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Digital-Based Expedition Planning to Improve Operational Efficiency

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Abstract

Digital transformation has become a key factor in improving the operational efficiency of the shipping industry amid the growth of global e-commerce and changing consumer behavior. This research focuses on the development of a digital-based expedition business planning model that integrates technologies such as Enterprise Resource Planning (ERP), Internet of Things (IoT), and big data analytics. This study uses a descriptive qualitative approach to explore the impact of digitalization adoption on cost reduction, delivery acceleration, and improvement of customer service quality. The results show that operational digitalization is able to overcome traditional inefficiencies, speed up workflows, and improve accuracy and speed of services. However, the implementation of digitalization also faces challenges, including the need for changes in organizational culture, human resource readiness, and cybersecurity risks. With proper strategic planning, digitalization can be a key catalyst in strengthening the competitiveness of expedition companies, especially in the small and medium-sized segments. These findings make a theoretical and applicable contribution to the development of digital transformation strategies in the modern logistics industry.

Keywords

Digital Transformation, Enterprise Resource Planning, Expedition Business Planning, Internet of Things, Operational Efficiency, TOE Framework.

1. Introduction

In the last decade, digital transformation has become a major driving force in various industrial sectors, including logistics and shipping (Siti & Zahra, 2021). The rapid growth of global e-commerce, driven by changes in consumer behavior that increasingly rely on online services, has created a surge in demand for fast, accurate, and efficient shipping services (Saefullah, 2024; Rahmawati, 2024). Amid these dynamics, the shipping industry faces serious challenges in maintaining operational efficiency, especially when most companies still rely on conventional methods in fleet management, route planning, and human resource management. This operational inefficiency not only has an impact on increasing costs, but also reduces the level of customer satisfaction and the company's competitiveness in the market (Alda, 2025). Therefore, the need to integrate digital technologies such as cloud-based logistics management systems, the Internet of Things (IoT), and big data analytics—into shipping business planning is becoming increasingly urgent (Cyntia & Fuad, 2024; Prawiyogi & Anwar, 2023). A digital-based approach is believed to be able to encourage operational optimization, increase transparency, and accelerate strategic decision-making, thus becoming an important foundation for sustainable growth in the modern expedition industry.

Despite the recognized potential of digital technologies, their implementation in the expedition sector, particularly among Small and Medium Enterprises (SMEs), remains limited, revealing a critical research gap (Saputra et al., 2024). SMEs struggle with manual systems, lack of data integration, and insufficient use of cloud-based technologies, leading to high costs, delivery inaccuracies, and reduced customer satisfaction. Existing studies often focus on isolated aspects of digitalization, such as technology adoption or operational improvements, but rarely provide a comprehensive, SME-specific business planning model that integrates multiple digital technologies to address these inefficiencies (Asikin & Fadilah, 2024). This gap underscores the need for a strategic framework that not only leverages advanced technologies but also aligns with the unique operational constraints of SMEs in the expedition industry. This study aims to fill this gap by developing a digital-based expedition business planning model that enhances operational efficiency through the integration of cloud computing, IoT, and big data analytics. The research seeks to formulate a strategic framework that optimizes expedition planning and operations, empirically evaluate the impact of digital technology adoption on cost reduction, delivery speed, and customer service quality, and offer practical recommendations for SMEs to strengthen their competitiveness in the global logistics market.

This study contributes theoretically by advancing the literature on digital transformation in logistics management, particularly by proposing an integrative model tailored to SMEs. Practically, it provides a replicable planning framework that enables expedition businesses to overcome traditional inefficiencies and adapt to market dynamics. The paper is organized as follows: the literature review synthesizes existing research on digitalization and operational efficiency in logistics, establishing a theoretical foundation. The methodology section details the descriptive qualitative approach and case study design used to explore digital business planning. The results and discussion section presents findings on digitalization needs, strategies, and their impacts, linking these to the broader literature. Finally, the conclusion summarizes key findings, outlines implications for practice, acknowledges limitations, and suggests directions for future research. By addressing the research gap and offering both theoretical and practical insights, this study seeks to support the sustainable growth of expedition businesses in an increasingly competitive and technology-driven logistics ecosystem.

2. Literature Review and Hypothesis Development

Digital transformation has garnered significant attention in logistics management, particularly for its potential to enhance operational processes and business outcomes (Muhammad et al., 2023). Business planning that incorporates digital technologies, such as Enterprise Resource Planning (ERP), Internet of Things (IoT), and big data analytics, is critical for addressing inefficiencies in traditional expedition operations (Ayu, 2024). To frame this study, the Technology-Organization-Environment (TOE) framework is adopted as a conceptual lens, as it accounts for technological innovation, organizational readiness, and external environmental factors influencing digital adoption (Tornatzky & Fleischer, 1990; Cahyono, 2023).

Prior research highlights that ERP systems streamline business functions, reduce operational costs, and enhance decision-making, as demonstrated in logistics and defense sector applications (Riposo et al., 2013). Similarly, data analytics and automation accelerate operational accuracy and strategic decision-making, enabling companies to predict demand and optimize supply chains (Lei, 2025; Nazara et al., 2024). Adaptive digital business management is also essential for maintaining competitive advantage amid rapid market changes, emphasizing the need for innovative strategies tailored to dynamic consumer demands (Widiana et al., 2024; Rasyad & Mawardah, 2024; Rididast & Muhammad, 2024).

However, a notable gap exists in the literature, as few studies holistically examine digital-based business planning that integrates operational, marketing, and customer relationship management aspects in the expedition sector, particularly for Small and Medium Enterprises (SMEs). Existing research often focuses on technical or functional applications of digital tools, such as IoT for supply chain tracking or analytics for route optimization, without addressing broader strategic planning (Prawiyogi & Anwar, 2023). Additionally, external factors, such as government regulations, consumer behavior, and market dynamics, are rarely linked to digitalization strategies, limiting the understanding of their influence on operational efficiency (Cyntia & Fuad, 2024). For instance, regulatory support for digital infrastructure or shifts in consumer expectations for real-time tracking significantly affect technology adoption but are underexplored in the context of expedition businesses. The TOE framework helps address this gap by integrating technological (e.g., ERP, IoT), organizational (e.g., culture, human resource readiness), and environmental (e.g., market competition, regulations) factors into a cohesive model for digital business planning. This study builds on prior findings by emphasizing the need for systematic, technology-driven strategic planning that aligns with SME constraints and market demands.

By synthesizing literature on digital transformation, this study underscores the importance of a holistic approach that not only adopts advanced technologies but also considers organizational adaptability and external influences to optimize operational efficiency. The integration of ERP systems, as noted by Riposo et al. (2013), enhances cross-functional coordination, while data analytics, as highlighted by Lei (2025), enables predictive insights for demand and resource management. Furthermore, the role of organizational culture in fostering innovation, as discussed by Rasyad and Mawardah (2024), is critical for successful digital adoption. This study extends these insights by proposing a comprehensive planning model that bridges operational efficiency, customer satisfaction, and competitive advantage in the expedition industry, addressing the literature's limited focus on SME-specific digital strategies

3. Methods

This study employs a descriptive qualitative approach to gain an in-depth understanding of the phenomenon being studied, both from the perspective of participants and the researcher. Qualitative methods are well-suited for exploring the complexity and contextual dimensions of a phenomenon and understanding the meanings embedded within it. This approach typically involves data collection methods such as in-depth interviews, participant observation, and document or text analysis. In this research, the focus is on exploring the perceptions, experiences, and understandings of stakeholders regarding digital business planning within the expedition industry. The primary objective is to investigate how the adoption of digitalization influences operational efficiency. By using a qualitative approach, the study aims to uncover the diverse challenges, opportunities, and strategic responses that expedition companies encounter as they integrate digital technologies into their operations.

To support this exploration, the research also adopts a case study approach. This allows the researcher to study and explain in greater detail how digital-based business planning is implemented and how it contributes to enhancing operational efficiency in real-world contexts. The selected case studies focus on several expedition companies located in urban areas that have already applied digital solutions in their daily operational processes. Through these cases, the study seeks to highlight practical insights into how digital tools such as online tracking systems, integrated databases, and automated logistics processes affect the effectiveness and responsiveness of expedition services. The combined use of descriptive qualitative and case study approaches provides a comprehensive framework for understanding how digitalization is transforming business planning and operational performance within the expedition industry, particularly among companies operating in dynamic urban environments.

4. Results

4.1. Identifying Digitalization Needs in the Shipping Business

The pressures of globalization, rapid technological advancement, and rising consumer expectations for fast and accurate logistics services have created an urgent need for expedition companies to digitize their operations (Noviani & Muhammad, 2024). The study found that traditional expedition business models often face inefficiencies, limited data accuracy, and slower service speed, which ultimately reduce customer satisfaction and weaken competitiveness. Digitization becomes a strategic response to overcome these challenges, aiming to optimize operations and accelerate data-driven decision-making. In line with Riposo et al. (2013), the integration of advanced technologies like Enterprise Resource Planning (ERP) systems is a key solution that streamlines business functions, reduces costs, and adapts to dynamic operational demands. Hence, digitization is no longer optional it is essential for maintaining business sustainability in the digital era.

The study also reveals that delays in delivery, inaccurate tracking, inefficient data management, and high operational costs are the primary barriers in traditional expedition methods (Idris et al., 2023; Evyana et al., 2024). Therefore, digital transformation becomes increasingly urgent as a response to these persistent issues. Digitalization is viewed as a foundational solution to accelerate workflow, improve accuracy, minimize human error, and enable flexible, customer-centric business models (Adha, 2020). One major step in this transformation is the integration of ERP systems into daily operations (Alayida et al., 2023). These systems support end-to-end management, from inventory and shipping processes to finance, enhancing data accuracy and interdepartmental communication (Windyasari, 2024). Additionally, data-driven decision-making through big data analytics allows companies to track

customer behavior, forecast demand, and optimize shipping routes efficiently (Moh & Dewi, 2025). Automation systems for order processing and tracking also significantly reduce human error and speed up operations.

The impact of digitalization is reflected in improved workflow efficiency and resource use (Siti, 2024). Processes such as order verification and communication, once slow and manual, are now faster and more reliable through ERP and automation platforms (Sittong & Rayyan, 2024). Moreover, digitization cuts operational costs by optimizing routes, predicting demand, and minimizing resource waste (Padak et al., 2025; Sri, 2025). The result is reduced labor needs and lower operational expenditure (Putra, 2024). Customer service benefits from enhanced accuracy and transparency through real-time tracking. Customers receive prompt, reliable updates about their shipments. Furthermore, digitalization supports the emergence of innovative, technology-based business models, such as drone and autonomous deliveries or app-based services, expanding market reach and meeting evolving consumer demands (Harmoko et al., 2025).

4.2 Digitalizing Shipping for Operational Efficiency

Digital transformation in the logistics and expedition sector has become essential in addressing operational efficiency and dynamic customer demands. Digitalization enables workflow simplification, automation, and resource optimization in the supply chain. In business planning, adopting digital systems is a key element in creating a modern and competitive expedition business. Research by Faisal et al. (2024) shows that implementing a web-based inventory system at PT Bintang Delapan Terminal improved logistics data processing time from 20 to 7 minutes per transaction and reduced input errors from 12% to 3%, increasing operational efficiency by 65%. Real-time stock monitoring also accelerates decisions and reduces distribution delays.

Ariyanto and Takaya (2024) found that digitalized operations cut inter-city delivery times from 48 to 30 hours and saved logistics costs by up to 18% through GPS and route optimization. Despite these benefits, Tamba (2024) noted that 63% of expedition businesses face challenges due to limited technical skills, and 40% of MSMEs lack digital infrastructure. Low digital literacy and high initial costs remain major obstacles. Muharrir et al. (2024) reported that medium-sized businesses benefit from digitalization in fleet tracking and communication, while Rachman and Susyanti (2024) emphasized Business Intelligence (BI) in predicting needs. Indriyani et al. (2024) found that MSMEs saw order volumes nearly triple and complaints decline after adopting online systems. Wardhani and Suharto (2024) showed that the EOQ digital method improved procurement efficiency by 40%. These findings confirm that digitalization supports not only technical operations but also long-term, adaptive business planning in the industry 4.0 era.

Table 1 shows that digitalization in expedition business operations significantly improves time efficiency and cost reduction. Faisal et al. (2024) found that implementing an inventory information system reduced data processing time from 20 minutes to 7 minutes and lowered errors from 12% to 3%, reflecting 65%-time efficiency and improved accuracy key for operational optimization. Ariyanto and Takaya (2024) revealed that GPS and route optimization reduced inter-city delivery times from 48 to 30 hours and saved logistics costs by 18%, enhancing service speed and lowering both fixed and variable expenses. Furthermore, Wardhani & Suharto (2024) reported that applying the digital-based Economic Order Quantity (EOQ) method improved raw material procurement efficiency by 40%, reducing waste and accelerating stock turnover. These findings demonstrate that digitalization in operations not only enhances technical performance but also serves as a strategic foundation for planning cost-effective, responsive, competitive expedition businesses in the digital era.

Table 1. Digitalization of Operational Processes and Time/Cost Efficiency

Digitalization Aspect	Data/Facts	Impact	Business Implications
Inventory information system	Faisal et al. (2024): Data processing from 20 minutes → 7 minutes, input errors decreased from 12% → 3%	Time efficiency up 65%, accuracy improved	Become the basis for operational efficiency
GPS & route optimization	Ariyanto & Takaya (2024): Intercity delivery time decreased from 48 hours → 30 hours, logistics costs decreased by 18%	Speeded service, lower costs	Reduced fixed and variable costs
Digital-based EOQ	Wardhani & Suharto (2024): Raw material procurement efficiency increased by 40%	Reduced waste, fast stock rotation	More efficient and responsive inventory management

Table 2. Challenges of Implementing Digitalization in Expeditions

Challenges	Data/Facts	Impact	Solutions or Important Notes
Lack of skilled human resources	Tamba (2024): 63% of expedition business actors lack technical skills	Barriers to adapting new technologies	Need digital training & mentoring
Minimal digital infrastructure	Tamba (2024): 40% of expedition MSMEs do not yet have a tracking system or API	System integration fails, services are not optimal	Need investment support and technology access
Initial investment costs	General in all research	Technology adoption is hampered	Technology subsidy/incentive scheme from the government

Table 2 highlights key challenges in expedition sector digitalization, including limited skilled human resources (Tamba, 2024), inadequate digital infrastructure among MSMEs, and high initial investment costs. Solutions involve digital training, investment support, and government incentives. Overcoming these barriers requires collaboration between business actors, technology providers, and the government to ensure successful digital transformation.

Table 3 describes the strategic impact of digitalization on MSMEs and business decisions, focusing on various technologies and their implementation. The automated ordering and tracking system implemented by Indriyani et al. (2024) showed an increase in orders from 30 to 85 per day, as well as a decrease in complaints, which has implications for improving performance and customer satisfaction, as well as creating transparency that increases customer trust and loyalty. The use of Business Intelligence (BI) by Rachman & Susyanti (2024) to predict delays and fleet loads allows for faster and more accurate decision-making, making BI a key tool in business planning and forecasting. The integration of data science, as reported by Muharrir et al. (2024), improves inter-divisional communication, leading to increased operational coordination and internal efficiency, and strengthening team synergy. These three focuses of digitalization

have a positive impact on improving operational efficiency and better strategic decision-making in MSMEs.

Table 3. Strategic Impact of Digitalization on MSMEs and Business Decisions

Digitalization Focus	Data/Facts	Positive Impact	Strategic Relevance
Automated booking and tracking system	Indriyani et al. (2024): Orders increased from 30 → 85 per day, complaints decreased	Performance increases, customer satisfaction increases	Transparency creates trust & loyalty
Business Intelligence (BI)	Rachman & Susyanti (2024): BI used to predict delays, fleet load	Decision making is faster & more accurate	BI as a key planning and forecasting tool
Data science integration	Muharrir et al. (2024): Inter-divisional communication improved	Operational coordination increases	Increase team synergy and internal efficiency

Table 4. Comparison Before and After Digitalization

Operational Aspects	Condition Before Digitalization	Condition After Digitalization	Percentage Change
Logistics data processing time	20 minutes per transaction	7 minutes per transaction	Efficiency 65%
Data input error rate	12%	3%	Decrease 75%
Inter-city delivery time	48 hours	30 hours	Faster 37.5%
Number of daily orders (UMKM)	30 orders	85 orders	Improvement 183%

Table 4 presents a comparison of operational conditions before and after digitalization, highlighting significant efficiency improvements. Logistics data processing time decreased from 20 to 7 minutes per transaction, reflecting a 65% increase in efficiency. Data input errors dropped from 12% to 3%, a 75% reduction. Inter-city delivery times were reduced from 48 to 30 hours, improving speed by 37.5%. Daily MSME orders rose from 30 to 85, marking a 183% increase. These results indicate the transformative impact of digitalization on operational efficiency, cost savings, and decision-making. However, this success faces structural challenges, including limited skilled human resources, inadequate digital infrastructure, and high initial investment costs. Addressing these requires comprehensive support through training, technological assistance, and government incentives. Digitalization is not merely about adopting technology but transforming business models through data integration, process transparency, and Business Intelligence. Ensuring its sustainability demands a collaborative, systemic approach to drive long-term competitiveness and structural change.

5. Discussion

The findings of this study underscore that digitalization is a pivotal factor in addressing inefficiencies inherent in traditional expedition business models, aligning with prior literature on logistics transformation. Manual processes, such as inventory management, order processing, and shipment monitoring, often result in

human errors and delays, as noted in earlier studies (Ridho et al., 2024). The integration of Enterprise Resource Planning (ERP) systems, as implemented by the case study companies, unifies business functions into a single platform, enabling real-time data processing, minimizing redundancy, and reducing errors, which corroborates findings that ERP enhances cross-functional coordination (Muhammad & Rini, 2023).

Furthermore, the application of big data analytics facilitates in-depth analysis of market demand and customer behavior, allowing companies to optimize shipping routes and manage stock with greater accuracy, consistent with research emphasizing data-driven decision-making in logistics (Tuti, 2024). Automation technologies, such as automated transaction processing and shipment tracking, reduce reliance on manual labor, accelerate response times, and improve delivery accuracy, supporting prior evidence that automation boosts operational effectiveness (Nazara et al., 2024). These findings align with the Technology-Organization-Environment (TOE) framework, which highlights the interplay of technological innovation, organizational readiness, and environmental factors in driving digital adoption (Tornatzky & Fleischer, 1990).

However, this study extends the literature by demonstrating how SMEs can leverage integrated digital solutions to overcome resource constraints, a topic underexplored in previous research. Strategic digitalization planning, as evidenced by the case studies, requires a clear roadmap that identifies technology implementation stages, operational flow adjustments, and resource allocation, reinforcing the importance of structured planning for successful transformation (Karsana et al., 2019; Riski & Ardiansyah, 2024). Organizational flexibility and an innovation-driven culture are critical success factors, as companies that foster creative thinking and experimentation adapt more effectively to digital systems, consistent with studies on organizational adaptability (Mustapa, 2025; Vip et al., 2023). Human resource training also emerged as vital, with skilled employees ensuring smooth system implementation, aligning with research on the role of digital literacy in transformation (Muzakki et al., 2024).

Despite these benefits, challenges such as rapid technological updates, organizational culture shifts, and cybersecurity risks, as identified in the case studies, mirror broader literature on digital transformation barriers (Aedi, 2025; Fahad et al., 2024). For instance, delays in adopting new technologies can lead to inefficiencies, while cybersecurity threats like data breaches pose risks to customer trust, necessitating robust security measures (Wildan et al., 2024). Unlike prior studies that focus on large-scale logistics firms, this research highlights the unique challenges SMEs face, such as limited digital infrastructure and high initial costs, and proposes a tailored planning model to address them (Aulia et al., 2024). The findings also suggest that digitalization not only streamlines operations but also enables innovative business models, such as application-based tracking, which enhance customer satisfaction and market competitiveness, extending the work of Rasyad and Mawardah (2024) on adaptive business strategies.

By linking these results to the TOE framework, this study provides a comprehensive analysis of how technological, organizational, and environmental factors converge to enhance operational efficiency in SMEs. Practically, the proposed digitalization roadmap offers SMEs a replicable strategy to integrate ERP, big data, and automation, addressing both operational and strategic needs. These insights contribute to the literature by bridging the gap between isolated technology applications and holistic business planning, emphasizing the need for systemic digital transformation to ensure long-term competitiveness in the expedition industry.

6. Conclusion

This study confirms that digital-based expedition business planning plays a vital role in improving operational efficiency in response to globalization, technological advances, and rising consumer expectations for fast and accurate logistics services. The integration of technologies such as Enterprise Resource Planning (ERP), big data analytics, and automation helps expedition companies streamline workflows, reduce operational costs, and enhance service accuracy, thereby boosting competitiveness. Digitalization supports faster decision-making and more responsive business models by optimizing inventory management, order processing, and shipment tracking. It also drives innovation through real-time tracking and app-based services that improve customer satisfaction.

However, several challenges emerge, including the need for continuous adaptation to rapid technological changes, the transformation of organizational culture to embrace innovation, and the implementation of strong cybersecurity measures to prevent data breaches. Theoretically, this study contributes to logistics management by introducing a digital planning model tailored to SMEs, grounded in the Technology-Organization-Environment (TOE) framework. Practically, it offers actionable strategies for SMEs to adopt ERP, IoT, and analytics, helping them address inefficiencies and compete effectively in a tech-driven environment.

Despite its contributions, the study's qualitative nature limits its generalizability, especially to large-scale expedition firms. Its focus on internal factors also overlooks the impact of external influences such as regulatory frameworks and global market dynamics. Limited access to data from varied company scales further narrows empirical depth. Future research should use mixed methods to validate findings and broaden scope by including large firms and diverse regions. Longitudinal studies are also needed to assess the long-term effects of digital transformation and explore the role of policies and cybersecurity in supporting adoption. Addressing these gaps will enhance the development of scalable digital strategies for a competitive logistics sector.

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