Indonesia an emerging market where enterprise system adoption is still maturing and by exploring the intersection of design and operations management in driving system transformation. While global literature is rich with best practices, little research has captured how Indonesian firms are uniquely navigating digital transformation through integrated strategies (Prihandono et al., 2023). By drawing upon both international insights and local cases, this study offers a fresh and comprehensive perspective.

The contribution of this study is twofold. Theoretically, it expands the literature by providing a focused review on enterprise system transformation in Indonesia, specifically from the lens of integrated design and operations management an area that remains underexplored. Practically, it delivers actionable insights for Indonesian organizations facing barriers such as limited digital infrastructure, skill gaps, and change resistance. By addressing these challenges (Putra & Santoso, 2020; Keefe et al.,

2024), the study informs strategic decision-making and policy development to support more resilient and efficient enterprise system integration.

Based on the identified gaps, this study seeks to answer: *How does the integration of design and operations management contribute to the transformation of enterprise systems in Indonesian enterprises, and what challenges do these organizations face in adopting such an integrated approach?* Through this inquiry, the study aims to develop a context-sensitive framework to guide both future research and practical implementations of enterprise system transformation in Indonesia.

Enterprise System (ES)

Enterprise systems (ES), also referred to as integrated information systems or enterprise application software, are comprehensive software platforms designed to coordinate and support a range of business functions within an organization (Al-Assaf et al., 2024). These systems typically encompass various modules that address key operational domains, such as finance, human resources, procurement, manufacturing, and customer service (Denhere et al., 2023). Commonly implemented types of enterprise systems include Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), and Supply Chain Management (SCM) systems (Mayasari et al., 2023).

The core function of enterprise systems is to facilitate seamless data sharing, real-time access to information, and automation of business processes across departments, leading to improved organizational coordination and responsiveness (Ali et al., 2024). This integrated approach stands in contrast to traditional fragmented systems, offering enhanced workflow efficiency and the capacity to transform organizational behavior and decision-making practices (Javaid et al., 2021).

In the context of the increasingly dynamic and interconnected global economy, the integration of enterprise systems has evolved from a strategic advantage to an operational necessity (Vărzaru & Bocean, 2024). Effective integration is essential for organizations striving to remain competitive, as it enables faster adaptation to market changes, more agile operations, and higher customer satisfaction.

From an organizational behavior perspective, the alignment between enterprise system capabilities and business processes plays a vital role in achieving digital transformation. According to Pambudi et al. (2022), ensuring that enterprise systems adapt to the unique behavioral and structural characteristics of an organization requires systematic evaluation of success factors, such as user acceptance, technological readiness, and strategic alignment. Companies characterized by networked structures, distributed teams, and flexible operating models have been found to demonstrate higher adaptability and resilience, particularly in crisis contexts (Obrenovic et al., 2020).

Despite the proven benefits and widespread adoption in many advanced economies, the implementation and integration of enterprise systems in emerging markets, such as Indonesia, present distinct challenges. These include limited technological infrastructure, skills gaps, and cultural resistance to change factors that must be carefully examined to ensure successful enterprise system transformations (AlMuhayfith & Shaiti, 2020; Almutairi et al., 2022).

Integrated Design

The Integrated Design Process (IDP) has high potential to be adapted beyond the architectural field, particularly into interior and industrial projects, due to its compatibility with the design-build approach commonly employed in these sectors (Li et al., 2022). In the industrial context, the implementation of technology to support system integration has not only enhanced operational efficiency but also signaled substantial business advancement, strengthening firms' competitiveness in global markets (Prastiwi et al., 2023). This resonates with Gordon's (2021) assertion that the evolution of systems whether in terms of time, location, or events requires both structural and substantive changes, including infrastructural transformation.

Integrated design is critical to examine because it significantly contributes to improvements in efficiency, effectiveness, and sustainability, particularly within business and industrial domains (Filho et al., 2024). A change in design management frequently results in a corresponding transformation in the overall structure of the enterprise under design and construction, underscoring the close interdependence between design and system architecture.

Zhang and Yingzi (2019) introduced the concept of Integrated Design and Operation Management (IDOM) as a theoretical foundation for this dual-function approach. The integration of design and operations management is essential, as both functions pertain to the same organizational system and must be aligned for optimal outcomes. This perspective is reinforced by Nawawi and Fazri (2022), who argue that with the integration of enterprise information systems, managers can access real-time organizational data and make strategic decisions rapidly bypassing the delays associated with manual reporting processes.

Furthermore, the integration of systems not only improves operational workflows but also acts as a strategic driver of innovation and business resilience (Yaqub & Alsabban, 2023; Khan et al., 2025). As noted by Hermundsdottir and Aspelund (2021), integration supports adaptive capabilities in volatile environments, while Robertson and Lapiņa (2023) emphasize its role in long-term sustainability. In alignment, Farida and Setiawan (2022) highlight that the synergy between design and operations fosters agile production, continuous improvement, and strategic alignment with market demands.

Therefore, the successful convergence of design management, operations management, and information system integration enables organizations to achieve enhanced performance outcomes. It provides a foundation for data-driven decision-making and helps firms remain agile and competitive in fast-evolving industrial landscapes (Hradecky et al., 2022; Salah et al., 2023).

Operations management

The long-term success of a company particularly in the manufacturing sector is heavily influenced by the efficiency and effectiveness of its production processes. A well-managed production process ensures timely delivery, high product quality, and cost control, all of which are fundamental to sustaining business continuity and driving growth (Murmura, 2021; Korhonen, 2023; Omar, 2019). As such, operations management emerges as a critical function in organizational management, playing a pivotal role in ensuring that these outcomes are consistently achieved.

Operations managers, who are responsible for overseeing and optimizing the use of organizational resources, contribute significantly to the firm's ability to produce goods and services that meet customer expectations (Luther, 2024; Kumar, 2022). Effective operations management not only maximizes resource utilization but also enhances organizational agility and customer satisfaction.

The scope of operations management encompasses a wide array of activities, including work organization, process selection, facility layout, job design, performance measurement, quality control, scheduling, inventory management, and production planning (Wolniak, 2020; Salah et al., 2023). These components are intricately connected and must be coordinated to achieve operational excellence.

In the broader organizational structure, operations represent one of the four key functional areas—alongside marketing, finance, and human resources and often serve as the technical core or "hub" that links internal functions with external stakeholders such as suppliers and customers (Kumar, 2022). This centrality reinforces the strategic importance of operations management in ensuring that a firm delivers value to its customers while maintaining internal efficiency.

Ultimately, operational management functions as the backbone of organizational performance, supporting not only the production of goods but also the alignment of business functions toward sustainable and competitive outcomes. When effectively implemented, it can provide companies with a robust framework for meeting dynamic market demands and achieving long-term success.

Organizational Transformation

Organizational transformation is a strategic imperative for companies aiming to remain relevant and competitive in an increasingly dynamic and technology-driven market environment. By adapting to shifting market demands and technological innovations, companies can enhance operational efficiency, reduce waste, and improve both productivity and the customer experience (Ahmed, 2020; Alojail & Khan, 2023). However, transformation is not merely a technical adjustment it deeply influences both individuals and organizational systems, requiring collective commitment and alignment across all levels of the organization (Fredberg, 2022).

According to Vientiany et al. (2024), organizational transformation entails a planned and systematic change in the structure, culture, and internal processes of a company, aimed at improving performance and sustaining competitiveness. This process demands responsiveness to both internal dynamics and external pressures ranging from market fluctuations and digital disruption to regulatory changes and evolving customer preferences (Schulze & Pinkow, 2020; Indriyani et al., 2023).

As highlighted by Hubbart (2023), successful transformation involves more than structural changes it requires ongoing learning, skill development, and knowledge sharing to ensure that the organization can effectively adapt. Moreover, transformation should be viewed as a continuous improvement effort designed not only to align with strategic goals but also to revitalize the organization holistically (Murmura, 2021).

One of the most complex aspects of transformation lies in changing organizational culture, especially when it involves digitalization, technological adoption, and the fostering of innovation (Cao et al., 2025). Cultural transformation, while necessary, must be carefully managed through well-planned stages to increase the likelihood of long-term success (Luvita & Toni, 2022).

Ultimately, organizational transformation is not optional—it is essential for sustaining relevance and achieving strategic goals in today's volatile business landscape (Moreno et al., 2024). Structural, cultural, and process changes must be managed integratively to ensure alignment with performance objectives and to enhance both employee outcomes and competitive positioning (Errida & Lotfi, 2021; Daniel, 2019).

Review questions

Q1:
How do human capital development, technology adoption, corporate culture, and market forces influence the effectiveness of corporate system transformation, integrated system implementation, and operations management practices in Indonesian companies?

Q2:
In what ways do corporate system transformation, integrated system implementation, and operations management practices enhance the efficiency, productivity, quality, and competitive advantage of Indonesian companies?

Q3:
To what extent do human capital development and technology adoption independently contribute to improvements in efficiency, productivity, quality, and competitiveness in Indonesian companies, without the mediation of integrated systems and operations management?

Q4:
How have leading Indonesian companies successfully implemented integrated systems and operations management, and what best practices or lessons can be drawn for broader application across industries?

B. Methods

This study uses a systematic literature review (SLR) to answer the aforementioned questions. SLR is one of the crucial review techniques that is gaining popularity for synthesizing literature in management in particular and any subject in general, including operations management and enterprise systems (Dhiman et al., 2023). By synthesizing and evaluating academic work for a particular research subject across time, systematic literature reviews (SLRs) can advance knowledge and guarantee accurate and thorough data reporting. They have been extensively used in management journals for decades (Paul et al., 2021). Additionally, the framework for this systematic review is the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) technique, which guarantees the review process's robustness. The current investigation followed the six steps of the PRISMA protocol as shown in Figure 1 (Selcuk, 2019). This study referred to Indonesian enterprises. A systematic review helps build a reliable knowledge base by combining data from multiple studies. This study examines the similarities and differences between these concepts, which are covered in this review.

Search Strategy

The systematic identification of relevant research articles enabled the development of transparent, well-documented procedures, including clear standards for inclusion and exclusion. The systematic review process involved several key steps: formulating research questions, defining inclusion and exclusion criteria, establishing guidelines for literature collection, designing a comprehensive search strategy, developing a codebook for literature classification and characterization, conducting the coding process, and synthesizing the findings.

This review aims to investigate whether there is a beneficial relationship between integrated design and operations management practices. Specifically, it explores how the integration of these concepts has been examined across various studies. The primary objective of the search strategy was to identify research publications that address the intersection of design and operations management. To achieve this, precise inclusion and exclusion criteria were established to guide the selection of relevant literature.

Sample selection process

Out of the research publications identified, 209 were predominantly written in English. The initial step of the review involved formulating the study topic, which in this case focused on understanding how integrated design and operations management contribute to the transformation of corporate systems in Indonesia. Once the research question was established, a review protocol was developed. This protocol outlined the search strategy, inclusion and exclusion criteria, as well as detailed guidelines for data extraction and synthesis, thereby ensuring consistency and transparency throughout the review process.

Subsequently, a comprehensive literature search was conducted to identify relevant scholarly journal articles. To ensure the inclusion of the most recent and pertinent studies, the search was carried out across multiple databases such as Scopus, Emerald, Taylor & Francis, Sage, Wiley Online Library, MDPI, and ScienceDirect, covering publications from 2019 to 2025.

Following the search, a screening process was implemented to assess the quality and relevance of the identified studies. This step helped minimize bias and ensured the reliability of the findings by including only high-quality and directly relevant literature. Next, data extraction was conducted systematically, gathering key information from each selected study including methodologies, theoretical frameworks, and major findings.

The extracted data were then synthesized to identify recurring themes, trends, and research gaps related to integrated design and operations management. Finally, a coherent narrative was developed based on the synthesis results, highlighting the implications of enterprise system transformation and discussing their practical relevance for Indonesian companies.

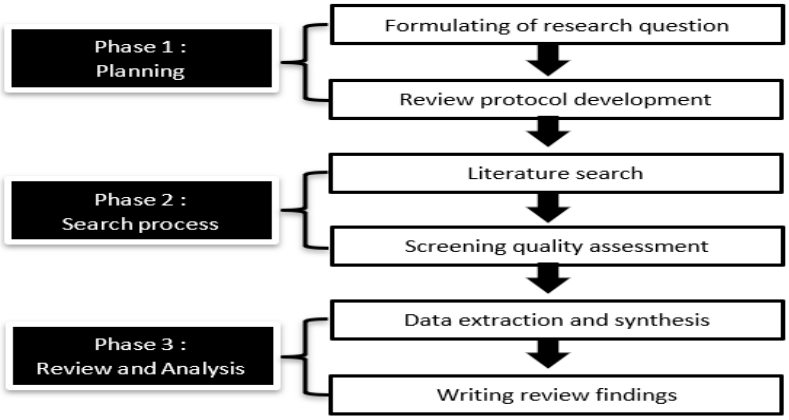

Figure 1. Steps in the SLR Process

A comprehensive search was conducted using Scopus, one of the world's leading academic databases, with keywords such as *"enterprise systems," "operations management," "digital transformation,"* and *"Indonesia."* To ensure the quality of the selected literature, additional filters were applied, including limiting results to peer-reviewed academic journal articles written in English. This initial search yielded 209 relevant publications.

After the initial acquisition of this sample, a duplicate check was performed, resulting in the elimination of nine redundant records. The remaining 200 articles then underwent a more rigorous screening process to determine their relevance to the scope of this study. The screening criteria included:

1. A thorough review of each article's title and abstract to assess thematic relevance;
2. The exclusion of non-journal literature such as book chapters, conference proceedings, and policy reports; and
3. The removal of publications from domains unrelated to operations management, enterprise systems, or digital transformation in Indonesia.

As a result of this screening, 134 publications were excluded for failing to meet the criteria, leaving a final set of 112 peer-reviewed journal articles. The metadata and classification of these studies were systematically recorded using a Microsoft Excel spreadsheet, following the guidance of Selcuk (2019), with clearly defined data categories and subcategories to facilitate the review and synthesis process.

Each of the 112 articles was then subjected to a full-text evaluation to assess both quality and relevance. This step included critical appraisal of the study design, methodologies, theoretical frameworks, and empirical contributions. As emphasized by Selcuk (2019), this quality assessment phase plays a crucial role in enhancing the trustworthiness and rigor of a systematic review. Ultimately, these 112 articles were retained as the final sample.

Figure 2 illustrates the process of article selection and screening, while Figure 3 summarizes the sources of the final sample, including journal titles, publishers, and the number of articles contributed by each.

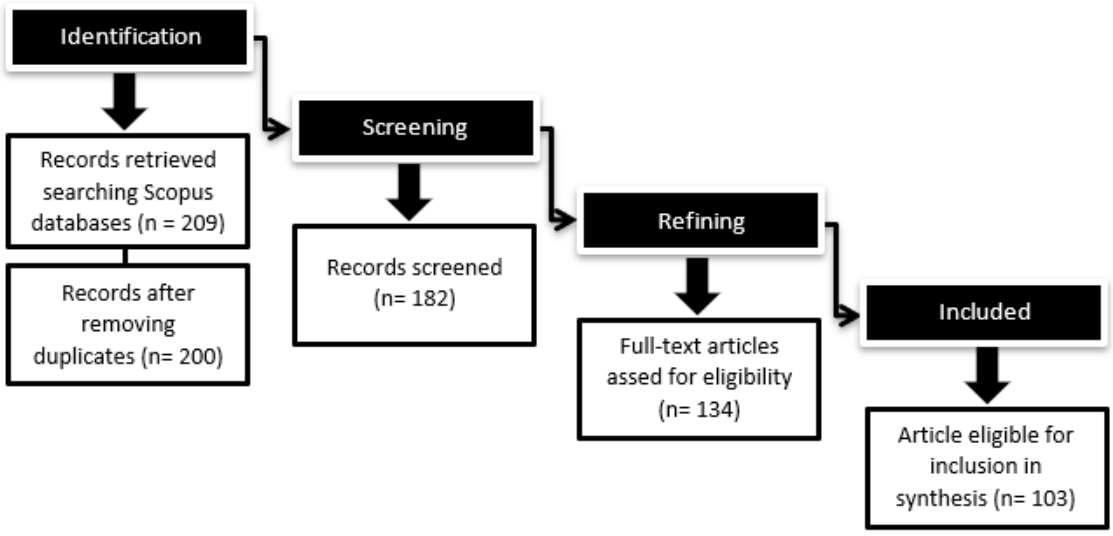

Figure 2. Data Screening and Selections

Data Analysis

A descriptive and content analysis was conducted based on the review questions formulated during the initial stage of the systematic review. The descriptive analysis focused on summarizing the key characteristics of the reviewed articles, guided by categories in the data extraction form. These categories included variables such as the database source, type of study (conceptual, empirical, or review), and the level of analysis. This analysis offers a concise overview of the literature and supports the discussion on research characteristics.

In parallel, content analysis was employed to analyze and interpret the qualitative aspects of the included studies. This method involved manually coding and interpreting the content of the selected papers, allowing for a thematic synthesis aligned with the research objectives. The analysis considered aspects such as the case study subjects, theoretical and practical contributions, limitations, research methodologies, and the distribution of publications by year and journal.

The initial subsection of this analysis presents a summary of the 103 journal articles included in the final sample, emphasizing their contributions to the field, methodological approaches, and publication trends. The subsequent section provides a more detailed account of how scholars have conceptualized integrated design and operations management practices, highlighting the evolution of thought, common frameworks, and emerging perspectives.

Table 1. Journal sources of articles included in the final sample

Journal Name	Total
Elsevier	30%
MDPI	16%
Research gate	14%
Emerald	8%
Taylor & Francis	6%
Asian Scholars Network	2%
Atlantis Press	2%
Business Perspective	2%
Bussman Journal	2%
IGI Global	2%
Institercom	2%
Institute of Educational, Research, and Community Service	2%
Jon Institute	2%
Jyothis Publishers	2%
Oxford Academic	2%
Sage Journals	2%
Sage Open	2%
Sciendo	2%
SCIMAGO Journal	2%
SSRN	2%

Table 1 presents a breakdown of the disciplinary fields of the final 103 articles included in the review. The analysis reveals that the **majority of the publications (32%) fall within the field of Business and Management**, reflecting a strong focus on strategic and managerial aspects of enterprise systems transformation. This is followed by **Industrial Engineering**, which accounts for **15%** of the reviewed articles, highlighting the relevance of operational efficiency and systems integration in production environments. Other fields represented in the dataset include **Information Technology**, **Supply Chain Management**, and **Digital Innovation**, indicating the interdisciplinary nature of research on integrated design and operations management. This distribution underscores the broad applicability of the topic across both technical and managerial domains.

Table 2. Field of Study Source Distribution

Field of Study	Articles
Business & Management	32%
Industrial Engineering	15%
Information Technology	24%
Supply Chain Management	16%
Digital Innovation	13%

This systematic literature review presents a comprehensive overview of the transformation of enterprise systems in Indonesia. It integrates insights from various disciplines such as business management, industrial engineering, and digital

innovation. The findings aim to guide future research and support the development of more effective operations management practices in Indonesian companies.

C. Results and Discussion

Table 3 illustrates the outcomes achieved by Indonesian businesses that have successfully implemented integrated systems. These outcomes include improvements in operational efficiency, productivity, and overall organizational performance. The figure highlights how integrated systems contribute to creating a competitive advantage in the dynamic Indonesian business environment.

Table 3. Company Contributions in Review

Company	Contribution
PT. Kereta Api Indonesia (KAI)	Implementation of Integration Design through Human Capital Development
PT. Perusahaan Listrik Negara (PLN)	Integration of Operation Management in Human Capital Development
PT. Telkom Indonesia	Adoption of digital transformation through integrating contemporary technology systems
PT. Gojek Indonesia	Implementation of system integration by cultural changes
PT. Bank Cental Asia	Adopting technology and performing system integration transformations
PT. Unilever Indonesia	Integrating cutting-edge technological systems into its production, distribution, and supply chain
PT. Tokopedia	Comprehending by using market factors and integrating the appropriate systems
PT. Indofood Sukses akmur	Integrating supply chain management and production systems based on technology
PT. Pertamina	Implemented an integrated system for logistics and energy management
PT. Kalbe Farma	Improve quality management system
PT. Garuda Indonesia	Implemented an integrated system for customer service management and operations
PT. Semen Indonesia	Productivity in operations
PT. Mayora Indah	Integrating supply chain and manufacturing systems
PT. Bukalapak	Optimise supply chain management
PT. Bank Rakyat Indonesia	Integrated banking systems

Eight prominent factors have been identified in the transformation of enterprise systems in Indonesia, categorized into four key inputs and four corresponding outputs. The inputs include: (1) Human Capital Development, (2) Organizational Culture, (3) Technology Adoption, and (4) Market Power. These inputs contribute to the outputs of (1) Efficiency, (2) Quality, (3) Productivity, and (4) Competitive Advantage, as illustrated in Figure 6, and each of these themes is comprehensively discussed in the following section.

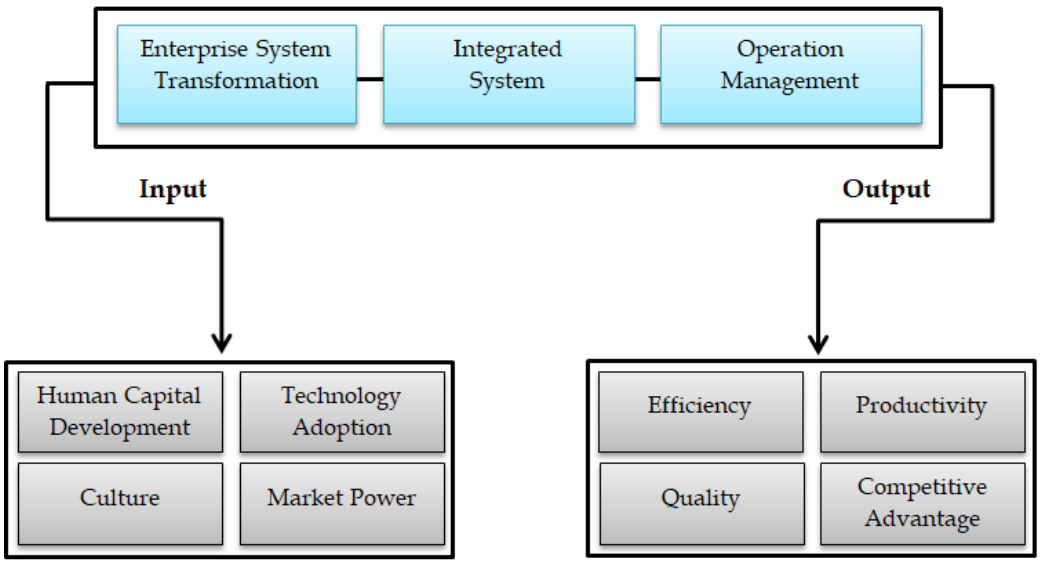

Figure 3. Framework Transformation of Enterprise Systems

Input

Human capital development, organizational culture, technology adoption, and market forces represent key input indicators in the integration of systems within operations management. These elements serve as foundational components that drive the effectiveness and adaptability of integrated enterprise systems. Previous studies have emphasized their significance in shaping strategic alignment and operational performance (Cui & Diwu, 2024; Asif et al., 2024; Díaz-Arancibia et al., 2024; Faiz et al., 2024; Xu & Li, 2023; Clougherty & Skousen, 2019).

Human Capital Development

The phenomenon in human resource management highlights that the success of an organization is largely dependent on the quality and commitment of its employees (Jawaad et al., 2019). Without sufficient investment in human capital development, economic growth and progress cannot be sustainably achieved, as people remain a nation's most valuable resource (Triatmanto & Bawono, 2023). In Indonesia, PT Kereta Api Indonesia (PT. KAI) exemplifies this by successfully executing system integration through modernisation initiatives aimed at enhancing operational efficiency and safety (Mayangsari et al., 2024). PT. KAI, which provides freight and passenger transportation services, has adopted new technologies and improved existing systems, including comprehensive human resource training and development programs (Azizah, 2023). These efforts are designed to equip employees with the competencies required to navigate the Society 5.0 era, focusing not only on technical skills but also on transforming employee mindsets to support the company's shift toward a service-oriented business model (Kraus et al., 2021).

Similarly, PT Perusahaan Listrik Negara (PT. PLN) has implemented a robust human capital development strategy to strengthen its competitiveness in the energy sector (Mutiara et al., 2019). With the goal of delivering top-tier power generation and related services, PT. PLN underscores the importance of enhancing technical, managerial, and behavioral competencies at all organizational levels (Kosasih et al., 2024). One of its key initiatives is the Integrated Operations Management Development Centre, which encompasses the Asset Management Centre & Engineering Support (ACE), a Training Centre, and a Simulator Central Control Room. Through this integrated training system, PT. PLN has successfully conducted 38 training programs involving over 600 participants, utilizing simulators for both diesel-gas and solar power plants. This strategic investment in human capital development has proven critical in supporting PT. PLN's operational excellence and long-term transformation goals.

Culture

Indonesia, a nation renowned for its rich cultural diversity with over 270 million people, more than 17,000 islands, 700 languages, and 1,300+ ethnic groups (BPS, 2020) is undergoing a significant transformation in its corporate systems. This transformation is driven by the necessity to blend traditional values with modern technological advancements (Taptiani et al., 2024). In the era of digital economy, there is a rising appreciation for Indonesia's cultural assets, including UNESCO-recognized traditions like the Saman dance, wayang kulit, and batik. Companies that have successfully embraced integrated system transformation often cultivate organizational cultures centered on flexibility, collaboration, and innovation (Deep, 2023). Indonesian firms that actively promote inclusivity and teamwork are more inclined to adopt integrated systems, as these environments are better suited to continuous adaptation (Dharmayanti et al., 2023; Kraus et al., 2021). This kind of transformation typically requires not only technological and procedural changes but also cultural shifts that foster adaptability and a commitment to continuous learning (Vicente et al., 2023).

A supportive corporate culture marked by openness, shared accountability, and effective communication plays a critical role in ensuring the seamless flow of information across departments (Robinson, 2020; Lam et al., 2021; Ojuade, 2024). Leadership plays a pivotal role in cultivating such cultures, as visionary leaders are essential for motivating employees to embrace change as a vital path to progress. Another integral aspect is the development of a customer-centric culture. In today’s competitive landscape, organizations must ensure that their integrated systems not only improve internal operations but also enhance customer satisfaction (Tuominen et al., 2023; Calza et al., 2023). Companies that prioritize customer feedback and strive for continuous service improvement are better positioned to leverage integration for delivering more personalized and responsive experiences (Metz & Ilies, 2020).

PT. Telkom Indonesia serves as a compelling example. As the country's largest telecommunications provider, it has enhanced its operational efficiency and service quality through the integration of modern technologies such as cloud computing, big data, and the Internet of Things (Suci et al., 2024). These technological shifts were accompanied by cultural transformation, promoting cross-divisional collaboration, constant innovation, and rapid adaptation. Leadership at PT. Telkom emphasizes transparency and encourages employees to improve their digital competencies and embrace creative thinking (Maran et al., 2022). Similarly, PT. Gojek exemplifies successful digital integration through its platform that connects millions of users to services in transport, payments, and logistics (Furqon, 2023). PT. Gojek's culture emphasizes agility, customer-focus, and team-based problem solving as pillars of their transformation (Sari et al., 2023). Together, these companies illustrate that the success of enterprise system integration in Indonesia is deeply rooted in cultural transformation that supports innovation, collaboration, and adaptability factors essential for sustainable organizational growth and performance enhancement.

Technology Adoption

Several organizations in Indonesia have demonstrated notable success in adopting technology and implementing system integration transformations, leading to significant improvements in service quality and operational outcomes (Utama et al., 2024). One such example is PT. Bank Central Asia (BCA), one of the largest banks in Indonesia. BCA has integrated advanced information technology systems to enhance customer service, ensure transaction security, and increase operational efficiency (Yuningsih et al., 2024). By adopting digital platforms such as internet and mobile banking, the bank has expanded its service reach and significantly improved customer satisfaction (Ferdinan & Aprilia, 2021). This transformation has also cultivated a culture of innovation, where employees are encouraged to continuously upgrade their digital competencies and adapt to technological advancements (Vuchkovski et al., 2023). BCA's successful technological integration has not only solidified its market leadership but also elevated the quality of its banking services. Similarly, PT. Telkom Indonesia has enhanced its digital and telecommunications operations through the adoption of big data and cloud computing technologies (Ali, 2024). These initiatives have enabled the company to streamline internal processes while offering customers faster, more reliable, and personalized services. Together, these two companies exemplify how effective system integration and strategic technology adoption can significantly boost both output quality and the competitive advantage of Indonesian enterprises.

Market Power

Companies in Indonesia that have adopted system integration transformation are largely driven by market forces, particularly in response to the escalating competition and rapidly changing consumer needs (Kusuma et al., 2024; Priyono et al., 2020).

System integration enables businesses to respond more quickly and effectively to market dynamics by consolidating various systems and business processes into a single, cohesive platform (Tolstykh et al., 2024). This transformation allows companies to utilize real-time data for informed decision-making, streamline supply chains, and improve customer experiences—an essential capability in Indonesia's fast-evolving economic landscape (Negi, 2021). A prime example is PT. Unilever Indonesia, a leading consumer goods company facing intense market pressures from both domestic and international competitors, as well as increasingly dynamic consumer expectations (Cheng, 2021). In response, Unilever has implemented data analytics to gain deeper insights into consumer behavior and integrated advanced technological systems across its production, distribution, and supply chain operations. This strategic shift has not only enhanced operational efficiency but also enabled the company to innovate and adapt more swiftly to market changes, thereby maintaining its position as a market leader (Gerry & Ellitan, 2024). Similarly, PT. Tokopedia—an online marketplace operating in Indonesia's highly competitive digital sector—has successfully adopted integrated technological solutions to enhance user experience, expand market reach, and streamline logistics (Farida & Setiawan, 2022b). By capitalizing on the country's rising digitalization and internet penetration, Tokopedia has grown into one of Indonesia's largest e-commerce platforms. These cases demonstrate that companies which understand and strategically respond to market demands through effective system integration are more likely to improve performance quality and achieve sustainable business growth.

Output

After examining the input factors, it is evident that these inputs generate several critical outcomes for organizations. These outcomes include efficiency, quality, productivity, and competitive advantage (Talukder et al., 2024; Rita et al., 2019; Williams et al., 2024; Farida & Setiawan, 2022). Therefore, optimizing inputs through integrated systems plays a significant role in enhancing organizational performance and sustaining competitiveness.

Efficiency

Efficiency refers to the capacity to achieve optimal outcomes with minimal time, cost, or effort, without compromising quality (Talukder et al., 2024). In today's rapidly evolving business landscape, this concept has become increasingly essential, especially as organizations face mounting pressures to remain competitive while managing limited resources. System and technology integration has emerged as a strategic approach for enhancing efficiency across various operational levels.

In Indonesia, several companies have successfully adopted system integration as a means to improve efficiency and productivity (Utama et al., 2024). For instance, PT. Indofood Sukses Makmur, the nation's largest food company, has implemented

technology-driven supply chain and production systems to streamline operations from upstream to downstream (Cuandra et al., 2022). This integration has enabled Indofood to reduce operational costs, minimize production waste, and expedite the delivery of products to market, which in turn has strengthened its competitive edge both domestically and internationally.

A similar case can be seen in PT. Pertamina, Indonesia's state-owned energy enterprise, which has embraced digital transformation by integrating logistics and energy management systems (Bagir, 2023). Pertamina's use of digital technologies has significantly improved the efficiency of its fuel production and distribution processes while also lowering its environmental impact. These examples highlight how companies that apply system integration with a clear understanding of efficiency principles can achieve long-term, sustainable improvements in performance and competitiveness.

Quality

Quality refers to the extent to which a product or service consistently meets or exceeds customer expectations (Rita et al., 2019). It is not only defined by the final output but also shaped by the processes and systems that support its creation, including the adoption of advanced technologies and system integration (Bashan & Kordova, 2021). In today's competitive landscape, ensuring high quality has become a strategic priority for many companies, particularly in Indonesia, where customer demands continue to evolve.

A compelling example is PT. Kalbe Farma, one of Indonesia's leading pharmaceutical companies. The firm has integrated a technology-based quality management system that ensures all stages of production—from research and development to distribution—align with international standards (Pitaloka, 2023). By utilizing this integrated system, Kalbe Farma is able to minimize production errors, improve the accuracy of drug formulation, and ensure the safety and efficacy of its products. As a result, the company has strengthened both its domestic reputation and its capacity to compete in the global pharmaceutical market (Prakoso & Ellitan, 2024).

Another notable case is PT. Garuda Indonesia, the national airline that has applied system integration to enhance both customer service and operational efficiency. Through digital platforms and an integrated management system, Garuda has elevated the passenger experience from online booking to in-flight services meeting the rising expectations of modern travelers (Jannah & Sukmana, 2022). These examples affirm that a commitment to quality, supported by effective system integration, enables businesses to deliver superior products and services that meet customer needs while maintaining operational excellence.

Productivity

Productivity is a measure of how effectively inputs such as labor, capital, and resources are converted into outputs like goods or services within a specific time frame (Williams et al., 2024). In today's fast-paced business environment, productivity is heavily influenced by the integration of advanced technologies and systems that streamline operations, improve output quality, and reduce delays (Aljohani, 2023; Allioui & Mourdi, 2023; Javaid et al., 2023). Companies across Indonesia are increasingly leveraging system integration to boost their productivity and maintain a competitive edge in the marketplace.

A prime example of this is PT. Semen Indonesia, the largest cement manufacturer in the country. By integrating automation and data analytics into its production processes, PT. Semen Indonesia has been able to enhance output while reducing both downtime and resource waste. The real-time monitoring and optimization capabilities offered by this integrated system ensure consistent quality and efficiency throughout the production cycle, positioning the company as a leader in the Indonesian cement industry (Utama et al., 2024).

Similarly, PT. Mayora Indah, a renowned consumer goods company, has achieved significant improvements in production accuracy and speed through the integration of its supply chain and manufacturing systems (Ewaldo et al., 2023). The technological advancements implemented by Mayora Indah have enabled the company to maintain high product quality while meeting the growing demands of the market. These examples demonstrate that incorporating modern technologies and system integration can not only improve productivity but also help companies achieve sustainable growth and maintain their competitive positions in the market.

Competitive Advantage

Superior technology, cost-effectiveness, creativity, and exceptional customer service are prime examples of the distinctive qualities or competencies that grant businesses a competitive edge in today's market (Farida & Setiawan, 2022). These advantages are often achieved through the intentional integration of technologies and systems that enhance market responsiveness, product quality, and operational efficiency. In Indonesia, companies like PT. Bukalapak and PT. Bank Rakyat Indonesia (BRI) have successfully employed system integration to stay ahead of their competitors.

PT. Bukalapak, an e-commerce giant, leverages big data and artificial intelligence to optimize its supply chain management and tailor the shopping experience for customers (Nur et al., 2024). The integration of these advanced technologies allows Bukalapak to offer faster, more efficient, and personalized services, ensuring a competitive position against major rivals in the e-commerce space (Puspitasari et al., 2023). This level of innovation in technology not only enhances operational efficiency

but also strengthens customer loyalty, which is crucial in the highly competitive online marketplace.

Similarly, PT. Bank Rakyat Indonesia (BRI) has embraced integrated banking systems to improve its digital banking and microfinance services (Muliasari, 2022). This integration has led to a broader customer base, faster transaction times, and a stronger market position as Indonesia's banking leader. Both PT. Bukalapak and PT. BRI exemplify how leveraging innovation, focusing on customer needs, and implementing strategic system integration can generate a sustained competitive advantage in a rapidly evolving market.

The transformation of enterprise systems in Indonesia is a multifaceted process influenced by key input factors such as human capital development, culture, technology adoption, and market power, which collectively drive outputs like efficiency, quality, productivity, and competitive advantage. This aligns with contemporary research emphasizing the interdependence of organizational and technological factors in digital transformation (Asif et al., 2024; Díaz-Arancibia et al., 2024). Human capital development, as seen with PT. KAI and PT. PLN, underscores the critical role of continuous training and skill enhancement in adapting to technological advancements, supporting findings by Jawaad et al. (2019) that employee competence is pivotal for organizational success. Similarly, Indonesia's diverse cultural landscape requires an adaptive organizational culture, demonstrated by PT. Telkom Indonesia and PT. Gojek, where flexibility, innovation, and customer-centricity have been instrumental in successful system integration (Deep, 2023; Tuominen et al., 2023). This supports Kraus et al. (2021) and Lam et al. (2021), who argue that cultural alignment fosters collaboration and accountability, which are crucial for seamless information flow during digital transitions.

Technology adoption, exemplified by PT. BCA and PT. Telkom Indonesia, highlights how digital tools like big data and IoT enhance operational efficiency and service quality, corroborating studies by Utama et al. (2024) and Ali (2024) on the role of digitalization in competitive differentiation. Market power, demonstrated by PT. Unilever and PT. Tokopedia, drives system integration by compelling companies to leverage real-time data and agile supply chains to meet evolving consumer demands (Konopik et al., 2022; Tolstykh et al., 2024). This echoes Negi's (2021) assertion that integrated systems enable firms to respond swiftly to market volatility. The outputs of this transformation—efficiency, quality, productivity, and competitive advantage—are evident in Indonesian enterprises like PT. Indofood and PT. Kalbe Farma, where system integration has reduced waste and ensured compliance with global standards (Talukder et al., 2024; Bashan & Kordova, 2021).

Productivity gains in PT. Semen Indonesia and PT. Mayora Indah align with Aljohani's (2023) findings on automation and data analytics optimizing resource use, while the competitive edge achieved by PT. Bukalapak and PT. BRI through AI and

digital banking reflects Farida & Setiawan's (2022) emphasis on innovation as a sustainable differentiator. Furthermore, Indonesia's enterprise system transformation mirrors global trends, where the strategic integration of human, cultural, technological, and market-driven inputs yields measurable operational and competitive outcomes. Future research could explore sector-specific challenges, such as resource constraints faced by SMEs, to provide a more nuanced understanding of digital transformation in emerging economies.

D. Conclusions

The role of integrated design and operations management is crucial in achieving a seamless transformation, as it facilitates better resource allocation, reduces operational silos, and enhances decision-making. Organizations that effectively synchronize their enterprise systems with operational workflows experience greater efficiency, agility, and long-term sustainability. By aligning technological innovations with operational strategies, businesses can optimize processes and improve overall performance, enabling them to adapt swiftly to market demands and stay competitive in the digital era.

Despite the progress made in enterprise system transformation in Indonesia, the review highlights significant research gaps, particularly in empirical studies examining the long-term impacts of transformation, industry-specific challenges, and frameworks tailored to the Indonesian business landscape. Future research should explore context-specific models that account for Indonesia's unique economic, cultural, and regulatory environment, providing a deeper understanding of how system integration can be more effectively implemented within local industries. These insights would help businesses and policymakers better navigate the complexities of digital transformation in Indonesia.

Furthermore, the transformation of enterprise systems in Indonesia is a complex yet essential process for businesses to remain competitive in the digital era. A strategic, integrated approach combining technology, design, and operations management is crucial for organizations to fully capitalize on the benefits of enterprise system transformation. Stakeholders, including business leaders, policymakers, and researchers, must collaborate to develop sustainable and innovative solutions that drive successful enterprise system integration in Indonesia, ensuring long-term growth and competitiveness in a rapidly evolving global market.

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