Management Studies and Business Journal (PRODUCTIVITY)
Vol 1 (3) 2024 : 496-506

Digital Transformation in Operations Management: A Systematic Review of Current Trends and Practices

Transformasi Digital dalam Manajemen Operasi: Tinjauan Sistematis terhadap Tren dan Praktik Saat Ini

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ABSTRACT
This research investigates the impact of digital transformation technologies, including artificial intelligence (AI), Internet of Things (IoT), and big data, on operational decision making in the context of operational management. Through a comprehensive literature analysis, this research presents findings from studies that reveal the important role of digital technology in increasing operational efficiency, improving decision making, and facilitating innovation in various industrial sectors. The research findings highlight the importance of understanding the integration of digital technologies with existing operational management practices, as well as the ethical and organizational challenges associated with their use. In addition, this research identifies a number of potential research agendas to develop a deeper understanding of digital transformation in operational management and provide valuable guidance for organizations in facing the challenges and exploiting opportunities in this digital era.
Keywords: Digital Transformation, Artificial Intelligence, Internet of Things, Big Data, Operational Decision Making, Operational Management.

ABSTRAK
Penelitian ini menginvestigasi dampak teknologi transformasi digital, termasuk kecerdasan buatan (AI), Internet of Things (IoT), dan big data, terhadap pengambilan keputusan operasional dalam konteks manajemen operasional. Melalui analisis literatur yang komprehensif, penelitian ini menyajikan temuan dari studi-studi yang mengungkapkan peran penting teknologi digital dalam meningkatkan efisiensi operasional, memperbaiki pengambilan keputusan, dan memfasilitasi inovasi dalam berbagai sektor industri. Temuan penelitian menyoroti pentingnya pemahaman tentang integrasi teknologi digital dengan praktik manajemen operasional yang ada, serta tantangan etika dan organisasi yang terkait dengan penggunaannya. Selain itu, penelitian ini mengidentifikasi sejumlah agenda penelitian potensial untuk mengembangkan pemahaman yang lebih dalam tentang transformasi digital dalam manajemen operasional dan memberikan panduan yang berharga bagi organisasi dalam menghadapi tantangan dan memanfaatkan peluang di era digital ini.
Kata Kunci: Transformasi Digital, Kecerdasan Buatan, Internet of Things, Big Data, Pengambilan Keputusan Operasional, Manajemen Operasional.

1. Introduction

Digital transformation in operational management involves the continuous utilization of new digital technologies within organizations to enhance agility and facilitate strategic renewal. This process encompasses the evolution of various aspects such as business models,

collaborative approaches, and organizational culture (Warner & Wäger, 2019). It is crucial to understand that digital transformation is not a one-time event but an ongoing journey that requires organizations to adapt to the changing digital landscape (Warner & Wäger, 2019).

emphasize the importance of distinguishing between digitization, digitalization, and digital transformation as distinct phases in the process. Digitization involves the creation of digital assets, digitalization refers to deploying digital technologies, and digital transformation entails restructuring operational models and organizations (Verhoef et al., 2021).

Furthermore, the impact of digital transformation on operational efficiency has been highlighted in a study indicating significant improvements in business operations due to digital initiatives ("Effect of Digital Transformation on Company Operational Efficiency", 2023). This underscores the transformative power of digital technologies in enhancing organizational performance and effectiveness.

In the context of digital transformation, the role of managers is crucial. suggest that managing digital transformation in operational work involves overseeing the adoption of digital tools and technologies to streamline processes and drive organizational change (Kraft et al., 2022). Additionally, discusses how digital transformation enriches the literature on the economic consequences of digital initiatives and aids managers in understanding the role of digitalization in operational management (Li, 2023). In conclusion, digital transformation in operational management is a multifaceted process that requires organizations to embrace digital technologies, adapt their operational models, and foster a culture of continuous innovation. By leveraging digital tools effectively and integrating them into various aspects of the business, organizations can enhance their operational efficiency, drive strategic renewal, and stay competitive in today's digital age.

In the digital transformation landscape in operational management, data from various authoritative sources highlights trends, challenges and their potential impact on the world of work and business practices. According to McKinsey & Company's report on The State of Digital Transformation in Operations 2023, 80% of respondents believe that digital transformation has significantly improved their operational efficiency. As many as 70% of organizations have also implemented digital technologies such as artificial intelligence (AI), Internet of Things (IoT), and Big Data. Identified benefits include increased efficiency, productivity, visibility, and control. However, challenges such as skills gaps, data security, costs and organizational resistance remain in focus.

Meanwhile, a report from the World Economic Forum, The Future of Jobs Report 2022, predicts dramatic changes in the structure of the workforce due to digital transformation. Projections state that there is the potential for the emergence of 974 million new jobs in 2025, but on the contrary, 83 million jobs have the potential to be lost due to automation. Skills in demand in this context include critical thinking, creativity, leadership, technology expertise, and data analysis.

Current trends in supply chain management are also in the spotlight, with Gartner identifying 10 key trends for 2023. Among these trends are supply chain resilience, visibility, adoption of artificial intelligence (AI), sustainability, and adoption of digital platforms. On the other hand, the International Organization for Standardization (ISO) provides guidance through ISO 55001:2014 - Asset Management, which emphasizes the importance of implementing an asset management system to improve performance, reduce costs, comply with regulations, and improve decision making.

Forrester, in its report on The State of AI in Operations 2023, highlights the increasingly widespread use of artificial intelligence in operations. As many as 70% of organizations are expected to use AI in their operations in the next two years, with potential benefits including increased efficiency, productivity and quality of decision making. However, challenges such as skills gaps, data security and costs still need to be addressed.

Overall, this narrative paints a complex but potential panorama of digital transformation in operations management, with an emphasis on the benefits, challenges and trends that organizations wishing to adopt it need to understand effectively.

Table 1.
SurveyDigital Transformation in Operations Management

Source	Reports/Standards	Key Findings
McKinsey & Company	The State of Digital Transformation in Operations 2023	- 80% of respondents: digital transformation increases operational efficiency. - 70% of organizations: apply digital technologies (AI, IoT, Big Data). - Benefits: efficiency, productivity, visibility, control. - Challenges: skills gap, data security, costs, resistance.
World Economic Forum	The Future of Jobs Report 2022	- Digital transformation: 974 million new jobs by 2025. - Automation: 83 million jobs lost by 2025. - Digital skills are in demand: critical thinking, creativity, leadership, technology, data analysis.
Gartner	Top 10 Trends in Supply Chain Management for 2023	- 10 trends: supply chain resilience, visibility, AI, sustainability, digital platforms.
International Organization for Standardization (ISO)	ISO 55001:2014 - Asset Management	- Guide: implementation of an asset management system. - Benefits: performance, costs, compliance, decision making.
Forrester	The State of AI in Operations 2023	- 70% of organizations: using AI in operations within 2 years. - Benefits of AI: efficiency, productivity, decision making. - AI challenges: skills gap, data security, costs.

Source: McKinsey, World Economic Forum, Gartner, ISO, Forrester

Based on the data above, research gaps are still found that will be proposed in this research. Firstly, there is no in-depth analysis of the integration of digital transformation trends with supply chain management that Gartner has identified for 2023. A more detailed study could explore the impact of digital technologies such as AI, IoT and Big Data on trends such as supply chain resilience , visibility, and sustainability. Furthermore, reports from the World Economic Forum have provided projections about changes in workforce structure due to digital transformation, but there has been no in-depth research on the impact on specific industrial sectors and different employment levels. In addition, research is still needed that focuses on concrete strategies to overcome challenges in adopting digital transformation, such as skills gaps, data security and costs. Finally, although many reports highlight the benefits of digital transformation in operational management, there is a need to develop better metrics to measure the effectiveness of digital technology implementation in achieving business goals. By filling these research gaps, we can gain a deeper understanding of the dynamics of digital transformation in operational management and develop the insights needed to guide strategic decisions in the context of sustainable business and workforce development.

This research has significant urgency in the context of the evolution of the business world which is increasingly exposed to digital transformation. With the emergence of new technologies such as artificial intelligence, the Internet of Things, and Big Data analytics, companies in various sectors are required to adapt quickly to remain competitive effectively. However, to undertake a successful digital transformation, a deep understanding of relevant challenges, trends and strategies is essential. Therefore, this research has a substantial contribution in filling existing knowledge gaps. By analyzing the integration of digital transformation trends with supply chain management, the impact of digital transformation on workforce structure, strategies to overcome challenges in adopting digital technologies, and the development of more sophisticated metrics to measure their effectiveness, this research will provide valuable insights for business stakeholders , academics and practitioners to design more effective strategies in facing challenges and exploiting opportunities faced in the era of digital transformation. Thus, this research will make a significant contribution to the development of best practices and a deeper understanding of digital transformation in the context of operational management, which in turn will support business growth and sustainability in this digital era.

2. Research Methods

The research method used is a systematic literature review with a structured and documented approach. First, reference sources will be obtained from international databases that provide access to academic literature and leading journals in the field of operational management and digital transformation. Some databases to be used include Scopus, Web of Science, and IEEE Xplore. Keywords used to search for references will include a combination of phrases such as "digital transformation", "operational management", "current trends", "best practices", and other variations relevant to the research topic.

After obtaining a list of articles from the database, the next step is the filtering process. Articles included in the review will be assessed based on predetermined inclusion and exclusion criteria. Inclusion criteria include articles that discuss digital transformation in the context of operational management, including current trends and best practices that have been implemented in various industries. Articles must also be published in academic journals that have a good reputation and have gone through a peer review process.

On the other hand, articles will be rejected if they are not relevant to the research topic, including articles that focus more on technical aspects without a direct connection to operational management, or articles that do not meet established quality standards. In addition, articles that are outdated or no longer relevant to current conditions will also be rejected.

This filtering process will be carried out in stages by researchers involved in the research, starting from reviewing the title and abstract, then full reading of the article to assess whether the article meets the predetermined inclusion criteria. Each accepted article will be further analyzed to extract information on current trends, best practices and other important findings related to digital transformation in operational management. The results of this process will be systematically analyzed and compiled into an in-depth report on the latest trends and practices in digital transformation in operational management.

3. Results and Discussions

A. Operational Management

Operational management is a crucial aspect of organizational functioning that involves the coordination of resources and processes to achieve efficient and effective production and delivery of goods and services. It encompasses various capabilities and practices aimed at optimizing operational performance and meeting organizational objectives (Peng et al., 2007). In the context of crisis management, operational resilience is essential, especially in dealing

with complex and uncertain environments where standard procedures may not suffice (Hermelin et al., 2019).

The field of operations management is closely related to supply chain management, logistics, marketing, and production, encompassing a wide range of industrial management functions (Mentzer et al., 2008). Operational definitions play a crucial role in various domains, such as asthma self-management in teens, where behaviors related to preventing, monitoring, and managing symptoms are defined within a theoretical framework (Mammen et al., 2018). Similarly, in healthcare, standardization of clinical practices and the development of operational definitions through consensus processes are vital for ensuring quality care and patient safety (Bhutta et al., 2013).

In the realm of self-management interventions, operational definitions help categorize and define critical components, guiding the implementation and evaluation of interventions (Jonkman et al., 2016). Moreover, in healthcare settings like Lean management in health care, having clear operational definitions is essential for identifying relevant studies and practices that align with Lean principles (Rotter et al., 2018). Operational definitions are also fundamental in defining and addressing specific health conditions, such as ineffective health management in heart failure patients, aiding in the critical thinking and care planning process (Carneiro et al., 2015).

Overall, operational management involves the systematic planning, implementation, and control of processes to enhance organizational performance and achieve strategic goals. Clear operational definitions are crucial in various fields to standardize practices, guide decision-making, and improve outcomes through effective management strategies.

B. The Influence of Artificial Intelligence on Operational Decisions

Artificial intelligence (AI) significantly impacts operational decision-making across various domains. AI enhances operational efficiency by understanding consumer behavior, improving service quality, and increasing marketing effectiveness (Sharma et al., 2022). Studies have explored AI's influence on managerial decision-making, strategic decision-making, and public policy decision-making (Tuncer, n.d.; Chernov et al., 2020; JI, 2023).

AI technologies like machine learning and deep reinforcement learning have transformed decision-making processes in fields such as warfare, healthcare, and enterprise management (Wang, 2023; Hassan et al., 2022; Cui et al., 2022). These technologies excel in real-time decision-making, improving outcomes, and fostering sustainable development through data analysis and predictive modeling (JI, 2023; Hassan et al., 2022).

The ethical considerations of AI in decision-making are crucial. Factors like autonomy, responsibility, and trust significantly impact the perceived usefulness and performance of AI solutions (Vărzaru, 2022). Organizations and policymakers must address these ethical implications when integrating automation and AI technologies into business practices (Lee & Tajudeen, 2020).

In decision-making support systems, AI has opened new research avenues, particularly in bounded rationality, multicriteria decision-making, and operational research (Pomerol & Adam, n.d.). Through automation and intelligent algorithms, AI systems can optimize decision tasks and enhance operational efficiency (Qureshi, n.d.).

In summary, AI's impact on operational decisions is diverse, from improving consumer experiences to revolutionizing strategic decision-making processes. As AI technologies advance, organizations must effectively utilize these tools while considering ethical implications and aligning with operational objectives.

C. The Influence of the Internet of Things (IoT) on Operational Decisions

The Internet of Things (IoT) has significantly impacted operational decisions across various industries. IoT technologies have evolved rapidly, integrating sensors and actuators to

create a network where information is shared seamlessly (Gubbi et al., 2013). This interconnected system allows for the development of a common operating picture, enhancing decision-making processes (Gubbi et al., 2013). In sectors like logistics and supply chain management, IoT enables radical transparency by connecting physical objects globally (Tu, 2018). The implementation of IoT in industries like the road freight sector has shown that end-to-end asset visibility influences operational effectiveness and decision quality (Farquharson et al., 2021).

Moreover, IoT technologies have been introduced in the medical field, revolutionizing existing systems and enabling the development of smart objects for pervasive frameworks (Tariq et al., 2020; Huang et al., 2021). In the context of the maritime industry, IoT deployment is supported through systems analysis, aiming to enhance operations within this sector (Hiekata et al., 2020). Additionally, IoT has been integrated with cloud computing to optimize decision-making processes in the cyber-power distribution system, enabling efficient and resilient operations (Sarker et al., 2023; Smys & Raj, 2019).

Furthermore, IoT has implications for the publishing industry, offering opportunities for data-driven competitive advantages through enhanced business models (Thiele, 2020). The integration of IoT with blockchain technology in logistics management has been explored to gather dynamic information accurately and evaluate quality effectively (Yujie & Qiuxia, 2022). In the hotel sector, factors influencing the implementation of IoT have been studied to understand the decision-making processes of hotels regarding IoT adoption (Moro et al., 2021).

In conclusion, the influence of IoT on operational decisions is vast and varied, impacting industries ranging from healthcare to logistics and supply chain management. By leveraging IoT technologies, organizations can enhance their decision-making processes, improve operational efficiency, and drive innovation across sectors.

D. The Influence of Big Data on Operational Decisions

Big data has a significant influence on operational decisions across various sectors. Research has shown that big data analysis systems can collect and convert data on business operations into valuable information, promoting timely decision-making and enhancing operational efficiency (Shan et al., 2022). Moreover, the quality of the big data team within a firm positively impacts the outcome of analytics and the decision-making process (Otchere et al., 2021). Big data not only enhances the information base for forecasting but also improves decision-making relevance, builds competitive advantages, and promotes dynamic decision-making (Ren, 2022).

Studies have highlighted the importance of big data in decision-making processes within organizations, emphasizing its role in innovation and operational improvements (Pillay & Merwe, 2021). Big data is intertwined with financial reporting and management, aiding in real-time decision-making and judgment processes (Megeid, 2022). Furthermore, big data-driven decision-making is gaining acceptance among operations and supply chain managers, enabling the utilization of vast amounts of data to derive valuable insights for decision-making (Lamba & Singh, 2018).

The application of big data in operational decision-making extends to various industries, including banking, where it is crucial for data-driven decisions (Hasan et al., 2021). Big data not only supports decision-making systems but also enhances the competitiveness and foundation of companies (Patil, 2018). Additionally, big data enables real-time operational decision-making through monitoring and efficiency analyses, utilizing big data engines at the operational level (Ding et al., 2023).

In conclusion, big data plays a pivotal role in influencing operational decisions by providing valuable insights, improving decision-making processes, enhancing competitiveness, and enabling real-time monitoring and analyses for efficient operational management.

E. Research Framework

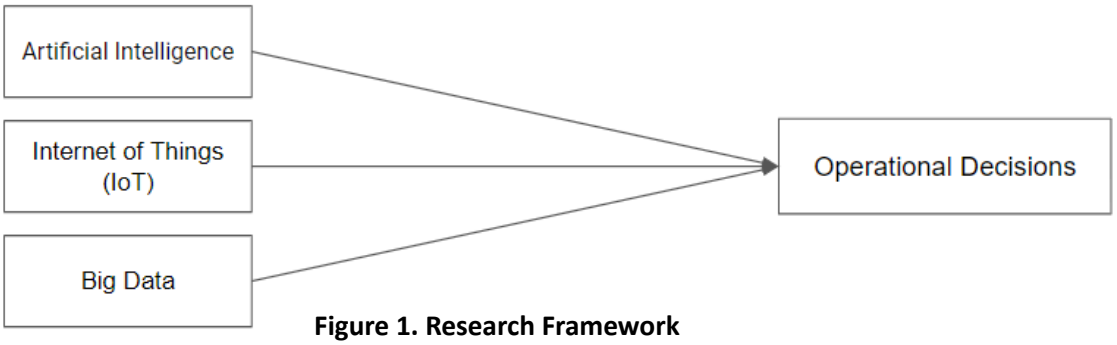

Figure 1. Research Framework

Hypothesis

H1: AI influences operational decision making
H2: Internet of Things (IoT) influences operational decision making
H3: Big Data influences operational decision making

4. Conclusions

Based on the discussion that has been presented, it can be concluded that operational management has a crucial role in organizational functioning by considering the coordination of resources and processes in order to achieve efficient and effective production and delivery of goods and services. In the context of crisis management, operational continuity becomes important, especially in the face of complex and uncertain environments where standard procedures may be insufficient. This study highlights the importance of operational definitions in various domains, whether related to self-management interventions or clinical practice in health care, to guide implementation, evaluation, and standardization. In the context of digital transformation, the use of artificial intelligence (AI), Internet of Things (IoT) technology, and Big Data analysis have a significant influence on operational decision making in various sectors. Implementation of this technology can increase operational efficiency, understand consumer behavior, and improve service quality and marketing effectiveness. However, the importance of ethical considerations in integrating these technologies is also emphasized, considering that factors such as autonomy, responsibility, and trust have a major influence on the performance and acceptability of AI solutions. In addition, the role of the Internet of Things (IoT) in operational decision making is also significant, enabling the creation of a comprehensive operational picture and more effective decision making through the integration of sensors and actuators. IoT has also changed the landscape of operational decisions across industries, from logistics to healthcare, by enabling the development of smart objects and connected systems that strengthen operational performance and efficiency. Meanwhile, big data also has a significant influence on operational decision making, enabling data collection and analysis on a large scale to gain valuable insights and improve operational efficiency. Overall, this research confirms that digital transformation technologies such as AI, IoT, and big data are playing an increasingly important role in operational decision making, providing valuable resources to improve performance and operational efficiency across various industrial sectors. In adopting this technology, organizations must take into account ethical considerations and direct it in accordance with established operational objectives.

While this research provides valuable insights into the influence of digital transformation technologies such as artificial intelligence (AI), Internet of Things (IoT), and big data on operational decision making, several limitations remain to be acknowledged. First, in exploring the literature, limitations in accessibility to certain resources or limitations in the scope of the databases used may affect the completeness of the picture of current trends and

practices in digital transformation. Second, although efforts were made to include as many articles and related studies as possible, there may still be articles that were missed or not included in this analysis. Third, this research relies primarily on published literature and may not include the latest information or innovative practices that are dynamically developing in the field. Fourth, there is a specific time frame used in this research, meaning that the trends and practices observed may not reflect the current situation or future developments. Therefore, use of the results of this research should be done with an understanding of these limitations, as well as with an awareness of the need to obtain additional information from other sources to obtain a more comprehensive picture of this topic.

The future research agenda in digital transformation in operational management includes several crucial aspects to consider. First, an in-depth case study was conducted on the implementation of digital technologies such as artificial intelligence (AI), Internet of Things (IoT), and big data in various industries and organizations. This research aims to provide deeper insight into the challenges faced and successful strategies in implementing digital technology in operational contexts. Next, an analysis of the organizational changes needed to support this digital transformation is needed, including team restructuring, increasing employee skills, and developing an organizational culture that supports innovation. A study of the influence of external factors such as government regulations, market dynamics and industry trends is also important, as these can influence the digital transformation strategy implemented by an organization. The development of an ethical framework for decision making is also a concern, considering the ethical implications of the use of digital technologies. In addition, there is also a need to develop more sophisticated and relevant performance metrics and use advanced data analysis techniques to develop predictive models that can forecast future trends in digital transformation. By exploring this research agenda, it is hoped that a more holistic and in-depth understanding of digital transformation in operational management can be gained and provide valuable guidance for organizations in facing challenges and exploiting opportunities in this digital era.

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