

Development of MPLMSC (Maritime Port and Logistics Management Schedule Class) Mobile Web App to Facilitate MPLM Students in Accessing Course Schedules

Farasabila Angeli Purnomo *

Port Management and Maritime Logistics Study Program, Universitas Negeri Jakarta, East Jakarta City, Special Region of Jakarta, Indonesia.

Corresponding Email: farasabilaangelpurnomo_1511521054@mhs.unj.ac.id.

Nabila Farraha Isha

Port Management and Maritime Logistics Study Program, Universitas Negeri Jakarta, East Jakarta City, Special Region of Jakarta, Indonesia.

Email: nabilafarrahaisha_1511521006@mhs.unj.ac.id.

Siti Sahara

Port Management and Maritime Logistics Study Program, Universitas Negeri Jakarta, East Jakarta City, Special Region of Jakarta, Indonesia.

Email: sitisahara@unj.ac.id.

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Abstract: Engineering at Universitas Negeri Jakarta, focusing on equipping students with specialized knowledge in managing maritime operations and logistics. Traditionally, MPLM students rely on the university's Academic Information System (SIKAD) to access essential academic information, including course schedules and room assignments. However, the frequent changes in schedules due to various factors, such as faculty availability and special events, have highlighted the need for a more dynamic and responsive scheduling tool. This study addresses this need by developing a mobile web application specifically designed for class scheduling. The application aims to streamline the process by allowing students to easily access real-time schedule updates, including changes in the mode of delivery (whether online or offline). The research was conducted using the Research and Development method, following the 4D development model: define, design, develop, and disseminate. The evaluation of the application indicated a high level of user satisfaction, with a positive response rate of 86.76%, demonstrating its effectiveness in meeting the needs of both students and faculty.

Keywords: Web Application; Information Technology; Course Scheduling; Maritime Logistics; Academic Information Systems.

1. Introduction

The advancement of information technology has significantly impacted various aspects of life, including education. In this digital era, information technology serves as the backbone for data management and information dissemination, particularly in academic settings. One of the critical aspects of higher education is the management of class schedules, which involves the allocation of classrooms, time slots, and other resources for teaching and learning activities. However, as the educational system becomes increasingly complex, particularly in programs with a large number of students and faculty, managing class schedules presents a unique challenge. This challenge is further exacerbated by the limited availability of facilities, such as classrooms, which can disrupt the smooth flow of classes if not managed properly. The Maritime Port and Logistics Management (MPLM) program at Universitas Negeri Jakarta faces a classic problem encountered by many educational institutions—limited classroom availability. The ongoing renovation of campus buildings has resulted in a reduced number of available classrooms, necessitating a division of classes between in-person (offline) and online sessions. This situation demands greater flexibility in schedule management, as class schedules may change frequently due to various factors, including faculty availability, seminars, and other events. Unfortunately, the current Academic Information System (SIKAD) does not fully accommodate these dynamic changes in real-time, making it difficult for students to access the most up-to-date information regarding their class schedules.

To address these challenges, innovation is required in the form of a mobile web application that can assist students in quickly and accurately accessing class schedule information. This study aims to develop a mobile web application called the Maritime Port and Logistics Management Schedule Class (MPLMSC), specifically designed to meet the needs of MPLM students in managing their class schedules. The development of this application is based on the Research and Development (R&D) method, which has proven effective in producing innovative products in educational technology [3]. The R&D method integrates various stages of product development, from problem definition, design, development, to dissemination. The development model used in this study is the 4D model, which consists of four main stages: Define, Design, Develop, and Disseminate. In the definition stage, a needs analysis is conducted to identify the primary problems faced by the MPLM program related to class schedule management. The design stage involves creating an initial prototype of the application, including user interface design and system architecture. The development stage is the process of implementing the design, which is then tested to ensure the application functions as expected. The final stage is dissemination, where the developed application is deployed in a real environment and its effectiveness is evaluated through surveys and questionnaires.

Research related to the development of web-based applications in educational contexts has shown positive results in improving the efficiency and effectiveness of teaching and learning processes [1][2]. For instance, a study by Febriani and colleagues (2022) developed a mobile web application for managing Islamic outreach activities in Bandar Lampung, which successfully improved coordination and information dissemination among the participants. Setiadi *et al.* (2018) also developed an Android application for Pneumatics learning, which proved effective in enhancing students' understanding of the subject matter. These findings suggest that web-based applications have significant potential for application in various educational contexts, including class schedule management. Furthermore, the development of web-based applications also requires a comprehensive approach in terms of user interface (UI) and user experience (UX) design to ensure the application is user-friendly for its target audience [4]. Intuitive design and reliable functionality are key to creating an application that is not only effective but also appealing to users. For example, Pambudi and colleagues (2021) used a genetic algorithm to design a web-based class scheduling system that successfully produced more optimal schedules and minimized scheduling conflicts.

The use of technology in education is further supported by studies showing that web-based applications can enhance information accessibility, particularly for students who often face tight schedules [5]. For instance, the Kahoot application developed by Damayanti and Dewi (2021) was successfully used as a medium for evaluating student learning outcomes, increasing student participation and engagement in the learning process. This research is relevant to the development of MPLMSC, where the developed application is expected to facilitate students in accessing important information related to their classes. The evaluation of the developed application is also a crucial aspect of this study. A survey was conducted among MPLM students to assess the feasibility and effectiveness of using the MPLMSC application. The survey results indicated that the majority of students responded positively to this application, with high satisfaction levels regarding ease of use and information access [2][4][5]. This assessment provides evidence that the MPLMSC application has great potential to be widely implemented in academic settings. The development of the MPLMSC mobile web application represents an innovative step in addressing the challenges of class schedule management in the

Maritime Port and Logistics Management program. By utilizing the R&D method and the 4D development model, this application is designed not only to meet students' needs for accessing class schedule information but also to enhance the overall efficiency and effectiveness of the educational process.

2. Research Method

The research method used in the development of the MPLMSC (Maritime Port and Logistics Management Schedule Class) mobile web application is the Research and Development (R&D) method. According to Sugiyono (2016), the R&D method is a research methodology aimed at producing a specific product and testing the effectiveness of that product in a relevant. In this study, the development of the mobile web application adopts the 4D development model, originally developed by Thiagarajan (1974), which consists of four main stages: Define, Design, Develop, and Disseminate [6].

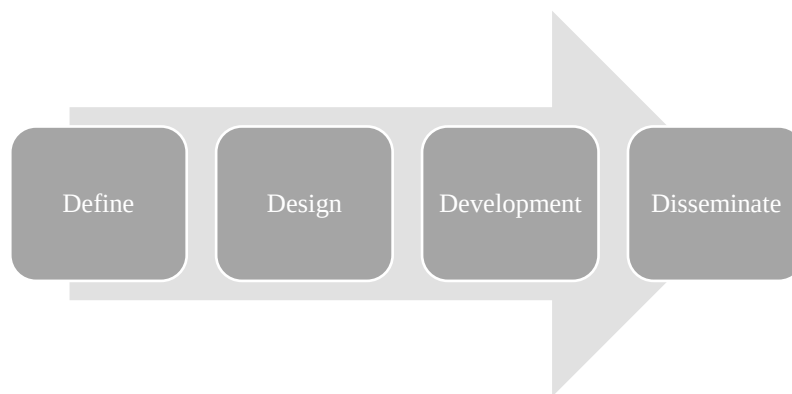


Figure 1. Define Stage Process

In the first stage, Define, an analysis was conducted to determine the requirements needed to build the mobile web application by identifying the main problems faced by the MPLM program, which formed the basis for the development of the application. The next stage, Design, involved the initial design of the mobile web application, including the visual and functional features that would be implemented in the final application. The subsequent stage, Develop, involved the process of developing the application based on the previously created design, including testing to ensure that the application could be used according to the specified requirements. Finally, the Disseminate stage involved distributing the developed product and evaluating its effectiveness through field trials. In this process, the sample size was determined using the Slovin formula, with the sample size calculated based on the total population of active students in the Maritime Port and Logistics Management program for the 2021, 2022, and 2023 cohorts, with a margin of error set at 5%. The study used a sample of 192 students selected to provide feedback on the developed application.

3. Result and Discussion

3.1 Results

The development of the MPLMSC (Maritime Port and Logistics Management Schedule Class) mobile web application is aimed at supporting the academic processes within the Maritime Port and Logistics Management program by providing essential features such as schedule management, SIMAKEL (Booking Class), and course management. This study utilizes the 4D development model, which includes the following stages: Define, Design, Develop, and Disseminate. In the Define stage, the primary issue identified was the limited availability of classrooms due to ongoing renovations, leading to a division of classes between offline and online formats. Moreover, frequent schedule changes were not accurately reflected in the university's Academic Information System (SIKAD), resulting in confusion among MPLM students. The analysis conducted during this stage laid the foundation for the development of the mobile web application, with the objective of resolving these scheduling challenges. The primary goal was to create a system that could provide real-time updates to both students and faculty, ensuring that everyone involved in the academic process had access to the most current information. Following this, the Design stage focused on creating the initial blueprint for the application. This involved detailing the user interface and the overall structure of the system. For example, the login interface,

as shown in Figure 2, was designed to allow students to log in using their Student Identification Number (NIM) and password, which are unique to each student in the MPLM program. Upon logging in, students would be directed to the homepage, which includes a list of class schedules, SIMAKEL, and course management tools, as depicted in Figure 3. The design aimed to be user-friendly, ensuring easy navigation for students to access the information they need without unnecessary complexity. The design stage also included creating mock-ups of the application's layout and functionality, ensuring that all necessary features were well-integrated and user-friendly.

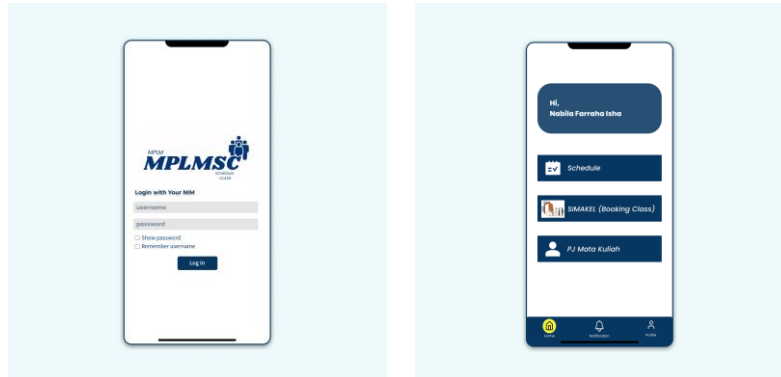


Figure 2. Login Interface Figure 3. Homepage Interface

The Develop stage then followed, where the application was built according to the design specifications. This stage involved the actual coding and implementation of the system. The development team focused on integrating all the planned features, such as enabling students to select their class year and view all enrolled courses. For each course, detailed information—such as course codes, instructor names, classroom locations, and whether the class would be held online or offline—was made available. This feature was crucial for providing students with the flexibility to prepare for classes, whether they needed to attend in person or log in virtually. For instance, Figure 4 shows how students can select their class year, and Figure 5 illustrates the detailed course information available. The development phase also included rigorous testing to ensure that the application functioned as intended, with simulations of various scenarios to identify and resolve any bugs or issues that could impact the user experience. The primary goal was to ensure the application was both functional and reliable in providing the necessary information to students.

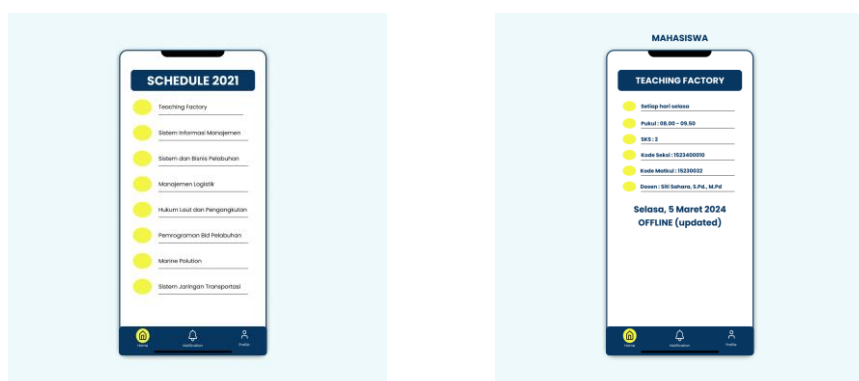


Figure 4. Class Year Selection Interface Figure 5. Course Information Interface

The Disseminate stage involved distributing the completed web application to its intended users and evaluating its effectiveness. This stage began with a survey distributed to MPLM students from the 2021, 2022, and 2023 cohorts using Google Forms. The survey aimed to gather feedback on the application's usability and effectiveness. A total of 132 students participated in the survey, providing a broad range of feedback essential for assessing the application's performance. Figure 11 illustrates the distribution of the questionnaire to the students. The survey featured five key indicators of effectiveness, with response options ranging from Strongly Disagree (scale 1) to Strongly Agree (scale 5). The results indicated that the MPLMSC application was well-received, with an overall satisfaction rate of 86.76%. This high approval rating suggested that the application successfully met its objectives, offering a convenient and efficient tool for managing class schedules. Figure 12 shows the evaluation results, where the majority of students found the application easy to use and appreciated the convenience it provided in accessing up-to-date class schedules. This positive feedback

confirmed that the MPLMSC application was an effective solution to the scheduling challenges faced by the MPLM program and demonstrated its potential to significantly improve the efficiency of academic processes within the program.



Figure 6. Questionnaire Distribution

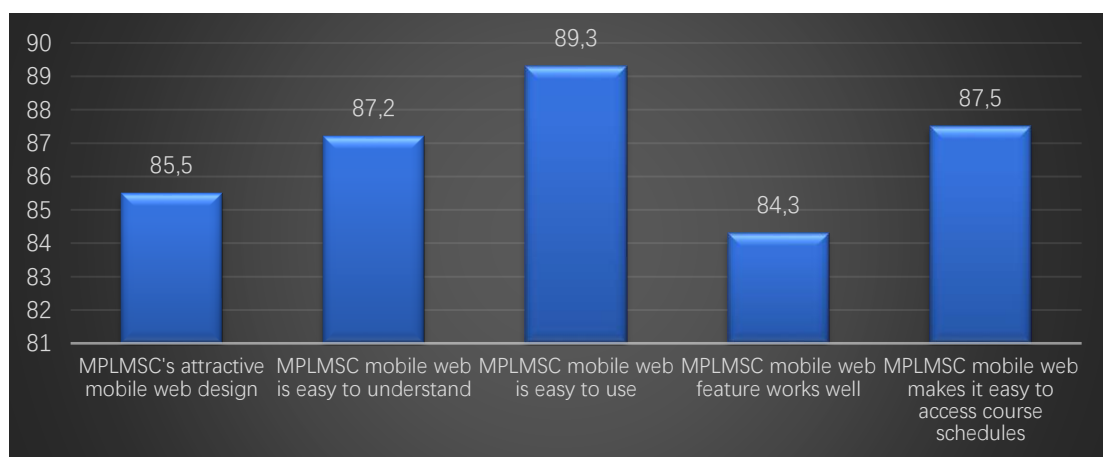


Figure 7. Evaluation Results

The development of the MPLMSC mobile web application followed a structured process beginning with problem identification, followed by designing and implementing a solution, and finally evaluating its effectiveness. Each stage of the process was carefully executed to ensure the final product met the needs of its users. The application's success, evidenced by the high satisfaction rate among students, highlights the importance of a systematic approach to software development, particularly in educational settings where the effectiveness of tools and resources is critical. The MPLMSC application not only addressed the immediate scheduling challenges faced by the MPLM program but also set a precedent for how similar challenges could be tackled in other academic programs. The development of this application showcased the value of integrating technology into educational management, offering a practical example of how digital tools can enhance the learning experience and streamline administrative tasks.

3.2 Discussion

The development of the MPLMSC (Maritime Port and Logistics Management Schedule Class) mobile web application is an effort to improve the efficiency of class schedule management in the Maritime Port and Logistics Management program at Universitas Negeri Jakarta. This application aims to address several key issues faced by students and faculty in managing class schedules, particularly in situations where classroom space is limited due to ongoing renovations and where schedule changes are not always accurately reflected in the Academic Information System (SIKAD). The survey conducted with 132 MPLM students from the 2021, 2022, and 2023 cohorts revealed that many respondents had a positive experience using the MPLMSC application. Most students reported that the application made it easier for them to access information related to their class schedules, whether for online or offline classes. These results indicate that the MPLMSC application successfully meets students' needs for accessibility and ease of use. The satisfaction scale used in the survey showed that the application received an average satisfaction rating of 86.76%, indicating a very

high level of acceptance from early users. The success of MPLMSC in receiving positive feedback from students is closely linked to the development process, which followed the 4D model. The Define stage allowed the development team to thoroughly understand the problems faced by end-users, namely students and faculty. Proper identification of these issues at this stage was crucial to ensuring that the solution developed was truly relevant to users' needs. During the Design stage, the focus on user-friendly access and navigation played a key role in the application's success. A simple yet informative interface made it easier for students to access the information they needed without navigating through complicated processes. For example, the login feature, which uses the Student Identification Number (NIM) and password, simplifies and secures the authentication process, while features such as course listings and SIMAKEL provide direct access to the necessary information.

The Develop stage was also critical, as it involved rigorous testing to ensure that every feature designed functioned correctly. This phase included thorough testing to identify and fix any bugs or issues that might disrupt the user experience. Feedback from initial testing was used to refine and improve the application before it was deployed to a broader user base. In the Disseminate stage, the effectiveness of the application was evaluated in a real-world setting. Surveys were distributed to students to gather direct feedback from end-users. The results of the surveys showed that the MPLMSC application was not only well-received but also considered effective in helping students manage their class schedules. The high scores obtained on the ease-of-use indicators demonstrated that the application successfully achieved one of its main objectives—making the management of class schedules simpler for students. However, despite the high ratings and positive feedback, there are areas where the MPLMSC application could be further improved. For instance, the notification feature could be enhanced to provide real-time updates on schedule changes or other important information. This would further increase the speed and efficiency of information delivery to students. Additionally, integrating the application with other systems used by the university, such as SIAKAD, could be considered to enhance the synergy between the various platforms used by students and faculty. The MPLMSC application has demonstrated significant potential as an effective tool for managing class schedules in the Maritime Port and Logistics Management program. The development process, guided by the 4D model, has proven effective in producing a product that is both relevant and useful to end-users. With ongoing evaluation and adjustments based on user feedback, the application is expected to continue evolving and provide even greater benefits in the future.

4. Related Work

In recent years, the integration of web-based technologies into educational environments has become increasingly prevalent. These advancements aim to enhance accessibility, efficiency, and the overall management of academic processes, particularly in higher education. The development of mobile and web-based applications for educational purposes has shown significant potential in addressing various challenges faced by students and educators. A significant body of research has focused on the design and implementation of scheduling systems tailored to the needs of educational institutions. Núñez *et al.* (2020) developed a cloud-based scheduling system that allows real-time updates and synchronization across multiple platforms, significantly improving the efficiency of schedule management in large institutions. This approach is particularly relevant to the development of the MPLMSC application, as it similarly aims to provide real-time updates to students regarding their class schedules [7].

Furthermore, the importance of user-centered design in educational applications has also been explored. Herumurti *et al.* (2023) focused on developing a mobile application for university schedule management and emphasized the need for an intuitive user interface to enhance user experience and engagement. This research aligns with the design principles applied in the MPLMSC application, which also prioritized user-friendliness and ease of navigation [12]. In addition to scheduling systems, recent studies have also explored the use of artificial intelligence (AI) in educational tools. Alotaibi and Alshehri (2023) proposed an AI-based system that adapts to the scheduling preferences of students and faculty, aiming to optimize class timings and resource allocation. Although AI was not directly implemented in the MPLMSC application, the concept of personalized scheduling could be a future enhancement for the system [9]. Another relevant study by Al-Sudani (2019) examined the impact of mobile learning applications on student engagement and academic performance. Their findings suggest that mobile applications well-integrated into the academic environment can significantly enhance student learning outcomes. The MPLMSC application, by providing easy access to class schedules and updates, seeks to support similar improvements in student engagement and performance [14].

Moreover, the integration of feedback mechanisms into educational applications has been extensively researched. Asiri *et al.* (2021) developed a mobile app that included real-time feedback features, allowing students to communicate directly with instructors and administrative staff. This feature significantly improved student satisfaction and communication efficiency, a concept that could be considered for future updates to the MPLMSC application [15]. The use of gamification in educational apps has also gained attention. Su and Cheng (2015) explored how gamification elements in mobile learning applications can increase student motivation and participation. Although the MPLMSC application does not currently incorporate gamification, this approach could be an interesting addition to further engage students in using the application for schedule management [16].

Other studies have focused on the security and privacy aspects of educational apps. Khvostov *et al.* (2021) discussed the importance of ensuring data security in mobile applications used in educational settings, especially concerning student information. The MPLMSC application addresses these concerns by implementing secure login protocols and data encryption techniques [17]. In addition to these studies, the scalability of educational applications has also been explored. Palomo-Duarte *et al.* (2014) analyzed the scalability of web-based educational tools, emphasizing the need for systems that can handle an increasing number of users without compromising performance. The MPLMSC application was designed with scalability in mind, ensuring that it can support a growing number of students as the program expands [18]. Research on the integration of mobile applications into blended learning environments has also been relevant. Ustun (2019) investigated how mobile apps can be used to complement traditional classroom settings, leading to enhanced learning experiences. The MPLMSC application, by offering seamless access to schedule information, supports the blended learning approach adopted by the Maritime Port and Logistics Management program [19]. Recent developments in user experience (UX) design have contributed to the success of educational applications. Dirin and Nieminen (2017) emphasized the role of UX in ensuring that educational tools are not only functional but also enjoyable to use. The MPLMSC application integrates these UX principles to provide a smooth and engaging user experience [20].

5. Conclusion

The development of the MPLMSC (Maritime Port and Logistics Management Schedule Class) mobile web application represents a significant advancement in addressing the challenges of class schedule management within the Maritime Port and Logistics Management program at Universitas Negeri Jakarta. By adopting the 4D development model, this application was meticulously designed, developed, and evaluated to meet the specific needs of both students and faculty. The positive feedback received from users, as reflected in the high satisfaction rates, confirms that the application successfully enhances the accessibility and management of class schedules, providing a user-friendly platform that effectively integrates with the existing academic infrastructure. The application's success is largely attributed to its ability to provide real-time updates, simplify the scheduling process, and offer an intuitive user interface that students find easy to navigate. The study highlights the importance of involving end-users in the development process to ensure that the final product is both relevant and effective in meeting their needs. Moreover, the MPLMSC application demonstrates how digital tools can significantly improve the efficiency of academic processes, thereby contributing to a more streamlined and organized educational environment. Looking ahead, there are opportunities to further enhance the application by incorporating additional features such as real-time notifications and integration with other university systems. These improvements could increase the application's utility and provide even greater support for students and faculty in managing their academic responsibilities. The MPLMSC application is not only a practical solution to the current scheduling challenges but also a model for how similar challenges can be addressed in other educational programs. It sets a precedent for the successful integration of technology into academic management, showcasing the potential for digital innovations to transform the educational experience.

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