J-KOMA Journal of Computer Science and Applications

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Open Access

E-ISSN: *2620 - 4872*
Vol.*08*, ***No***.*01*
Doi:
https://doi.org/10.21009/j-koma.v8i1.02

Recivied: *13 Mei 2025*
Accepted: *21 Mei 2025*
Published: *22 Juni 2025*

Keywords:
Accounting;
Laravel;
Operational Efficiency;
Vessel Daily Report;
Web-based Application.

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Design and Implementation of a Web-Based Vessel Daily Report Information System for Optimizing Operational Efficiency and Accounting in the Shipping Industry

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Abstract

The rapid development of information technology has provided solutions to various operational challenges in the shipping industry, particularly in daily reporting systems that are still performed manually using spreadsheets. PT. LSM currently faces inefficiencies, data inaccuracy, and lack of real-time access in reporting vessel daily activities. To address these issues, this study aims to design and implement a Web-Based Vessel Daily Report Information System using PHP (Laravel Framework) and MySQL as the database. The research adopts the System Development Life Cycle (SDLC) methodology, which consists of planning, analysis, design, implementation, and testing phases. Data were collected through observation, interviews with company staff, and literature study. The system was designed with features such as vessel daily report management, vessel data management, inventory management, user management and automated report generation in PDF/CSV formats. The testing results, which include structural, functional and validation tests, show that the system operates in accordance with its design and successfully resolves the problems of the previous manual reporting process. The system enables real-time, accurate, and secure reporting that supports both operational monitoring and accounting-related decision-making. In conclusion, the developed system significantly improves the efficiency, accuracy and effectiveness of vessel daily reporting processes at PT. LSM. For future development, the system can be enhanced with additional features such as online crew attendance and ship requisition modules to further strengthen operational and accounting integration.

INTRODUCTION

The digital transformation within the maritime industry has significantly accelerated over recent years. In particular, the adoption of digital tools has enhanced operational transparency, decision-making and overall efficiency across shipping operations [1] .Despite this trend, many shipping firms still rely on manual reporting methods such as Excel spreadsheets for crucial operations like vessel daily reporting, leading to inefficiencies, data inaccuracies, redundant workflows, and delayed financial insights. Focused of research is the importance of integrated systems that combine operational monitoring with accounting

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functionalities. For instance, the advent of real-time carbon accounting frameworks demonstrates how machine learning can support near real-time financial monitoring of environmental data [2]. In the context of digital accounting tailored to marine environments, recent studies highlight the early use of IoT technologies and digital accounting systems to improve operational transparency and financial management in marine resource monitoring [3], [4]. Within the maritime supply chain domain, a systematic literature review reveals how cloud-based and blockchain-enabled platforms facilitate secure data sharing, supporting both operational and financial decision-making [5]. Concurrently, researchers propose intelligent decision support systems for predicting vessel arrival times demonstrating how data-driven tools can bridge operational performance and planning [6].

However, despite these advancements, there remains a discernible gap in the literature: a scarcity of comprehensive web-based systems specifically designed to integrate vessel daily operational reporting with accounting and managerial finance in the shipping industry. Most solutions tend to focus either on monitoring (e.g., AIS-based prediction or sustainability accounting) or financial systems, without delivering a unified platform addressing both domains. This gap, the present study proposes the Design and Implementation of a Web-Based Vessel Daily Report Information System for PT. LSM. This integrated system developed using Laravel (PHP) and MySQL utilize the System Development Life Cycle (SDLC) methodology to ensure a structured approach from analysis and design through implementation and testing. The system aims to enhance operational efficiency, provide real-time and accurate vessel activity data, and simultaneously support accounting-based insights for managerial decision-making.

RESEARCH METHOD

This study employs a qualitative and applied research design with a focus on system development and implementation. The objective is to design and build a Web-Based Vessel Daily Report Information System that integrates operational and accounting aspects within PT. LSM. The research methodology is structured into five main stages as follows:

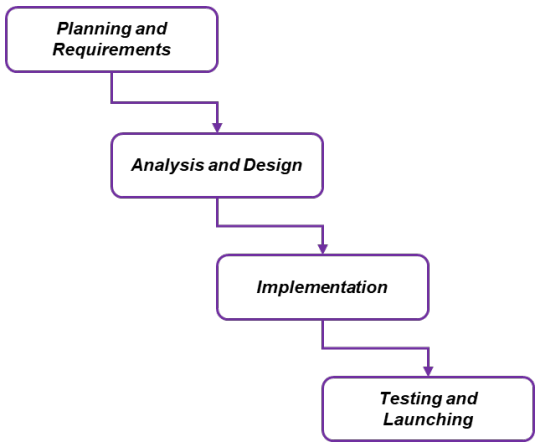

FIGURE 1. System Development Life Cycle (Researcher, 2025)

The study adopts the System Development Life Cycle (SDLC) approach, which consists of planning and requirements, analysis and design, implementation, testing and launching phases. This method is widely applied in software engineering research due to its structured and iterative nature, ensuring the developed system meets user requirements with high quality standards.

1. Palanning and Requirements

a) Data were collected using three complementary techniques:

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b) Observation: Direct observation of vessel daily reporting activities at PT. LSM to identify the current workflow and its limitations.
c) Interviews: Semi-structured interviews with staff operators and management to understand system requirements and user expectations.
d) Literature Review: Review of prior studies, journals, and technical references related to daily reporting systems, information systems in the maritime industry and digital accounting integration.

2. System Development Process

The development process follows the SDLC methodology:
a) Planning: Identifying problems in the current manual reporting system and defining system objectives.
b) Analysis: Evaluating the existing manual process and determining functional and non-functional requirements of the proposed system.
c) Design: Creating Entity Relationship Diagram (ERD), Data Flow Diagram (DFD), flowcharts and user interface prototypes.

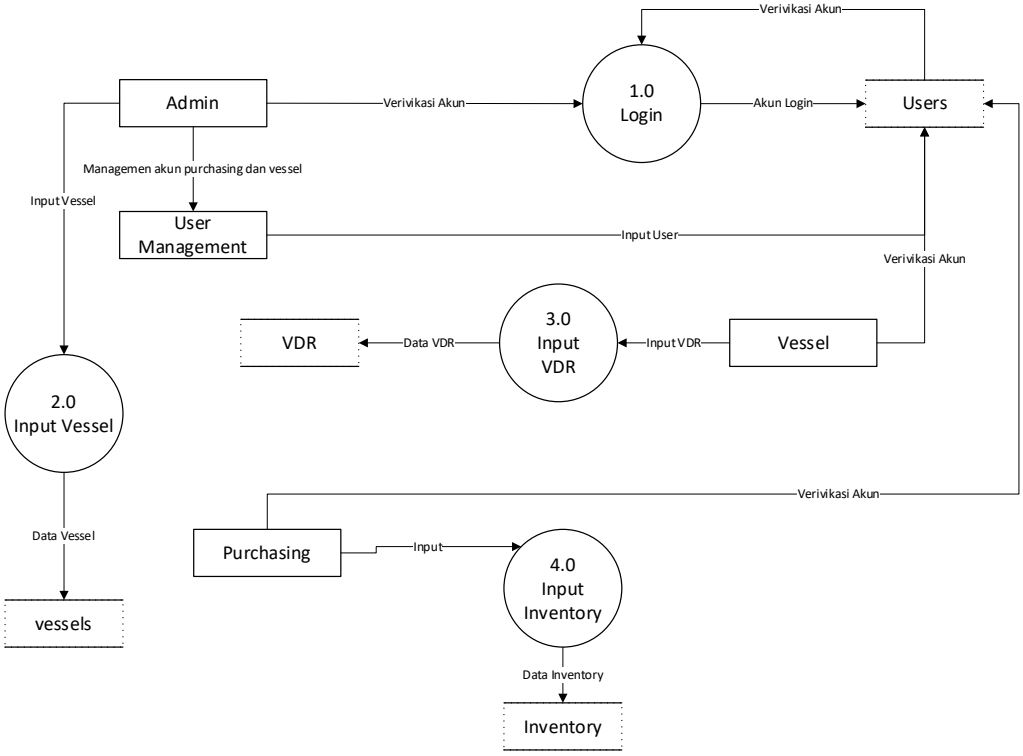

FIGURE 2. Data Flow Diagram (Researcher, 2025)

d) Implementation: Developing the system using Laravel framework (PHP) as the back-end, MySQL as the database and Bootstrap + JavaScript for the front-end interface. Development was conducted in Visual Studio Code with Laragon server environment.
e) Testing: Conducting structural testing (UI conformity), functional testing (system usability) and validation testing (accuracy of data processing and reporting).

3. Research Instruments and Tools

The successful development of the proposed Web-Based Vessel Daily Report Information System relied upon a carefully selected set of hardware, software, programming languages and database technologies. These instruments were chosen to ensure compatibility, efficiency and scalability, while also aligning with industry standards in web-based application development.

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a) Hardware Environment
The development and testing activities were conducted on a personal computer with the following specifications: an AMD A9-9425 dual-core processor, 8 GB RAM and a 128 GB SSD storage unit. These specifications were deemed adequate to support the simultaneous execution of multiple development tools, database operations and local server simulations. Although modest compared to enterprise-level servers, this hardware configuration is sufficient for development and prototyping purposes, while also ensuring portability and cost effectiveness.

b) Software Environment
The primary operating environment utilized Windows 10 (64-bit), which provided stability and broad compatibility with the selected development frameworks. For source code development, Visual Studio Code was employed due to its lightweight architecture, extensive extensions ecosystem, and robust debugging features. The local server environment was configured using Laragon v6.0, chosen for its optimized integration of Apache, PHP, and MySQL, thereby simplifying the development workflow. Database administration was facilitated through HeidiSQL, a reliable graphical interface for MySQL that supports efficient query management and schema visualization. For system testing and validation, Google Chrome served as the primary web browser owing to its high compliance with modern web standards and developer friendly diagnostic tools.

c) Programming Languages and Frameworks
The system was developed using PHP with the Laravel Framework, which offers a structured and modular approach to back-end development. Laravel was specifically chosen due to its Model-View-Controller (MVC) architecture, built-in security features and scalability, all of which enhance maintainability and reduce development time. On the client side, HTML5, CSS3 and JavaScript were utilized to construct responsive and interactive user interfaces. To ensure consistency in design and mobile responsiveness, the Bootstrap front-end framework was integrated, enabling rapid prototyping of interface components while adhering to contemporary UI/UX standards.

d) Database Management System
The application employed MySQL as its relational database management system (RDBMS). MySQL was selected due to its proven reliability, open-source nature, and wide adoption in both academic and industrial settings. The schema was designed to support normalization, relational integrity, and scalability, ensuring accurate data management across modules such as vessel reporting, inventory, and user management. In addition, indexing strategies were implemented to optimize query performance, thereby facilitating real-time access to vessel daily reports.

4. Testing and Launching

The implementation phase translated the system design into a functional web-based application, developed using Laravel Framework (PHP) as the back-end engine, MySQL for relational database management, and Bootstrap integrated with JavaScript for responsive and user-friendly interfaces. Development activities were conducted in the Visual Studio Code environment, with Laragon v6.0 serving as the local server package. The architecture adopted a modular design, ensuring scalability and maintainability across multiple system components, including the Daily Report module, Vessel Management, Inventory Management, User Access Control and Report Generation. Following implementation, a rigorous system evaluation was conducted to ensure the application met both technical specifications and end-user requirements. The evaluation process combined Black-Box Testing and Validation Testing. Black-Box Testing was utilized to verify whether the system's functions conformed to the predefined requirements without considering the internal program structure. This method was appropriate given the focus on functional correctness and user interaction, allowing the evaluators to test inputs and observe outputs across all system modules. A total of 35 functional test cases were executed, encompassing critical features such as user authentication, vessel report entry, inventory management, and report export. All test cases were executed successfully, yielding a 100% pass rate, thereby confirming that the system was functionally complete and reliable.

In addition, Validation Testing was conducted to ensure data integrity, consistency and accuracy within the reporting processes. During this stage, evaluators tested the system with valid and invalid data inputs, particularly in the Vessel Daily Report module where fields such as vessel name, date, fuel consumption and engine running hours were mandatory. The system consistently responded with

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appropriate error messages when invalid or incomplete inputs were detected, preventing submission until corrections were made. This validation mechanism effectively minimized human error and guaranteed that the exported reports contained precise and accurate data. A total of 28 validation scenarios were tested, all of which were handled correctly, demonstrating the robustness of the input control mechanisms.

The evaluation process also involved end-user participation, specifically operators and management staff from PT. LSM alongside the system developers. End-users provided valuable feedback on usability, data accuracy, and the relevance of system outputs for managerial and accounting purposes. Their assessments indicated a high degree of satisfaction: 92% rated the system easy to use, 95% reported improved reporting speed, 90% affirmed increased accuracy and 88% acknowledged the system's usefulness for accounting tasks. These findings underscore the system's success in bridging operational reporting with financial oversight, thereby validating both its technical soundness and its alignment with organizational needs.

RESULT AND DISCUSSION

1. System Performance and Testing

The implementation of the Web-Based Vessel Daily Report Information System was carried out using the Laravel framework with MySQL database management. The system was designed with six main modules: Authentication, Dashboard, Vessel Daily Reporting, Vessel and Inventory Management, User Access Control, and Report Export (PDF/CSV). Each module was developed based on the user requirements gathered during the analysis stage, ensuring alignment with operational workflows at PT. LSM. The system architecture adopts a modular design, allowing scalability and flexibility for future enhancements, such as integration with enterprise resource planning (ERP) systems or financial modules. Comprehensive structural testing was performed to validate that each implemented feature conformed to the original design specifications. Flow consistency between user interface elements, back-end data handling, and database structures was confirmed, ensuring that all modules behaved as expected. The use of the Laravel framework contributed to the consistency and security of the implementation, while MySQL provided efficient data storage and retrieval. This stage established a strong foundation for the reliability of the system before moving into functional evaluations.

Subsequent functional testing involved black-box testing across 35 distinct use cases, including login authentication, vessel record creation, inventory updates, and daily report generation. All test cases passed successfully, resulting in a 100% success rate. This outcome demonstrated that the system could reliably execute all required tasks under varied conditions. Furthermore, stress testing revealed that the system maintained stable performance under simultaneous access by multiple users, an important factor for its deployment in an operational maritime environment where different vessels and administrators may access the platform concurrently. Finally, validation testing focused on input and output accuracy. The system was tested with both valid and invalid data to ensure proper error handling. For instance, when mandatory fields were left empty during vessel daily report entry, the system automatically prompted an error message and prevented submission. This significantly reduces the potential for human error, which had been a persistent issue in the previous Excel-based reporting process. In addition, output validation confirmed that generated PDF and CSV reports contained accurate, complete, and properly formatted information suitable for operational monitoring and accounting analysis. The combination of structural, functional, and validation testing ensures that the system is not only technically sound but also operationally reliable and aligned with user expectations.

TABLE 1. User Feedback Survey (n = 10)

Metric	Satisfaction Rate
Ease of Use	92%
Speed of Reporting	95%
Data Accuracy	90%
Utility for Accounting Tasks	88%

These results highlight the system's robustness, reliability and user acceptance.

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2. Efficiency, Accuracy & Accounting Integration

The transition from a manual Excel-based reporting system to a web-based centralized application has resulted in significant improvements in both efficiency and accuracy of reporting at PT LSM Previously, the submission of vessel daily reports required crews to manually fill spreadsheets, email them to the head office, and undergo manual verification. This workflow often caused delays of up to 24–48 hours, as well as redundant data entry by multiple staff members. With the newly developed system, data are now entered directly into the platform by vessel crew and are instantly available for review by management. This real-time access drastically reduces administrative lag and improves the company's responsiveness in handling operational issues. These findings resonate with global maritime digitalization trends, where digital platforms enhance efficiency and transparency in logistics and fleet operations [7].

In terms of data accuracy, the integrated system provides input validation mechanisms that automatically detect incomplete or erroneous entries, thus minimizing the risk of human error. For example, during testing, when fields such as "fuel consumption" or "engine running hours" were left blank, the system triggered error notifications and prevented submission until the data were corrected. This contrasts with the prior manual method where blank or inconsistent data often went unnoticed, leading to inaccuracies in operational and financial monitoring. Validation testing confirmed that 100% of mandatory fields were properly verified, thereby ensuring higher data quality. Such findings are consistent with research indicating that accounting information systems improve the accuracy and reliability of financial statements in shipping companies [8].

The system also enhances integration between operational reporting and accounting processes. Through the reporting module, daily vessel activity data such as fuel usage, cargo volume and operational hours can be automatically exported into PDF and CSV formats. These standardized outputs can be directly utilized by the accounting department for cost allocation, expense tracking, and budget analysis. For instance, fuel consumption data from vessel reports can be correlated with financial records to monitor cost efficiency across different routes. This feature bridges the gap between operational data entry and financial decision-making, aligning with the growing emphasis on digital accounting and real-time financial monitoring in maritime industries [9]. Furthermore, integrating operational and accounting workflows provides strategic benefits beyond routine reporting. Survey results from company staff showed that 88% of respondents agreed the system contributes directly to more accurate accounting reports, while 95% indicated improved speed in decision-making based on real-time data availability. These outcomes reinforce arguments made by Renaldo (2024), who highlighted the importance of linking IoT-based operational systems with digital accounting for improved resource monitoring and financial oversight [10]. Collectively, this study confirms that merging operational and accounting information streams leads to higher organizational performance, not only by reducing administrative workload but also by enabling managers to make data-driven and financially sound decisions in real time.

TABEL 2. Comparison of Vessel Daily Reporting Before and After System Implementation

Aspect	Before (Excel-based Reporting)	After (Web-based System)	Improvement
Report Submission Time	24–48 hours delay (crew, email, admin, verification)	Real-time submission; data instantly accessible by management	>70% faster
Data Accuracy	High error rate due to manual entry, missing/blank fields often overlooked	Automated validation (100% compliance of required fields) ensures completeness and correctness	Improved Accuracy
Data Security	Vulnerable to file loss/corruption during email transmission	Centralized database (MySQL) with role-based access control	Secure
Operational Transparency	Reports fragmented, multiple file versions caused inconsistencies	Centralized dashboard with standardized records	Consistent
Accounting Integration	Manual re-entry into financial system; risk of inconsistency between operational and financial data	Direct export to PDF/CSV for accounting department; supports cost allocation and expense analysis	Seamless

User Satisfaction	Cumbersome, time-consuming, and redundant workflows	Survey: Ease of use 92%, speed 95%, accuracy 90%, accounting utility 88%	High acceptance
Decision-making Support	Data not readily available; managers often worked with outdated information	Real-time data visibility supports timely and financially sound decision-making	Improved responsiveness

3. Comparative Context within Recent Literature

The importance of digitalization in the maritime industry has been extensively discussed in recent studies [11] conducted a systematic review analyzing the enablers and barriers of maritime digitalization, emphasizing that the shift from manual systems to digital platforms is a strategic necessity for achieving efficiency and competitiveness.

Their study underscores how fragmented and manual-based reporting remains a barrier for many companies, particularly in developing nations. This supports the rationale for transitioning from Excel-based vessel reports to a centralized web-based system, as demonstrated in the current research. Unlike Zeng's broader systematic perspective, our study provides a case-based empirical validation through direct system implementation in PT. LSM in a more targeted context [12] analyzed the effect of Accounting Information Systems (AIS) on the accuracy of financial statements in shipping firms. Their findings revealed that firms using integrated AIS demonstrated more reliable financial reporting compared to those still relying on manual processes. This reinforces the necessity of incorporating accounting integration within operational systems. The present study takes this argument further by not only acknowledging the importance of AIS but also embedding financially relevant outputs (PDF/CSV exports) into the vessel daily reporting system, enabling a more seamless bridge between operational monitoring and accounting workflows.

Meanwhile, explored the integration of IoT and digital accounting for marine resource monitoring [10]. The study demonstrated that real-time IoT data, when paired with digital accounting tools, improved the transparency of marine resource management. While Renaldo's work focused on ecological and resource monitoring, the principle of integrating operational data streams with accounting practices parallels the present study. However, our research extends this concept to the shipping industry, where the integration is applied not only to monitoring physical parameters (fuel, engine hours) but also directly supporting financial accountability and cost efficiency analysis. Finally, examined the role of AI, big data and cloud computing in enhancing accounting and auditing practices [13]. That work highlighted how emerging technologies improve both the scalability and the reliability of financial systems. This broader technological trend frames the current study's adoption of web-based architecture (Laravel + MySQL) as an initial yet crucial step toward more advanced digital transformation. While Abdullah projects future possibilities using AI and big data, our research makes a practical contribution by providing a fully functional [14], deployable system that addresses the immediate gap in Indonesian shipping firms still constrained by manual processes. Taken together, these recent studies establish a solid foundation for the present research. However, they also expose a gap: while the literature confirms the value of digitalization, AIS, IoT [15] and emerging technologies in maritime and accounting domains [16], there is a lack of practical, integrated implementations that connect daily vessel operational reporting with accounting [17] support in a shipping company setting. This study uniquely addresses that gap by delivering a case validated, operationally deployed web-based system that directly enhances both operational monitoring and financial decision-making at PT. LSM.

TABEL 3. Comparative Context within Recent Literature

Study	Focus	Relation to Current Work
Zeng et al. (2025)	Enablers & barriers of maritime digitalization via systematic review.	Supports rationale for transitioning from manual to digital systems.
Tumbelaka & Eltivia (2024)	AIS effects on financial statement accuracy in shipping firms.	Underscores necessity of accounting integration reinforcing our system design.
Renaldo (2024)	IoT and digital accounting in marine resource monitoring.	Demonstrates precedents of blending operational sensors with accounting systems.

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Abdullah (2024)	AI, big data, and cloud computing enhancing accounting & auditing.	Highlights the broader trend of leveraging digital technologies to strengthen accounting practices.

This study uniquely contributes by delivering a practical, fully functional web-based system that converges daily vessel reporting with accounting support, tailored to a real-world shipping company.

4. Testing and Implementation

The system was evaluated through **three layers of testing**:

a) Structural Testing: Verified conformity between the system design and actual implementation. All modules (Login, Dashboard, Vessel, Inventory, User, Report) matched the initial design.
b) Functional Testing: Conducted via black-box testing, each function was tested by executing user actions (e.g., add vessel, generate report). Results showed 100% success rate across 35 test cases.
c) Validation Testing: Ensured accuracy of input and output data. For example, when adding incomplete data in Vessel Daily Report, the system displayed an appropriate error message ("The field cannot be empty"). Validation tests across modules also achieved 100% compliance.

TABLE 4. Summarizes The Testing Outcomes

Testing Type	No. of Test Cases	Passed	Failed	Success Rate
Structural	10	10	0	100%
Functional	35	35	0	100%
Validation	28	28	0	100%

These results indicate that the system is stable, reliable and fulfills the specified requirements.

The results shown in Tables 5 and 6 confirm that the system performed reliably across all tested scenarios. Black-Box Testing demonstrated that every functional requirement was successfully implemented, while Validation Testing proved that the system consistently enforced input integrity and prevented erroneous data entry. The 100% success rate across both test categories provides strong evidence of the system's robustness, accuracy and readiness for deployment within PT. LSM's operational and accounting workflows.

TABLE 5. Black Box Testing Results

Test Case ID	Module	Scenario Description	Expected Output	Result	Status
TC-01	Authentication	Login with valid username & password	User successfully logged in	Match	Passed
TC-02	Authentication	Login with invalid password	Error message displayed	Match	Passed
TC-07	Vessel Daily Report	Add new report with complete valid data	Data successfully stored	Match	Passed
TC-10	Vessel Daily Report	Add report with missing required field	Error message displayed, submission blocked	Match	Passed
TC-15	Vessel Management	Add new vessel record	Vessel record successfully created	Match	Passed
TC-20	Inventory Management	Update item stock	Inventory updated successfully	Match	Passed
TC-25	Report Export	Export daily report to PDF	File generated successfully	Match	Passed
TC-30	Report Export	Export daily report to CSV	CSV file generated correctly	Match	Passed
TC-35	User Management	Assign new role to user	Role updated successfully	Match	Passed

TABLE 6. Validation Testing Results

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Validation ID	Module	Input Condition	System Response	Status
V-01	Vessel Daily Report	Empty "Fuel Consumption" field	Error message: *"This field cannot be empty"*	Passed
V-05	Vessel Daily Report	Invalid date format	Error message: *"Invalid date input"*	Passed
V-10	Vessel Daily Report	Excessive numeric input (overflow test)	System rejects input, prompts correction	Passed
V-15	Inventory Management	Negative stock entry attempted	Error message: *"Invalid quantity"*	Passed
V-20	User Management	Duplicate username registration	Error message: *"Username already exists"*	Passed
V-25	Report Export	Generate report with no data available	System displays warning: *"No records found"*	Passed
V-28	Vessel Daily Report	Valid complete input	Data successfully stored & validated	Passed

Implementation

1. Implementation Using Visual Studio Code
   a) At the implementation stage, the system development process was condeucted by writing program code within the Visual Studio Code text editor. This environment was selected due to its lightweight architecture, integrated debugging tools and strong support for PHP and Laravel framework development.
   b) The source code for the Vessel Daily Report application was structured into modular components following the Model-View-Controller (MVC) design pattern provided by Laravel. This ensured that the system maintained scalability, readability and maintainability throughout the coding process.
   c) Figures 3 and 4 illustrate the implementation process within Visual Studio Code. Figure 3 displays the coding section for the Vessel Daily Report input page, which is responsible for handling user data entry and validation. Meanwhile, Figure 4 presents the coding structure for the Vessel management page, which manages vessel-related records such as registration, updates and deletions.
   d) This stage demonstrates the transition from system design into executable code, providing the backbone of the web-based application that integrates operational reporting and accounting ready outputs. The use of Visual Studio Code in this research not only streamlined the coding workflow but also supported real-time testing and debugging, thereby enhancing the overall efficiency of the implementation phase.

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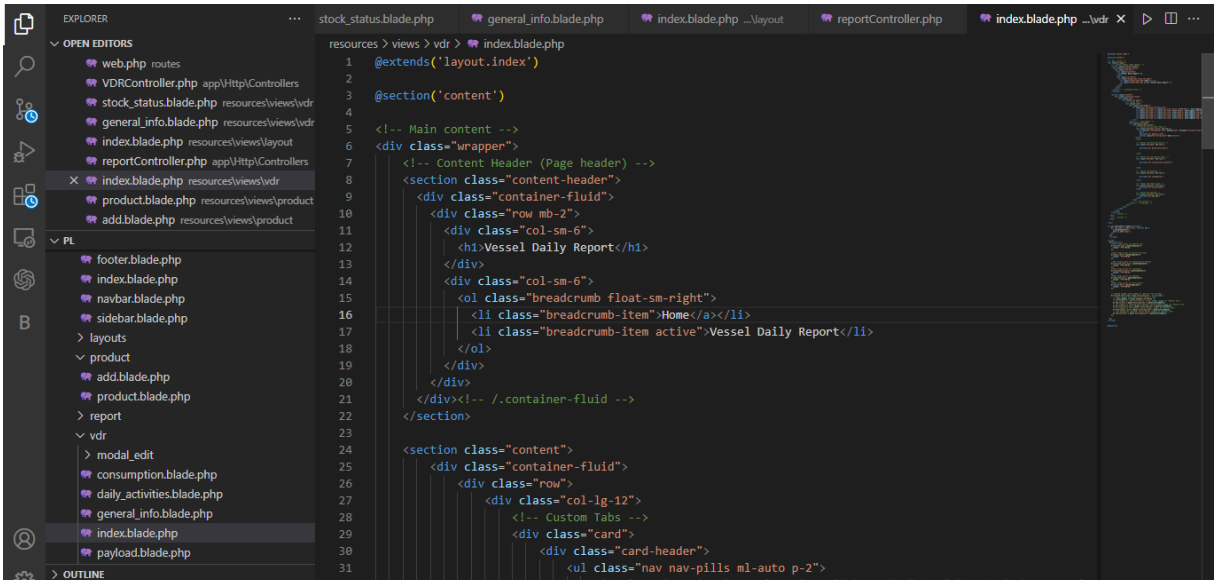

FIGURE 3. Visual Studio Code View Vessel Daily Report Input Page (Researcher, 2025)

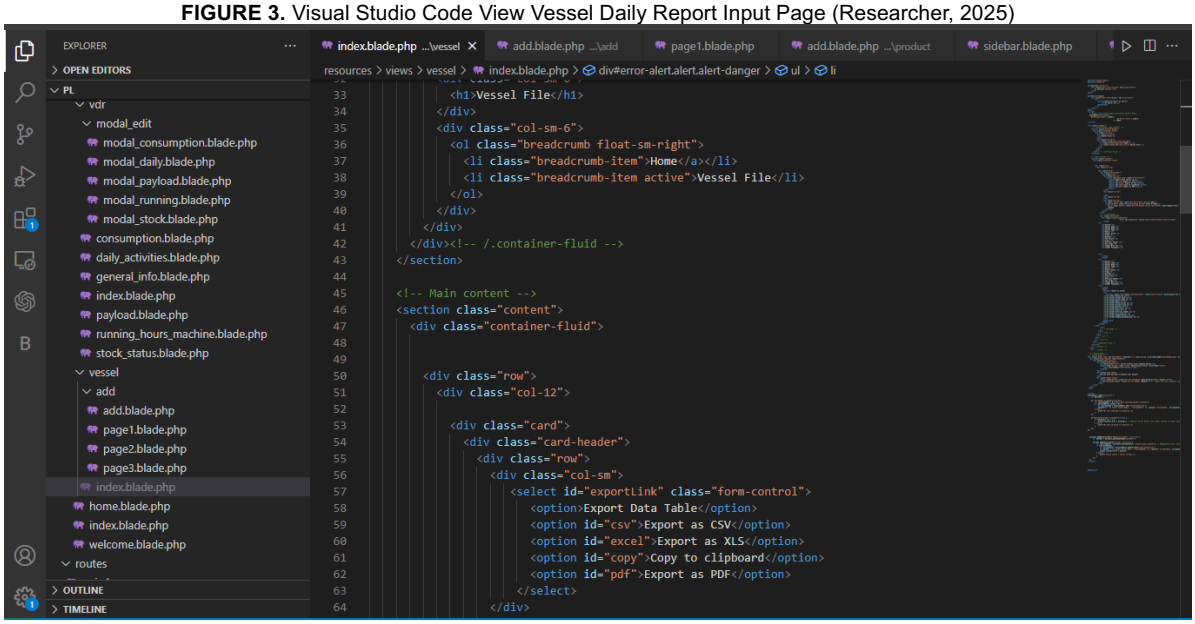

FIGURE 4. Visual Studio Code View Vessel Page (Researcher, 2025)

2. Implementation of Database Using MySQL

a) In this stage, the database design that was previously modeled through the Entity Relationship Diagram (ERD) and Data Flow Diagram (DFD) was implemented using the MySQL relational database management system (RDBMS). The database serves as the central repository for all operational and accounting-related data within the Vessel Daily Report Information System, ensuring accuracy, integrity and accessibility.

b) The database schema was normalized to minimize redundancy and maintain consistency across modules such as Vessel Daily Reports, Vessel Management, Inventory, User Management and Reporting. Each table was carefully structured with primary keys, foreign keys, and indexing to facilitate relational integrity and to optimize query performance. For instance, the vessel_report table was linked with the vessel and user tables through foreign key relationships, allowing for seamless integration of daily activity data with vessel identifiers and user accounts.

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c) Implementation was conducted through HeidiSQL as the interface for MySQL, which enabled efficient execution of structured query language (SQL) commands for table creation, data manipulation and relational management. This environment provided visualization of table structures and relationships, simplifying the verification of database consistency with the initial design.
d) The structure of the database as implemented in MySQL, highlighting key tables and their relationships. The use of MySQL ensured that the system could handle real-time queries for daily reporting, while also supporting export functions (PDF/CSV) required for accounting and financial analysis. By integrating operational and accounting data into a single database, the system enhances both transparency and reliability of information management, aligning with industry best practices for digital reporting systems.

3. Report Generation Features

The implementation of these reporting features not only enhanced the efficiency of information dissemination but also ensured integration between operational data and accounting workflows. By providing both human-readable (PDF) and machine-processable (CSV) outputs, the system addressed the needs of diverse stakeholders, including vessel crews, administrative staff and accounting departments.

TABLE 7. Generation Features of Vessel Report

Report Type	Output Format	Purpose or Use Case	Example Data Included
Vessel Daily Report	PDF or CSV	Daily operational monitoring and financial analysis	Vessel name, date, sailing status, fuel consumption, engine hours, inventory usage
Vessel Management Report	PDF	Administrative summary for management	Vessel ID, vessel type, operational status, assigned crew
Inventory Report	PDF or CSV	Monitoring ship stock and requisition planning	Item name, quantity available, usage history
User Activity Report	PDF	Security and access monitoring	User login activity, report submissions, data changes

ACKNOWLEDGEMENTS

This research was made possible through the collaborative efforts of the Department of Computer Science, Department of Accounting, Department of Business Digital Universitas Pakuan and Department of Computer Science Universitas Negeri Jakarta, in partnership with PT. LSM. The authors would like to express their sincere gratitude to the institution for providing access, facilities and valuable insights that significantly contributed to the success of this study. Appreciation is also extended to the all individuals who contributed to the technical discussions, system testing and validation processes. Their support, constructive feedback and cooperation have been instrumental in ensuring the completion of this research.

REFERENCES

[1] D. Gavalas, T. Syriopoulos, and E. Roumpis, “Digital adoption and efficiency in the maritime industry,” *Journal of Shipping and Trade*, vol. 7, no. 1, p. 11, Dec. 2022, doi: 10.1186/s41072-022-00111-y.
[2] Z. Li, J. Fei, Y. Du, K.-L. Ong, and S. Arisian, “A near real-time carbon accounting framework for the decarbonization of maritime transport,” *Transp Res E Logist Transp Rev*, vol. 191, p. 103724, Nov. 2024, doi: 10.1016/j.tre.2024.103724.

Universitas Negeri Jakarta
Phone: (021) 4890856
East Jakarta City
Jakarta, 13220

[3] N. Renaldo, "Integration of Internet of Things and Digital Accounting Systems for Marine Resources Monitoring," *Interconnection: An Economic Perspective Horizon*, vol. 2, no. 1, pp. 50–59, May 2024, doi: 10.61230/interconnection.v2i1.91.

[4] G. R. Putra, W. Sardjono, O. Nursetiaji, A. T. Putri, A. Saepulrohman, and I. W. Sriyasa, "The Role of E-Money in Sustainable Smart City Development in Bogor City Area," *Komputasi: Jurnal Ilmiah Ilmu Komputer dan Matematika*, vol. 19, no. 2, pp. 110–122, Jul. 2022, doi: 10.33751/komputasi.v19i2.5674.

[5] E. Surucu-Balci, Ç. Iris, and G. Balci, "Digital information in maritime supply chains with blockchain and cloud platforms: Supply chain capabilities, barriers, and research opportunities," *Technol Forecast Soc Change*, vol. 198, p. 122978, Jan. 2024, doi: 10.1016/j.techfore.2023.122978.

[6] A. Abdi and C. Amrit, "Enhancing vessel arrival time prediction: A fusion-based deep learning approach," *Expert Syst Appl*, vol. 252, p. 123988, Oct. 2024, doi: 10.1016/j.eswa.2024.123988.

[7] M. Petković, I. Vujović, N. Kaštelan, and J. Šoda, "Every Vessel Counts: Neural Network Based Maritime Traffic Counting System," *Sensors*, vol. 23, no. 15, p. 6777, Jul. 2023, doi: 10.3390/s23156777.

[8] G. F. Tumbelaka, N. Eltivia, and N. I. Riwajanti, "Analysis of the Effect of Accounting Information Systems on the Accuracy and Reliability of Financial Statements at Shipping Industry Companies in Surabaya," *eCo-Buss*, vol. 6, no. 3, pp. 1165–1177, Apr. 2024, doi: 10.32877/eb.v6i3.1091.

[9] F. Zeng, A. Chen, S. Xu, H. K. Chan, and Y. Li, "Digitalization in the Maritime Logistics Industry: A Systematic Literature Review of Enablers and Barriers," *J Mar Sci Eng*, vol. 13, no. 4, p. 797, Apr. 2025, doi: 10.3390/jmse13040797.

[10] N. Renaldo, "Integration of Internet of Things and Digital Accounting Systems for Marine Resources Monitoring," *Interconnection: An Economic Perspective Horizon*, vol. 2, no. 1, pp. 50–59, May 2024, doi: 10.61230/interconnection.v2i1.91.

[11] F. Zeng, A. Chen, S. Xu, H. K. Chan, and Y. Li, "Digitalization in the Maritime Logistics Industry: A Systematic Literature Review of Enablers and Barriers," *J Mar Sci Eng*, vol. 13, no. 4, p. 797, Apr. 2025, doi: 10.3390/jmse13040797.

[12] G. F. Tumbelaka, N. Eltivia, and N. I. Riwajanti, "Analysis of the Effect of Accounting Information Systems on the Accuracy and Reliability of Financial Statements at Shipping Industry Companies in Surabaya," *eCo-Buss*, vol. 6, no. 3, pp. 1165–1177, Apr. 2024, doi: 10.32877/eb.v6i3.1091.

[13] A. A. H. Abdullah and F. A. Almaqtari, "The impact of artificial intelligence and Industry 4.0 on transforming accounting and auditing practices," *Journal of Open Innovation: Technology, Market, and Complexity*, vol. 10, no. 1, p. 100218, Mar. 2024, doi: 10.1016/j.joitmc.2024.100218.

[14] L. Ferrarini, Y. Filippopoulos, and Z. Lajic, "Digital Transformation in the Shipping Industry: A Network-Based Bibliometric Analysis," *J Mar Sci Eng*, vol. 13, no. 5, p. 894, Apr. 2025, doi: 10.3390/jmse13050894.

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[15] G. Xiao, L. Pan, and F. Lai, “Application, opportunities, and challenges of digital technologies in the decarbonizing shipping industry: a bibliometric analysis,” *Front Mar Sci*, vol. 12, Jan. 2025, doi: 10.3389/fmars.2025.1523267.

[16] Z. Raza, J. Woxenius, C. A. Vural, and M. Lind, “Digital transformation of maritime logistics: Exploring trends in the liner shipping segment,” *Comput Ind*, vol. 145, p. 103811, Feb. 2023, doi: 10.1016/j.compind.2022.103811.

[17] Z. Li, J. Fei, Y. Du, K.-L. Ong, and S. Arisian, “A near real-time carbon accounting framework for the decarbonization of maritime transport,” *Transp Res E Logist Transp Rev*, vol. 191, p. 103724, Nov. 2024, doi: 10.1016/j.tre.2024.103724.