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Strategic management perspective on digital transformation in PT Schneider Electric Manufacturing: The Smart Factory Program

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ABSTRACT

This study explores the digital transformation journey of PT Schneider Electric Manufacturing Batam through the implementation of its Smart Factory Program, grounded in the principles of industry 4.0. Using a qualitative library research method, data were gathered from books, scientific journals, and official company sources to analyze how the integration of digital technologies addresses critical operational challenges. The study identifies key issues such as insufficient oversight of performance, frequent equipment failures, and the need for scalable digital solutions across facilities. Through thematic analysis, eight strategic solutions emerged, including supply chain efficiency, agile management, process optimization, asset performance management, operator empowerment, reliability enhancement, energy efficiency, and social engagement. These strategies not only improved operational efficiency and agility but also supported environmental sustainability and customer satisfaction. The findings highlight that a well-aligned digital transformation strategy, supported by cross-functional collaboration and technological innovation, can significantly enhance manufacturing competitiveness in the era of industry 4.0.

Keywords: Digital transformation, industry 4.0, operational management, strategic management

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INTRODUCTION

PT Schneider Electric Manufacturing Batam (SEMB) is a subsidiary of PT Schneider Electric SE, a French-based company specializing in electrical systems and energy management (Oscar & Palit, 2022). Founded in 1836, Schneider Electric initially produced Telemecanique products and has since developed global brands such as Merlin Gerlin, Square D, and Telemecanique. PT Schneider Electric Manufacturing provides services that prioritize safety, reliable power generation, and controlled operating costs. In the energy and infrastructure sector, its products and services include process control, power generation and distribution, energy monitoring and supervision, utility management, and smart electrical network systems. Since 1991, the Batam factory has been manufacturing 11 types of Schneider Electric's power and industrial automation products. It runs efficiently thanks to the implementation of Schneider Electric's EcoStruxure solutions (Electric, 2024). Currently, the company is implementing Industry 4.0 technologies and is recognized as one of the companies in Indonesia adopting this approach. To support its digital transformation, the company launched the Smart Factory Program. PT Schneider Electric was recognized as a Fourth Industrial Revolution (4IR) Lighthouse by the World Economic

Forum in 2019 and has received the Advanced Manufacturing Lighthouse award, becoming part of a select global network of companies leading in digital innovation (Betti & Boer, 2023).

PT Schneider Electric formed a dedicated team to drive the adoption of Industry 4.0 and partnered with AVEVA to select advanced solutions that enhance collaboration and unify data across the plant (Aveva, 2020). These technologies help monitor and even predict equipment failures, optimizing performance and reducing downtime, which supports the company's global Smart Factory Program. PT Schneider Electric also implemented a Smart Supply Chain plan to improve efficiency, increase customer service levels—such as on-time delivery and supplier service rates—reduce costs, and demonstrate how digital tools can enhance manufacturing outcomes (Koot et al., 2021). The company aims to reach the next level of performance efficiency across its operations. In addition, it seeks to improve the customer experience by leveraging digital tools as a key opportunity to increase output and efficiency. Through its partnership with AVEVA, the company hopes to improve operations, sustain long-term efficiency, and reduce the carbon footprint of its manufacturing processes.

Despite the company's significant progress in adopting Industry 4.0 technologies, PT Schneider Electric Manufacturing Batam still encountered several operational challenges that impeded optimal performance. One of the major issues was the limited oversight of plant performance in real-time, which restricted the ability to quickly detect inefficiencies or disruptions in the production process (Kumar Kanike, 2023). Additionally, the company faced difficulties due to incomplete and unstructured data on equipment failures, which made it challenging to implement predictive maintenance effectively. Another obstacle was the lack of an integrated digital solution that could connect and harmonize operations across all facilities within the Batam site, resulting in fragmented workflows and communication gaps. These challenges highlighted the need for comprehensive and coordinated digital strategies to enhance operational visibility, agility, and decision-making across the organization.

To overcome these issues, PT Schneider Electric initiated several strategic programs aligned with its digital transformation goals. Key efforts included the development of a Smart Supply Chain system, investment in performance management tools, and a strategic partnership with AVEVA to unify data and optimize operations (Aveva, 2020; Wang et al., 2022). These initiatives were designed to address the root causes of operational inefficiencies while supporting long-term objectives such as sustainability, customer satisfaction, and reduced downtime. The implementation of these technologies demonstrates the company's commitment to continuous improvement and innovation in manufacturing processes. Therefore, this study aims to answer the research question: *How can digital transformation through the adoption of Industry 4.0 technologies improve operational efficiency and address key business challenges at PT Schneider Electric Manufacturing Batam?* Through a qualitative analysis of the company's transformation journey, the study also seeks to offer valuable insights and practical alternatives for other manufacturing firms embarking on similar digital transitions.

LITERATURE REVIEWS

Digital Transformation

Digital transformation has been widely discussed as a strategic driver for organizational change in the digital era. Robertsone & Lapiņa (2023) describe it as the use of technology to radically enhance enterprise performance and reach, emphasizing its role in reshaping operational capabilities and customer engagement. Kraus et al. (2021) builds on this view by highlighting that digital transformation is a process involving significant changes to an organization's structure and functioning, enabled by a combination of digital technologies such as information systems, computing, communication, and connectivity tools. Verhoef et al. (2021), meanwhile, frames digital transformation as an organizational reinvention to better serve customers, reflecting a customer-centric perspective. Collectively, these definitions underline a shared understanding: digital transformation is not merely about adopting new technologies, but about strategically aligning digital tools with core business processes to deliver enhanced value, agility, and innovation. This study draws on these insights to explore how PT Schneider Electric leverages digital transformation as a response to operational challenges.

Industry 4.0

Closely related to digital transformation is the concept of Industry 4.0, which refers to the current phase of industrial evolution driven by intelligent technologies. Folgado et al. (2024) emphasizes its broader societal implications, characterizing it as a fusion of digital, physical, and biological systems that transforms how we live and work. In contrast, Khan et al. (2025) focus on the structural impact within industry, presenting Industry 4.0 as a shift toward decentralized, self-optimizing systems enabled by real-time data exchange. Javaid et al. (2022) add that smart technologies within Industry 4.0 contribute to the creation of interconnected value networks, supporting mass customization and enhanced productivity. Those studies reveals that Industry 4.0 extends digital transformation into the manufacturing domain, enabling companies like PT Schneider Electric to optimize operations through integration, automation, and real-time decision-making.

Operations Management

The success of digital transformation and Industry 4.0 initiatives depends heavily on effective operations management. According to Salah et al. (2023), operations management focuses on converting inputs such as materials, labor, and energy into valuable outputs in the form of goods and services. Handoyo et al. (2023) extend this definition by emphasizing the role of operations managers in creating value through cost control, quality improvement, and responsiveness—critical capabilities in a highly competitive environment. Browning (2020) reinforces this view by positioning operations management as the foundation of systems that generate organizational outputs. These perspectives suggests that digital transformation and Industry 4.0 are not standalone strategies, but must be deeply embedded in operations management practices to realize tangible performance improvements. In the context of PT Schneider Electric, this integration becomes vital in addressing inefficiencies, reducing downtime, and supporting sustainable manufacturing.

METHODS

This study uses a library research method, which involves collecting data and information from various written sources such as books, scientific articles, journals, research reports, and other relevant documents. The focus of this study is to analyze existing theories in order to conceptually address the research questions.

Data were collected through a literature review process, which included three steps. First, literature identification was conducted by searching for relevant sources using appropriate keywords. Next, source evaluation involved assessing the reliability and validity of the sources by considering the reputation of the author, journal, or publisher. Finally, data recording was performed by citing key information according to scientific writing standards.

The collected data were analyzed descriptively and qualitatively, following these steps: First, data reduction was carried out by filtering out irrelevant information and focusing on content that aligns with the research problem. Then, categorization involved grouping the information based on related themes or topics. Finally, data interpretation was performed by analyzing the categorized data within the framework of the theoretical models used, in order to draw meaningful conclusions.

RESULTS AND DISCUSSION

For the selection process of the alternative solutions, these solutions were derived based on the results of brainstorming conducted by examining the business issues present at PT Schneider Electric. During the brainstorming stage, the author focused on solving problems occurring in management operations at PT Schneider Electric by consulting scholarly sources. As emphasized by Kraus et al. (2021), digital transformation is not simply about adopting new technologies but involves fundamental changes to an organization's structure and function, aligned with strategic goals. Similarly, Salah et al. (2023) emphasize that operations management serves as the backbone for converting inputs into valuable outputs—making it a logical focus for addressing the company's performance challenges.

Operational management is a crucial aspect for companies in running their business and plays a significant role in enabling Industry 4.0 (Javaid et al., 2022). There are three business issues that occurred at PT Schneider Electric. To begin with, the team is focusing on enhancing how they monitor the plant's operations and ensure it runs efficiently. In addition, the management is working on gathering more specific information about equipment breakdowns to find better ways to fix them. Finally, they plan to create a new digital system that can be used across all the facilities within the Batam location. These business issues are focused on improving efficiency in operations at PT Schneider Electric. Therefore, through brainstorming and the support of several journals and books from the internet, the author identified eight alternative solutions that PT Schneider Electric could implement to streamline its operations. The proposed alternative solutions are efficient supply chain, agile management, process efficiency, asset performance management, empowered operators, reliability, energy efficiency, and social. Based on the results of the brainstorming process, the eight proposed alternative solutions are considered appropriate for addressing the challenges encountered by PT Schneider Electric. This assessment is supported by expert understanding of each solution, which demonstrates a high degree of alignment with the company's operational requirements.

To solve the problems identified at PT Schneider Electric, several alternative solutions are proposed to ensure that these challenges can be addressed effectively and efficiently. The first solution is efficient supply chain management, which is essential because the company has implemented a smart supply chain program that utilizes digital technology to streamline operations. The second is agile management, which enables the team to control output across the entire factory value chain while fostering innovation in products. Third, process efficiency is emphasized through better closed-loop measurement and control systems that increase throughput and enable faster processing. The fourth solution is asset performance management, which aims to optimize assets to enhance profitability. Fifth, empowering operators is considered crucial, as it enables them to make more informed and effective decisions on the factory floor. The sixth solution focuses on reliability by introducing tools that support higher uptime for plants, processes, and assets. Seventh, energy efficiency is addressed through increased

visibility, control, and optimization of power consumption and operational costs. Lastly, social factors are also taken into account, such as the advancement of networking, communication systems, models of customer demand, and the emergence of new customer experiences and ways of thinking.

For PT Schneider Electric, efficient supply chain management is highly applicable, as the supply chain functions as a vital component of the entire business ecosystem. Modern supply chain management involves aligning end-to-end business processes strategically to deliver both market relevance and economic benefit, while also providing companies with a competitive edge (Kumar Kanike, 2023; Wang et al., 2022). It plays a central role in business operations and is critical to achieving company success and ensuring customer satisfaction. Supply chain management can enhance customer service, lower operational costs, and strengthen a company's financial position (Koot et al., 2021). It also facilitates ongoing communication between the company and its customers, ensuring that products move through multiple stages before arriving at their final destination. In addition, supply chain management addresses key global issues, including the expansion of multinational corporations, the formation of partnerships, the spread of global brands, and the practice of outsourcing (Shekarian et al., 2022). Therefore, a well-structured supply chain can significantly improve the customer service performance of PT Schneider Electric.

Agile management is needed for PT Schneider Electric because there is more organizational control, so the team in the company can control the output right across the factory value chain. It allows quicker delivery, so there are no constraints or wasted time when sending materials from production. It reduces risk that occur in operations. Agile management focuses on specific goals, using frequent updates and input from users to create a product that truly fits the organization's needs (Steegh et al., 2025). When employees are involved in shaping the systems and workflows, they are more invested in making them succeed. Additionally, the step-by-step development process allows leaders to identify flaws, explore new options, and gradually enhance existing operations by integrating the new tool or technology.

Process efficiency is needed for PT Schneider Electric because it allows efficient measurement, faster processing, and detailed control of processes. A common practice among high-performing organizations is the implementation of systematic performance measurement mechanisms. Such systems rely on continuous feedback to inform strategic planning and to prioritize areas for improvement. Instruments like SWOT analysis, action plans, and balanced scorecards serve not only to assess performance but also to facilitate organizational development (Putri et al., 2024). Effective enterprises recognize that pursuing efficiency in isolation is insufficient; instead, emphasis must be placed on aligning resources and initiatives with critical customer service metrics. Efficiency is best achieved by minimizing attention to non-essential tasks and processes. Furthermore, the adoption and regular upgrading of appropriate technologies are vital to maintaining organizational relevance and operational effectiveness. Merely possessing advanced tools is inadequate—without consistent updates and enhancements, technological assets may impede rather than support productivity.

Asset performance management is needed for PT Schneider Electric to reduce downtime and maintenance costs. Asset performance management (APM) focuses on tracking equipment condition, predicting failures, maintaining asset integrity, and ensuring systems run reliably (Macchi et al., 2024). It typically uses technologies like data collection on asset health, visual dashboards, and performance analytics. APM encourages collaboration and smooth information flow between operations and maintenance teams, giving a full picture of how assets perform, how products are made, and how quality is maintained. It also helps align production processes with equipment upkeep, making it easier to connect production goals with maintenance capabilities. As a result, organizational goals are more effectively communicated and commonly understood.

Empowered employees are essential for PT Schneider Electric, as they are equipped to make well-informed decisions that directly affect organizational outcomes. This is facilitated through access to performance data, a clear understanding of how their roles contribute to overall success, performance-based incentives, and decision-making authority (Ángeles López-Cabarcos et al., 2022). Modise (2023) expands on the concept of empowerment by identifying its core elements: the sharing of information, the ability to engage in upward problem-solving, autonomy in task execution, the development of constructive attitudes, and the practice of self-management. Effective empowerment strategies require active collaboration between management and employees. However, in practical settings, the extent of empowerment granted often depends on organizational priorities, the availability of relevant knowledge, and timing. Moreover, individual differences such as experience, training, personality traits, background, and cognitive orientation significantly influence how employees' approach and resolve complex issues. These personal factors, alongside the specific nature of work tasks, must be carefully considered in the design and implementation of empowerment initiatives (Shah et al., 2020).

Reliability is needed for PT Schneider Electric because it helps the company remain sustainable and reduces mistakes in the production process. It is essential for an organization to systematically identify critical operational parameters, define acceptable performance thresholds, and ensure these are clearly communicated to operational personnel. Mechanisms should be established to monitor system performance and manage any deviations from prescribed limits. Operators must be able to readily detect instances when equipment functions beyond its operational boundaries. Furthermore, it is crucial to recognize key activities that may pose risks of

overload or equipment failure and to provide comprehensive training that enables personnel to either avoid such scenarios or perform these tasks with consistent accuracy. The concept of reliability extends across nearly all dimensions of asset management, including cost control, customer satisfaction, effective resource utilization, the organization's capacity to deliver products or services, operational safety, and product quality (Parra et al., 2024).

Energy efficiency is needed for PT Schneider Electric because it will reduce the cost to the company and help the company remain sustainable if raw materials become very limited. The company should have an intelligent manufacturing system, including smart design, smart machines, smart monitoring, smart control, and smart scheduling. With this intelligent manufacturing system, the company will find it easier in its operational processes to use sufficient energy, thus enabling innovation in its product manufacturing process (Javaid et al., 2022). As a result, the company will become more aware of the energy used in its production process.

Social is needed for PT Schneider Electric because social aspects can impact the performance of the company. The social impact of a company's operations is assessed from both internal and external perspectives, ensuring that its activities throughout the supply chain align with principles of social responsibility and ethical conduct (Vuong & Bui, 2023). Internally, this impact primarily pertains to employment-related practices, including workplace conditions, equitable hiring processes, opportunities for professional development among women and underrepresented groups, non-discriminatory policies, and the provision of essential benefits such as affordable healthcare. It also encompasses compliance with labor laws, fair compensation, adequate rest periods, occupational safety, and employee training programs. Externally, social impact is shaped by the expectations and regulations imposed by customers, stakeholders, suppliers, and governmental bodies. A socially sustainable enterprise also extends its ethical commitments to its supply chain, actively evaluating the labor practices and working environments of its suppliers to ensure that goods and materials are sourced in a responsible and ethical manner.

This study has shown that digital transformation, through the adoption of Industry 4.0 technologies, plays a vital role in improving operational efficiency and addressing key business challenges at PT Schneider Electric Manufacturing Batam. By identifying core operational issues such as limited performance oversight, equipment failure analysis, and the lack of integrated digital systems, the study highlighted how strategic initiatives—such as the Smart Supply Chain system, performance management tools, and the partnership with AVEVA—have been effectively implemented to overcome these challenges. The eight alternative solutions derived from a qualitative analysis—ranging from agile management to energy efficiency—further support the company's efforts toward innovation, sustainability, and enhanced productivity. These findings affirm that a well-aligned digital transformation strategy not only resolves existing inefficiencies but also positions the company for long-term competitive advantage. Moreover, the insights presented in this study offer practical value for other manufacturing firms navigating similar digital transitions in the Industry 4.0 era.

CONCLUSIONS AND SUGGESTION

Conclusions

The findings of this study demonstrate that PT Schneider Electric Manufacturing Batam's digital transformation efforts, particularly through its Smart Factory Program, represent a strategic response to the evolving demands of Industry 4.0. The company's commitment to integrating advanced technologies, improving data visibility, and fostering operational excellence reflects a proactive approach to aligning internal processes with global standards. However, the gap between current conditions and expected outcomes highlights the ongoing need for innovation in operational management and strategic implementation. This study reaffirms that digital transformation must be supported not only by technological adoption but also by a comprehensive understanding of organizational needs and management practices. The analysis provides valuable insights into how Industry 4.0 technologies can be effectively aligned with strategic goals to enhance efficiency, agility, and sustainability in manufacturing operations.

Suggestion

To achieve the intended outcomes of its digital transformation, PT Schneider Electric should continuously evaluate and refine its implementation strategy, ensuring alignment between technology, people, and processes. Strengthening cross-functional collaboration, investing in workforce capability building, and promoting a data-driven culture are essential to sustaining progress. Future studies may benefit from conducting empirical assessments or case-based analyses to measure the long-term impact of specific initiatives, providing a broader understanding of best practices in managing digital transformation within the manufacturing sector.

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