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Enhancing Cargo ERP Implementation Efficiency through Agile Approaches

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ABSTRACT

Enterprise Resource Planning (ERP) system implementation in the cargo logistics industry often needs help with challenges such as high costs, time delays, and gaps between business needs and system capabilities. Traditional approaches are often less responsive to change, leading to a lack of efficiency in cargo operations. This research aims to improve the efficiency of ERP implementation in the cargo logistics industry through an Agile approach. Research methods include literature analysis, interviews with industry experts, development of an Agile project plan, system testing, and evaluation of implementation results. Implementing the Agile approach in the cargo logistics industry has increased efficiency by reducing implementation costs, accelerating implementation time, increasing adaptability to change, and improving user satisfaction. This research contributes to developing best practices for ERP system implementation in the cargo logistics industry. The results can help cargo companies adopt a more adaptive and responsive approach, improve operational efficiency, and gain a competitive advantage in a competitive market.

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INTRODUCTION

In the cargo logistics industry, Enterprise Resource Planning (ERP) systems are essential in managing various business processes in an integrated manner. ERP is a software solution designed to manage inventory management, shipment tracking, route optimization, financial management, human resources, and customer relationship management (CRM) on a single platform. In cargo logistics, essential ERP functions include inventory, shipment tracking, route optimization, and financial management. Inventory management helps monitor and optimally manage inventory levels, reduce stock shortages, and improve overall supply chain management(Amore et al., 2020; Celik et al., 2023; Singh et al., 2018; Thomas & Helgeson, 2021; Varriale et al., 2023). ERP systems also enable real-time shipment tracking, allowing logistics teams to monitor the status, location, and condition of goods throughout the transport process.

In addition, ERP plays a vital role in route optimization by using algorithms and data analysis to optimize transport routes based on factors such as distance, traffic conditions, fuel efficiency, and delivery schedules. Financial management is also integrated into the

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ERP system, handling financial aspects such as billing, payments, budgeting, and financial reporting. The increasing complexity and competition in the cargo logistics industry highlight the importance of effective ERP implementation. Companies face challenges such as demand variability, supply chain disruptions, regulatory compliance, global market dynamics, and the need for real-time decision-making and visibility(Bowen & Leinbach, 2003; du Plessis et al., 2024; Garro et al., 2023; Jörgensen et al., 2023; Kooij et al., 2021; Schünemann et al., 2022). Hence, there is an urgent need to improve the efficiency of ERP implementations, specifically for cargo logistics companies. Challenges that must be addressed include customization, scalability, data integration, user adoption, and tailoring ERP functionality to specific industry processes and standards.

Enterprise Resource Planning (ERP) system implementation is often a complex challenge for cargo logistics companies. One of the main obstacles is the high costs associated with such implementation. These costs include purchasing ERP software, customizing the system to specific business needs, and training required for users. In addition, there are frequent time delays in the implementation process. This can be due to technical difficulties, system integration with existing infrastructure, or other issues that arise during the implementation phase. The mismatch between ERP systems' capabilities and cargo logistics companies' business needs is also a severe challenge. Often, ERP systems do not fully meet the unique operational needs of the logistics industry, requiring additional customization that is time-consuming and costly. In addition, resistance to change from users is also a significant obstacle. Changes in business processes and work habits can create discomfort and uncertainty among users, requiring more significant efforts to ensure successful adoption.

Lack of precise project planning and effective governance can also hinder ERP implementation. Poorly planned projects can have difficulty managing resources, effectively measuring project progress, and identifying and addressing risks arising during implementation. Therefore, cargo logistics companies must identify these challenges and develop appropriate strategies and plans to overcome these obstacles for a successful ERP system implementation. Efficiency plays a crucial role in implementing Enterprise Resource Planning (ERP) systems, especially in the context of the cargo logistics industry. First, efficiency helps cargo logistics companies reduce costs and avoid wasting resources. With a streamlined implementation process, companies can allocate budgets more optimally, reduce unnecessary customization costs, and minimize wasted time and effort. In addition, efficiency also impacts the provision of faster time-to-value from the implemented ERP system. With a streamlined implementation process, companies can utilize the ERP system earlier and reap its benefits faster. This allows companies to increase productivity, optimize business processes, and increase competitive advantage faster than competitors.

Efficiency also contributes to increased user adoption of the new ERP system and reduced disruption to operations. Companies can ensure users adopt the system better by reducing complexity and difficulty in use and providing adequate training. This reduces resistance to change from users and minimizes operational disruptions as users more quickly adapt to the required changes. Lastly, efficiency in ERP implementation also supports bet-

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ter decision-making based on real-time business data. Companies can collect, integrate, and analyze business data more effectively with a streamlined implementation process. This provides access to more accurate insights and supports more timely and effective decision-making(De Siqueira Silva et al., 2022; Densberger & Bachkar, 2022; Lim et al., 2021; Pobedinsky, 2022). Thus, the importance of efficiency in ERP implementation impacts the financial and operational aspects and affects the overall business value and long-term success of the investment in ERP systems in the cargo logistics industry.

The Agile approach, becoming popular in software development and project management, offers several relevant concepts in addressing the challenges often faced in traditional ERP projects in the cargo logistics industry. First, Agile applies iterative and incremental development, allowing companies to break down ERP implementation projects into small iterations called sprints(Al-Saqqa et al., 2020; Bomström et al., 2023; Dingsoeyr et al., 2019; Najihi et al., 2022; Rindell et al., 2021; Santos et al., n.d.; Serrador & Pinto, 2015). This helps address the high cost and time issue, as the team can focus on developing the most important features first, reduce the cost of unnecessary customization, and ensure early delivery of value. Collaboration with customers is also a key focus in the Agile approach. Actively involving customers in the development process allows the team to obtain valuable feedback, provide appropriate training, and adapt the system according to the user's needs. This helps increase user adoption and reduce resistance to change often occurring in ERP projects.

In addition, the Agile approach emphasizes early and continuous delivery of value(Gutierrez et al., 2019; Hasan et al., 2013; Martin, 2023; Michalides et al., 2023; Mishra & Alzoubi, 2023; Paasivaara et al., 2018; Tøndel et al., 2022). By prioritizing the features with the highest business value first, cargo logistics companies can utilize the ERP system faster and reap the benefits earlier. This also allows companies to make better decisions based on continuously updated information and business insights from iterative development. Overall, the Agile approach has great potential to overcome the challenges of traditional ERP implementation in the cargo logistics industry(Abusaeed et al., 2023; Altuwaijri & Ferrario, 2022; Mero et al., 2022; Sarhadi et al., 2022). Flexibility, adaptability, focus on value delivery, and customer collaboration are the fundamental cornerstones in dealing with the dynamics and complexities associated with ERP system implementation. By applying this approach appropriately, companies can increase efficiency, reduce risk, and achieve tremendous success in implementing an optimal ERP system for their business needs.

While Agile approaches offer several potential benefits in cargo ERP implementations, methods must be established to apply them specifically in that context. It should be recognized that the use of Agile in cargo ERP implementations has yet to be fully explored, and there is no framework specifically tailored to the unique characteristics of the cargo logistics industry. Therefore, this research aims to fill this gap by providing a more in-depth understanding of how Agile approaches can be effectively applied in cargo ERP implementation. By focusing the research on the integration between Agile methodologies and the specific business needs of the cargo logistics industry, this research can provide practical guidance and a helpful framework for cargo companies looking to adopt an Agile approach

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in their ERP system implementation. By addressing these research gaps, this research can make a meaningful contribution to developing theory and practice in cargo ERP implementation with an Agile approach.

METHODS

The first stage was requirements definition, which involved a literature review, functional and non-functional requirements identification, and stakeholder interviews. The second stage is planning, which involves developing a project plan and selecting a suitable Agile methodology. The third stage is developing the ERP system with an Agile approach through iterative development, integration, and customization. The last stage is system testing, which includes functional, integration, and user engagement testing to ensure quality and successful adoption after implementation.

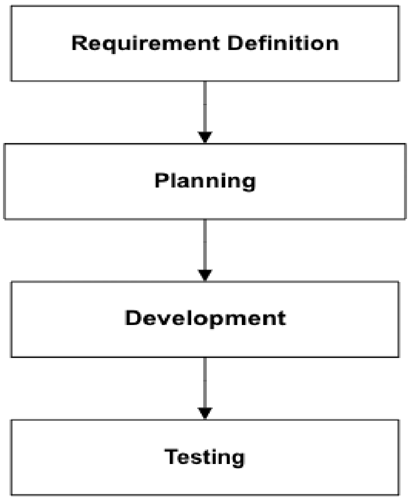

Figure 1. Research Stages

Definition of need

The first stage in the research was requirement definition. The activities in this stage involved an in-depth literature study to understand the specific needs for ERP implementation in the cargo logistics industry. In addition, it involves identifying and analyzing the functional and non-functional requirements of the ERP system to be implemented. These may include the availability of real-time information, inventory management, shipment tracking, and integration with other systems within the company. Interviews with internal and external stakeholders are also conducted to gain a more in-depth perspective on the business and technical needs that must be met.

Planning

The next stage is planning, where the main activity is to develop a comprehensive project plan. This plan includes implementation timelines, budget allocation, human resource management, and assignment of team responsibilities. In addition, at this stage, the Agile methodology that best suits the project characteristics and company needs is selected and applied. The selection of this methodology is essential to direct the development of the ERP system with an iterative and incremental approach consistent with Agile principles.

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Development

After planning, the next stage is system development. Activities at this stage involve initiating the ERP system development using the previously selected Agile approach. The team will execute iterative and incremental development principles by actively involving users in each iteration. In addition, this stage also applies the integration and customization required to meet the pre-defined business needs.

Testing

The last stage is system testing. Activities at this stage include planning and executing a series of functional and non-functional tests to ensure the ERP system functions as expected. These tests include integration testing between ERP modules, load testing, and involving users in system trials to get feedback and ensure successful adoption after implementation. This testing phase is essential to ensure the quality and performance of the system before it is widely used in a production environment.

RESULTS AND DISCUSSION

Definition of need

The outcomes of the Requirements Definition stage include a deeper understanding of the specific requirements for ERP implementation in the cargo logistics industry obtained through a comprehensive literature study. In addition, the results include identifying and analyzing functional and non-functional requirements of the ERP system to be implemented, such as inventory management, shipment tracking, and integration with other systems within the company. The outcome of this stage also includes a more in-depth understanding of the business and technical requirements obtained through interviews with internal and external stakeholders.

Table 1. Results of Needs Definition

No.	Requirement Definition Result	Data Source
1	A deeper understanding of the specific needs of ERP in the cargo logistics industry through literature study.	Academic journals, reference books
2	Functional requirements of the ERP system, such as inventory management, shipment tracking, and integration with other systems within the company, were identified, as well as non-functional requirements, such as system performance, data security, and efficient governance. In-depth analyses are conducted to ensure these needs are well-documented.	Interviews with stakeholders, case studies of related companies
3	Interviews with internal and external stakeholders obtained a deeper understanding of the business and technical requirements. These interviews involved various parties, including management, logistics, and IT departments, to ensure that the needs identified aligned with the company's business objectives and could meet the required technical standards.	Stakeholder interviews, internal document analysis

Based on Table 1, the results of the Requirements Definition stage in ERP implementation in the cargo logistics industry show a deeper understanding of the specific require-

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ments needed. This was obtained through a thorough literature study from sources such as academic journals and reference books, which provided a solid foundation for understanding this industry's complexities and unique specifications. In addition, the results also included the identification of functional and non-functional requirements of the ERP system to be implemented. Functional needs, such as inventory management, shipment tracking, and integration with other systems within the company, and non-functional needs, such as system performance and data security, have been analyzed in depth. This provides a clear understanding of the features and standards that must be met to ensure successful ERP implementation. In addition, a deeper understanding of the business and technical needs was also obtained through interviews with internal and external stakeholdersInvolving various parties such as management, the logistics department, and IT in these interviews provides a comprehensive perspective on the needs that must be met to achieve the company's business objectives and meet the required technical standards. Thus, the results of this Needs Definition stage become a solid foundation for continuing the next stages in the ERP implementation project appropriately and efficiently according to the existing business needs.

Planning

The results of the Planning stage in ERP implementation in the cargo logistics industry include several vital aspects. First, the development of a comprehensive project plan, which includes an implementation schedule, budget allocation, human resource management, and assignment of team responsibilities. This plan becomes the leading guide in directing the entire implementation process effectively and efficiently. Next, the outcome of this stage is the selection and application of the Agile methodology that best suits the project characteristics and company needs. Agile methodologies such as Scrum, Kanban, or Lean are selected based on an in-depth evaluation of the project complexity and organizational preferences. Another critical step is to develop a product backlog and sprint planning for the development phase, which provides a detailed view of the features to be developed in each iteration. This helps the team stay focused, prioritize well, and ensure continuous value delivery throughout the implementation process. Thus, the outcome of the planning stage provides a strong foundation for proceeding with the implementation project with a clear structure, proper methodology selection, and efficient resource management.

The results of this stage, as displayed in Figure 2, show that the planning stage in ERP implementation in the cargo logistics industry has been well implemented. Developing a comprehensive project plan covering essential aspects such as implementation schedule, budget allocation, resource management, and team responsibilities shows the seriousness and regularity of managing the project. Furthermore, the selection and application of an Agile methodology appropriate to the characteristics of the project and the needs of the company confirmed an adaptive and efficient approach to dealing with the complexity of the ERP project. This result was supported by creating a product backlog and sprint planning for the development phase, ensuring focus, good prioritization, and continuous value delivery throughout the implementation process. These steps became a solid foundation for continuing the project effectively and efficiently based on the company's business objectives in implementing an ERP system in the cargo logistics industry.

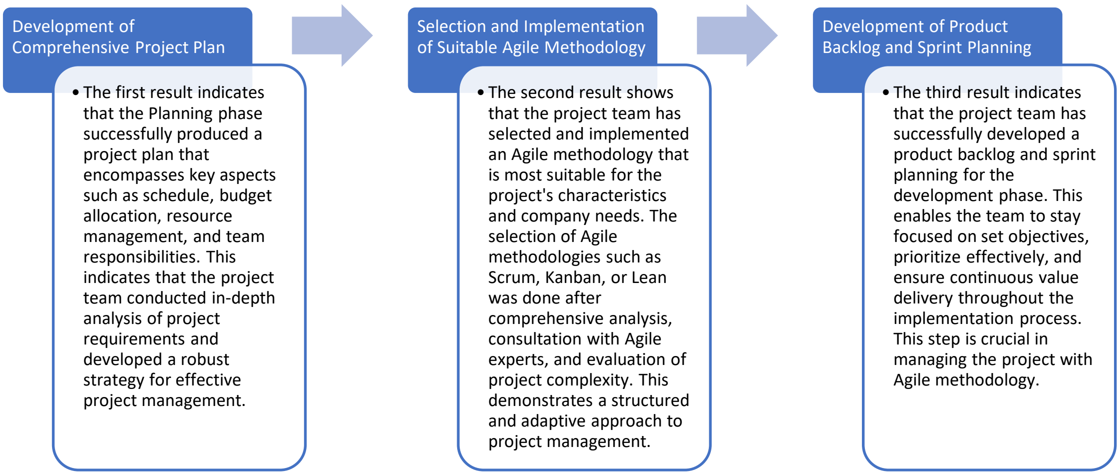

Figure 2. Project Plan

Development

The Development phase begins by applying a pre-selected Agile approach. These approaches include methodologies such as Scrum, Kanban, or Lean, which are chosen based on the project's characteristics and company needs. This step aims to start the ERP system development process in a structured and adaptive manner. Furthermore, in the Development phase, iterative and incremental development principles are applied by actively involving users in each iteration. This approach enables incremental system development, taking user feedback to improve the features developed continuously. The final step in the Development phase is to implement the necessary integrations and customizations to meet the business needs that have been previously defined. Integration between ERP modules and customization of certain features are done so that the system can function according to the operational needs of companies in the cargo logistics industry. Thus, the results of the Development stage include initiating the development of an ERP system with an Agile approach, applying the principles of iterative and incremental development, and implementing the necessary integrations and customizations to meet predetermined business needs. This stage is critical in laying the foundation of a system that meets the company's objectives in optimizing cargo logistics operations.

Table 3. Development

Sprint	Sprint Description	Sprint Objectives	Sprint Duration	Key Tasks	Main Outcomes
1	Development of Inventory Management Module	Complete development of inventory management module including inventory recording, status up-	2 weeks	Requirement analysis, module design, feature development, module testing	Functional inventory management module integrated with ERP sys-

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Sprint	Sprint Description	Sprint Objectives	Sprint Duration	Key Tasks	Main Outcomes
		date, and inventory reports.			tem.
2	Integration of Shipping Module with Inventory Module	Integrate shipping module with inventory module to ensure inventory availability during shipping.	2 weeks	Integration analysis, integration development, integration testing	Integrated module ensuring smooth data exchange and consistency.
3	Development of Shipment Tracking Feature	Develop shipment tracking feature to allow customers and management to track shipment status in real-time.	3 weeks	Feature design, feature development, feature testing	Responsive shipment tracking feature providing accurate information.
4	Customization of Financial Features to Meet Specific Needs	Customize financial features to meet specific company needs in financial reporting and cost analysis.	2 weeks	Requirement analysis, feature customization, feature testing	Customized financial features supporting reporting and analysis.
5	System Testing and User Feedback Collection	Conduct comprehensive system testing and obtain feedback from users for final adjustments and improvements.	1 week	System testing, feedback collection	Thoroughly tested system with adjustments based on user feedback.

Table 3 provides a structured and detailed overview of the ERP system development process in the cargo logistics industry. In this analysis, several important aspects can be highlighted. First, the specific sprint descriptions illustrate the focus of each iteration on developing specific features or modules. For example, Sprint 1 focused on developing an inventory management module with features such as inventory recording, status updates, and inventory reports. This shows that the project team deeply understood the functional requirements to be met in each sprint. Secondly, clearly defined sprint goals provide a purposeful and measurable direction for each development period. For example, Sprint 2 aimed to integrate the shipping module with the inventory module to ensure inventory availability during shipping. This clear goal allows the team to focus on achieving concrete and measurable results.

Furthermore, the sprint duration adjusted to the complexity of the work reflects a realistic approach to organizing the development schedule. For example, Sprint 3 has a longer duration due to its focus on developing delivery tracking features that may require extra design, development, and testing time. Identified vital tasks and deliverables provide strong guidance for each development iteration. For example, Sprint 4 emphasizes the customization of financial features to the company's needs, with the expected outcome being customized financial features that support reporting and analysis processes. Finally, the emphasis on system testing and user feedback collection in Sprint 5 demonstrated the team's commitment to ensuring system quality and user satisfaction. This reflects an inclusive, iterative approach, where the development process focuses on feature development and rigorous verification and response to user feedback. Overall, the sprint table provides clear evidence of a structured, scalable, and adaptive approach to managing the ERP system development process in the cargo logistics industry. This analysis highlights the importance of a detailed sprint plan, clear objectives, customized duration, comprehensive testing, and collection of user feedback in achieving a successful ERP system implementation.

Testing

The Testing phase of ERP implementation in the cargo logistics industry results in a series of activities that are crucial to ensure the success of the implemented system. The testing includes comprehensive functional and non-functional testing to verify that the features in the ERP system perform as expected, including inventory management, shipment tracking, and financial reporting. In addition, integration testing between ERP modules was also conducted to ensure smooth interoperability and efficient data exchange between modules. Load testing was also conducted to test the system's performance under high workload conditions to ensure optimal performance. Another essential aspect is users' involvement in system trials, which aims to get direct feedback from users regarding their experience using the system. This feedback is invaluable for making final adjustments before full implementation and ensuring successful adoption once the system is officially implemented. Overall, the Testing stage is essential in ensuring that the implemented ERP system can function adequately, provide optimal performance, and be well received by end users so that the objectives of system implementation can be achieved successfully.

CONCLUSION

In this research, it has been identified that using an Agile approach in implementing ERP systems in the cargo logistics industry can improve implementation efficiency. By facing the challenges commonly faced by cargo companies in implementing traditional ERP systems, the Agile approach provides a more adaptive, responsive, and value-oriented solution. The research stages, including requirements definition, planning, development, testing, and evaluation, provide an in-depth understanding of how Agile can be effectively applied in a cargo logistics environment. The results of this study show that Agile enables cargo companies to respond to changes more quickly, reduce implementation costs and time, improve system quality, and increase user satisfaction. In addition, integrating Agile with solid project management practices is also a critical factor in successfully implementing ERP systems in the cargo logistics industry. Thus, this study concludes that the Agile approach has great potential to improve the efficiency of ERP system implementation in the cargo logistics industry by providing a competitive advantage through better system performance, adaptability to change, and faster response to business needs. However, it is essential to remember that Agile implementation must be accompanied by a deep understanding of business needs and company policies and full support from all relevant stakeholders to achieve optimal success.

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