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Development of Business Intelligence in a Cargo Company Using the Agile Scrum Approach

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ABSTRACT
This research uses the Agile Scrum approach to develop Business Intelligence (BI) in a cargo company. The problems faced in the cargo industry, such as fuel price volatility and demand fluctuations, demand an adaptive and fast BI solution. The method includes stages from requirements definition to testing with Agile Scrum as the main framework. The results showed that developing BI with this approach resulted in a more adaptive, rapid, and high-quality solution. The contribution of this research is to provide a better understanding of the use of Agile Scrum in the context of BI development, provide practical guidance for the cargo industry, and provide empirical evidence of the effectiveness of this methodology in improving the efficiency and effectiveness of BI development.

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INTRODUCTION

Business Intelligence (BI) has become the backbone of effective decision-making in various industries, including cargo. In an increasingly dynamic and complex context, BI enables companies to collect, analyze, and interpret data to generate actionable information, allowing them to act proactively and promptly (Bouaziz et al., 2019; Camacho-Muñoz et al., 2023; Kimball et al., 2003; Santoso & Yulia, 2017; Sihombing, 2022). The cargo industry, in particular, is a sector faced with unique and diverse challenges. Unexpected fluctuations in fuel prices, route disruptions that can hamper operations, and rapid changes in demand are some of the challenges that cargo companies often face. In this context, BI solutions are becoming increasingly important as they can help companies track, optimize, and adjust their processes according to dynamic market changes.

The main challenges in cargo logistics are often related to uncertainty and volatility. Sudden changes in fuel prices, extreme weather, or changing global economic conditions can significantly impact shipping operations and supply chain management(Corrotea et al., 2024; Hunt et al., 2023; Ilic & Momcilovic, 2023; Li et al., 2021; Malik et al., 2023; Vinje Kramer & Steen, 2022; Yıldız et al., 2023). In addition, the availability and integration of data from multiple sources is also a challenge, along with the need for staff with the right skills and knowledge to analyze the data. Business Intelligence can be the perfect solution to overcome these challenges. With deep data analysis, clear visualizations, and scalable

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reporting and dashboards, BI enables cargo companies to gain deep insight into their operational performance. Thus, companies can respond to market changes more quickly and efficiently.

The Agile methodology and Scrum framework have become popular in developing BI solutions. Agile Scrum emphasizes rapid iteration, strong collaboration between development teams and stakeholders, and continuous feedback(Almeida et al., 2022; Al-Saqqa et al., 2020; Bomström et al., 2023; Dingsoeyr et al., 2019; Dingsøyr et al., 2012; Estrada-Esponda et al., 2024; Rindell et al., 2021; Santos et al., n.d.; Serrador & Pinto, 2015; Shrivastava & Rathod, 2014). With this approach, cargo companies can develop BI solutions incrementally, focus on the most valuable features of their business, and respond to changing needs with greater flexibility. BI development using the Agile Scrum approach can provide several significant benefits. Among them are increased company adaptability to market changes, faster delivery of value to customers, improved quality of BI solutions, and increased customer satisfaction through their involvement in the development process.(Hasan et al., 2013; Meiliana et al., 2023; Michalides et al., 2023; Mishra & Alzoubi, 2023; Tøndel et al., 2022)

Although much research has been conducted in BI and Agile, there still needs to be a gap in the literature that explicitly addresses developing BI solutions with the Agile Scrum approach in the cargo industry. This research aims to fill this gap by investigating how Agile Scrum can be effectively applied to develop BI solutions that fit the unique needs and dynamics of the cargo industry. This research will provide a better understanding of the application of Agile Scrum in developing BI solutions for the cargo industry. In addition, this research is also expected to provide practical guidance for cargo companies looking to adopt the Agile Scrum approach in BI development and provide empirical evidence of its benefits in improving operational performance and decision-making in the cargo industry.

METHODS

The first stage, Requirements Definition, involved identifying the business and technical requirements and analyzing the data required by the cargo company for the BI system. Planning is followed by drawing up a project plan, defining the BI features to develop, and creating a product backlog. The Development stage focuses on the iterative development of BI features per the backlog. In contrast, the Testing stage is essential to ensure product quality by identifying test scenarios, conducting iterative testing, and using feedback for improvement. This entire process illustrates the structured steps required to develop an effective BI system with the Agile Scrum approach in a cargo company.

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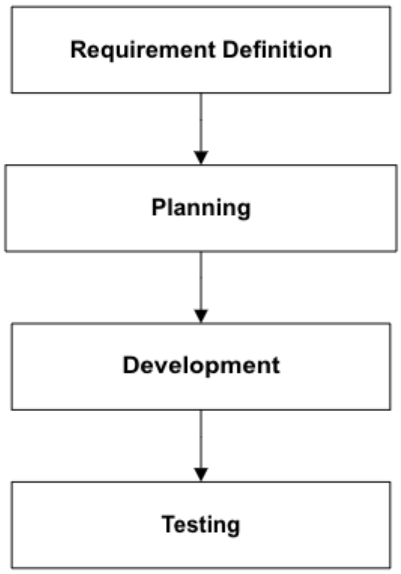

Figure 1. Research Stages

Definition of Need

In the requirements definition phase, the main focus was identifying and analyzing the cargo company's business and technical requirements for developing the BI system. This includes an in-depth analysis of the required data, meetings with key stakeholders to clarify the project objectives, and identification of specific information needs that will be accommodated by the BI system that will be developed.

Planning

Once precise requirements are established, the planning phase begins with a project plan that includes objectives, development schedule, resource allocation, and team responsibilities. In addition, the BI features or functions that should be developed in each iteration (sprint) are determined based on business priorities and user needs. This process also involves establishing a product backlog that contains all the work that needs to be completed during BI development.

Development

In the development phase, the team starts with sprint planning to plan the work in the first sprint. This includes creating user stories, estimating time, and allocating tasks to team members. Subsequently, development is done iteratively based on the product backlog, focusing on delivering features that provide high business value first. Daily stand-ups are also conducted to monitor progress, identify bottlenecks, and synchronize team activities.

Testing

The testing phase is an essential step in the BI development cycle. Here, the team identifies test scenarios that include functional testing, performance testing, security testing, and data integration testing. Testing is performed iteratively at each iteration of development to ensure the product's quality. Feedback from testing is used to make improvements and iterate on further development.

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RESULTS AND DISCUSSION

Definition of Need

The Requirements Definition phase begins with identifying business and technical requirements relevant to developing a Business Intelligence (BI) system for cargo companies. This involves an in-depth understanding of the business and technical requirements needed to build an effective BI system. Next, an in-depth analysis of the required data, including operational, customer, and market data, was conducted. This analysis aims to understand the specific information needs that must be met by the BI system to be developed. In addition, during this stage, key stakeholders are identified, and meetings are held to clarify goals, expectations, and constraints that may exist during the development process. This is important to ensure that all stakeholders understand the BI development project and address any constraints that may arise effectively. This stage provides a solid foundation for determining the direction and scope of the BI system development project for the cargo company.

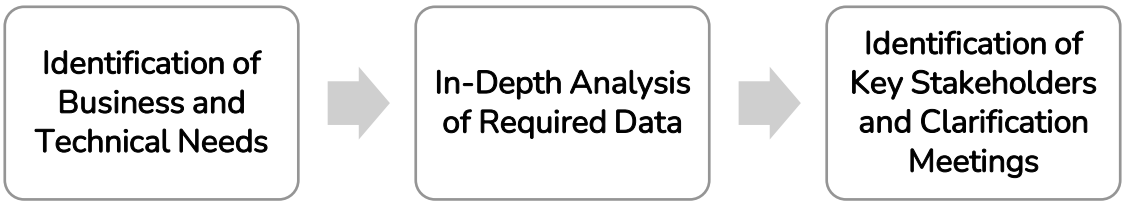

Figure 2 The Requirements Definition phase

The outcome of the Requirements Definition stage, as shown in Figure 2 in the development of a Business Intelligence (BI) system for a cargo company, includes three important steps. First is identifying business and technical requirements related to the BI system, including an in-depth understanding of the required operational needs and IT infrastructure. Second, it involves an in-depth analysis of various types of data, such as operational, customer, and market data, to understand the specific information needs the BI system must fulfill. Finally, key stakeholders and meetings are identified to clarify goals, expectations, and constraints that may arise during development. This stage is essential to set the project's direction and ensure that the developed BI system can meet all parties' expectations and needs.

Planning

The Planning phase in developing a Business Intelligence (BI) system for a cargo company produced several significant results. First, a comprehensive project plan was developed, including project objectives, development schedule, resource allocation, and team responsibilities. This step is critical for describing the project's overall direction, establishing development milestones, allocating resources effectively, and defining roles and responsibilities within the team.

Second, the BI features or functions that should be developed in each iteration (sprint) have been identified based on business priorities and user needs. By prioritizing

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features and functions according to business value and user needs, the development team can focus on developing the most critical components of the BI system first, ensuring key functionality is available from the beginning of the development process.

Finally, a product backlog includes all work to be completed during BI development. This backlog is a comprehensive list of all tasks and activities, including feature enhancements, bug fixes, data integration tasks, and user interface improvements. This helps prioritize tasks, track progress, and ensure all necessary work is addressed throughout the development cycle.

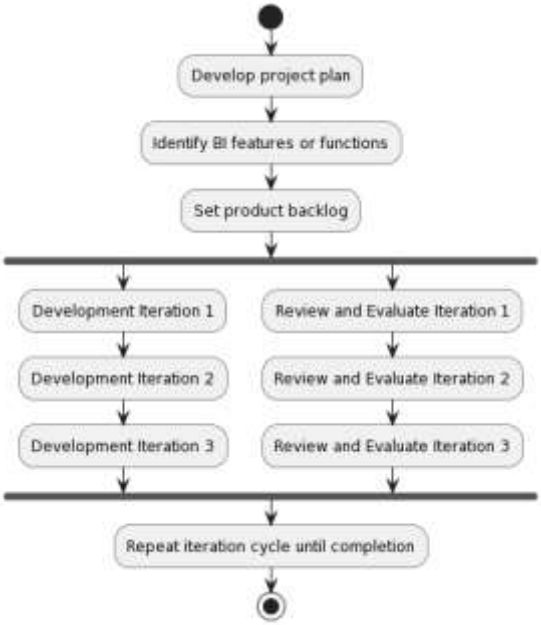

Figure 3 The Planning Phase

By completing these activities in the Planning stage, as shown in Figure 3, cargo companies can create a well-defined roadmap for BI system development, aligning project goals with business priorities, user needs, and resource availability.

Development

In the Development phase of the Business Intelligence (BI) system for the cargo company, key steps include sprint planning to plan the work in each sprint, iterative development based on the product backlog, as shown in Figure 4, with a focus on high business value features, and daily meetings to monitor progress and address bottlenecks. By following this process, the company can ensure efficient BI system development, delivery of valuable features, and practical cooperation within the team to create a robust BI system that functions as needed.

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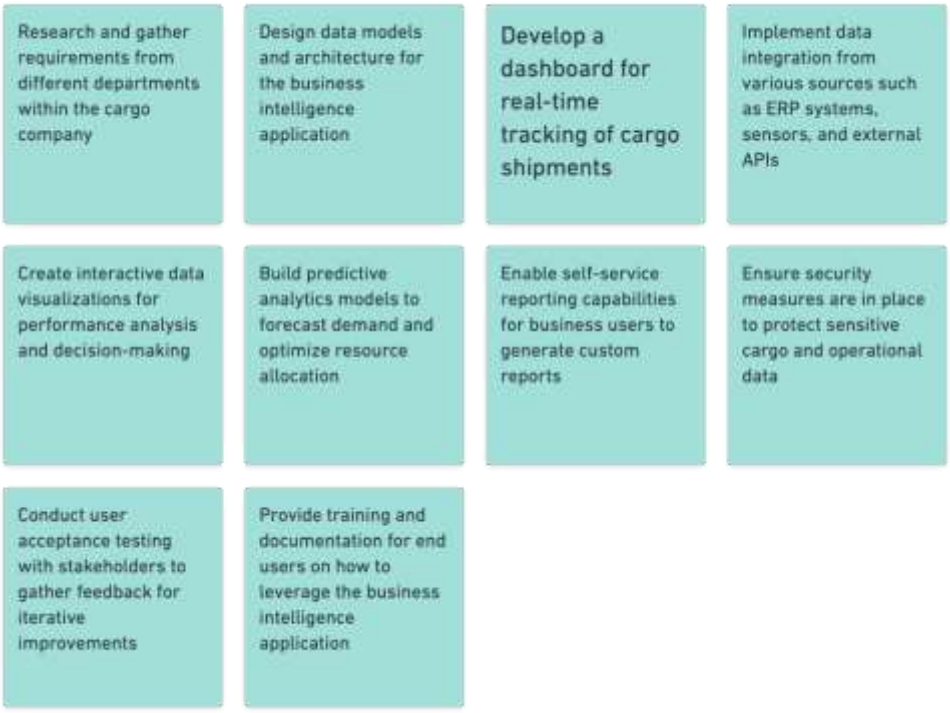

Figure 4 Product Backlog

Planning

The Testing phase in developing a Business Intelligence (BI) system for a cargo company involved several essential steps. First, the development team identified test scenarios that included functional testing to test the performance of the system and its features, performance testing to evaluate the performance of the system under high load, security testing to ensure data and system protection, and data integration testing to verify the consistency and integrity of the data processed by BI. Furthermore, testing is performed iteratively at each development iteration, from unit to whole system testing. This aims to ensure the quality of the product being developed and identify issues that need to be fixed before the product is implemented. The team also uses the test results as feedback to improve and iterate on the subsequent development. By conducting this process systematically and iteratively, cargo companies can ensure that the BI system developed is of high quality and good performance and can be relied upon to support informed and efficient decision-making.

CONCLUSION

This research explores the development of Business Intelligence (BI) in the context of a cargo company using the Agile Scrum approach. Various stages in BI development, from requirements definition, planning, and development to testing, have been studied in depth. Developing a clear project plan and identifying crucial BI features is essential in the planning phase. Next, the Agile Scrum approach is used in development to deliver value incre-

mentally and improve the adaptability and quality of the BI solution. Testing plays a vital role in ensuring the quality of the developed product and fixing recurring issues. Thus, this research provides a better understanding of how Agile Scrum can be applied in BI development for cargo companies, provides practical guidance for practitioners, and provides empirical evidence of the benefits of using this methodology in improving the efficiency and effectiveness of BI development.

REFERENCE

Almeida, F., Simões, J., & Lopes, S. (2022). Exploring the Benefits of Combining DevOps and Agile. *Future Internet*, *14*(2). https://doi.org/10.3390/fi14020063

Al-Saqqa, S., Sawalha, S., & Abdelnabi, H. (2020). Agile software development: Methodologies and trends. *International Journal of Interactive Mobile Technologies*, *14*(11). https://doi.org/10.3991/ijim.v14i11.13269

Bomström, H., Kelanti, M., Annanperä, E., Liukkunen, K., Kilamo, T., Sievi-Korte, O., & Systä, K. (2023). Information needs and presentation in agile software development. *Information and Software Technology*, *162*. https://doi.org/10.1016/j.infsof.2023.107265

Bouaziz, S., Nabli, A., & Gargouri, F. (2019). Design a data warehouse schema from document-oriented database. *Procedia Computer Science*, *159*, 221–230. https://doi.org/10.1016/j.procs.2019.09.177

Camacho-Muñoz, G. A., Franco, J. C. M., Nope-Rodríguez, S. E., Loaiza-Correa, H., Gil-Parga, S., & Álvarez-Martínez, D. (2023). 6D-ViCuT: Six degree-of-freedom visual cuboid tracking dataset for manual packing of cargo in warehouses. *Data in Brief*, *49*. https://doi.org/10.1016/j.dib.2023.109385

Corrotea, H., Portales, H., Amigo, L., Gatica, G., Troncoso-Palacio, A., Mondragón, D., & Ramos, M. (2024). Maintenance Process Analysis in a Port Cargo Company through Discrete Event Simulation. *Procedia Computer Science*, *231*, 415–420. https://doi.org/10.1016/j.procs.2023.12.227

Dingsoeyr, T., Falessi, D., & Power, K. (2019). Agile Development at Scale: The Next Frontier. In *IEEE Software* (Vol. 36, Issue 2, pp. 30–38). IEEE Computer Society. https://doi.org/10.1109/MS.2018.2884884

Dingsøyr, T., Nerur, S., Balijepally, V., & Moe, N. B. (2012). A decade of agile methodologies: Towards explaining agile software development. In *Journal of Systems and Software* (Vol. 85, Issue 6). https://doi.org/10.1016/j.jss.2012.02.033

Estrada-Esponda, R. D., López-Benítez, M., Matturro, G., & Osorio-Gómez, J. C. (2024). Selection of software agile practices using Analytic hierarchy process. *Heliyon*, *10*(1). https://doi.org/10.1016/j.heliyon.2023.e22948

Hasan, R., Ta, A.-, & Razali, R. (2013). Prioritizing Requirements in Agile Development : A Conceptual Framework. *Procedia Technology*, *11*(Iceei), 733–739. https://doi.org/10.1016/j.protcy.2013.12.252

Hunt, J. D., Nascimento, A., Tong, W., Zakeri, B., Jurasz, J., Patro, E. R., Đurin, B., de Jesus Pacheco, D. A., de Freitas, M. A. V., Filho, W. L., & Wada, Y. (2023). Perpetual motion

electric truck, transporting cargo with zero fuel costs. *Journal of Energy Storage*, *72*. https://doi.org/10.1016/j.est.2023.108671

Ilic, N., & Momcilovic, N. (2023). Progressive collapse analysis of inland waterway cargo vessel. *Procedia Structural Integrity*, *48*, 318–325. https://doi.org/10.1016/j.prostr.2023.07.126

Kimball, R., Ross, M., & Anisimov, A. A. (2003). The Data Warehouse Toolkit: The Complete Guide to Dimensional Modeling (2nd Edition). In *SIGMOD Record* (Vol. 32, Issue 3). https://doi.org/10.1145/945721.945741

Li, W., Pundt, R., & Miller-Hooks, E. (2021). An updatable and comprehensive global cargo maritime network and strategic seaborne cargo routing model for global containerized and bulk vessel flow estimation. *Maritime Transport Research*, *2*. https://doi.org/10.1016/j.martra.2021.100038

Malik, F. A., Egan, R., Dowling, C. M., & Caulfield, B. (2023). Factors influencing e-cargo bike mode choice for small businesses. *Renewable and Sustainable Energy Reviews*, *178*. https://doi.org/10.1016/j.rser.2023.113253

Meiliana, Daniella, G., Wijaya, N., Putra, N. G. E., & Efata, R. (2023). Agile Software Development Effort Estimation based on Product Backlog Items. *Procedia Computer Science*, *227*, 186–193. https://doi.org/10.1016/j.procs.2023.10.516

Michalides, M., Bursac, N., Nicklas, S. J., Weiss, S., & Paetzold, K. (2023). Analyzing current Challenges on Scaled Agile Development of Physical Products. *Procedia CIRP*, *119*, 1188–1197. https://doi.org/10.1016/j.procir.2023.02.188

Mishra, A., & Alzoubi, Y. I. (2023). Structured software development versus agile software development: a comparative analysis. *International Journal of System Assurance Engineering and Management*. https://doi.org/10.1007/s13198-023-01958-5

Rindell, K., Ruohonen, J., Holvitie, J., Hyrynsalmi, S., & Leppänen, V. (2021). Security in agile software development: A practitioner survey. *Information and Software Technology*, *131*. https://doi.org/10.1016/j.infsof.2020.106488

Santos, R., Cunha, F., Rique, T., Perkusich, M., Almeida, H., Perkusich, A., & Icaro Costa, ′. (n.d.). *A Comparative Analysis of Agile Teamwork Quality Instruments in Agile Software Development: A Qualitative Approach*. https://doi.org/10.18293/DMSVIVA2023-217

Santoso, L. W., & Yulia. (2017). Data Warehouse with Big Data Technology for Higher Education. *Procedia Computer Science*, *124*, 93–99. https://doi.org/10.1016/j.procs.2017.12.134

Serrador, P., & Pinto, J. K. (2015). Does Agile work? - A quantitative analysis of agile project success. *International Journal of Project Management*, *33*(5). https://doi.org/10.1016/j.ijproman.2015.01.006

Shrivastava, S. V., & Rathod, U. (2014). Risks in Distributed Agile Development: A Review. *Procedia - Social and Behavioral Sciences*, *133*, 417–424. https://doi.org/10.1016/j.sbspro.2014.04.208

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ESSN 2721-9879 (Online)
https://ejournal.seaninstitute.or.id/index.php/Ekonomi

Sihombing, D. J. C. (2022). Academic Data Warehouse Modeling in Higher Education Using Nine-Step Design Methodology. *Journal of Information Systems and Informatics*, *4*(4). https://doi.org/10.51519/journalisi.v4i4.399

Tøndel, I. A., Cruzes, D. S., Jaatun, M. G., & Sindre, G. (2022). Influencing the security prioritisation of an agile software development project. *Computers and Security*, *118*. https://doi.org/10.1016/j.cose.2022.102744

Vinje Kramer, J., & Steen, S. (2022). Sail-induced resistance on a wind-powered cargo ship. *Ocean Engineering*, *261*. https://doi.org/10.1016/j.oceaneng.2022.111688

Yıldız, B., Savelsbergh, M., & Dogru, A. K. (2023). Transshipment network design for express air cargo operations in China. *EURO Journal on Transportation and Logistics*, *12*. https://doi.org/10.1016/j.ejtl.2023.100120