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Design and Development of an Exhibition Management System for Final Project Products of Practicum Using the Prototyping Method

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ABSTRACT

This study focuses on the design and development of the Exhibition Management System (EMS) through the Prototyping Method exemplifies a workable solution to the challenges of organizing exhibitions aimed at showcasing products developed from Project Based Learning (PBL) in practicum activities. By integrating features such as participant registration, product submission, feedback collection, and archive management, this system presents an organized platform that boosts user interaction and streamlines operations. Requirement prototype technique of prototyping is utilized because the developer builds the system by outlining its functions and processes, especially when the user or owner of the system is unable to accurately. The system is built using the Laravel framework and MySQL as data storage. This system is not only a digital platform in exhibition management, but also serves as a reference that can be implemented for other educational institutions that want to increase public engagement in the institution's activities to improve the experience through digital solutions. The successful implementation of this system as a benchmark shows its potential to increase innovation, teamwork, and effective results in project-based learning.

Keywords: Exhibition, Prototyping Method, System

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INTRODUCTION

One of the learning models used in practice is Project Based Learning (PBL). PBL is a dynamic approach to teaching that focuses on students, marked by their independence, exploratory research, setting objectives, teamwork, interaction, and thoughtful consideration in practical situations (Kokotsaki et al., 2016). This method is considered effective because it can increase individual self-confidence and the ability to analyze and solve problems faced (Fauzi et al., 2019). The application of this learning model is very important, especially in the Information Technology Department which gives a weighting of practicum and theoretical assessments of 70% and 30% respectively. The Appendix of the Permendikbud explains that vocational education must prioritize learning outcomes that reflect work competencies, (Permendikbud No. 3, 2020).

In order to introduce and promote the products resulting from this final project practicum, usually at the end of the semester a product exhibition will be held which includes desktop, website, and

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mobile applications. However, the exhibition is still held offline with booths created in class by the student committee and often invites stakeholders, agencies, and institutions around the campus environment. Currently, there is no platform that allows digital recording and organization of products in this final project practicum exhibition, which aims to expand promotion and increase visibility to the public, especially the digital community. Therefore, it is very important to build a system that can manage the products of this final project practicum on a digital platform for exhibition activities.

In previous studies, the development of a student work exhibition management system using the Extreme Programming (XP) method was carried out by (Mutezar & Umniy Salamah, 2021). This study focuses on event management, works, and certificate of participation creation, and the application of the method is carried out according to the release plan. Unlike similar studies on exhibition management systems, this system will be built using the prototyping method, where the development process adopts a fast and gradual design approach so that the development results can be immediately evaluated by prospective users. One important aspect in implementing the prototyping method is communication with end users; the more feedback and interaction from end users, the clearer the development process with application developers, because they understand the client's needs. In this development process, attention is paid to event management, exhibition products, event data archiving, and direct product ratings by visitors. This research uniquely bridges this gap by focusing on the integration of these methodologies, thereby offering a novel approach to system development that emphasizes iterative feedback and experiential learning.

Meanwhile, in the study of system development using the prototyping method, there are only a few studies that specifically emphasize its integration in the final project practicum, especially those that refer to the development of an exhibition management system. This study addresses this deficiency by combining these perspectives, emphasizing the ways in which the prototyping method can enhance the usefulness and influence of exhibition management system development in academic environments. The uniqueness of its contribution lies in illustrating how prototyping can connect theoretical knowledge with real-life applications.

This study aims to design and develop an Exhibition Management System as a final project practicum using the Prototyping Method within the framework of Project-Based Learning. It seeks to demonstrate the feasibility and effectiveness of this integrated approach in enhancing system usability, adaptability, and student learning outcomes. The research further endeavors to provide a replicable model for other educational institutions and developers in similar contexts.

METHOD

In the development of this exhibition management system, the prototype method is used, which is an iterative approach in which an initial model of the application (called a prototype) is created, tested, and refined until it meets user needs. This approach is a component of the system creation technique within the System Development Life Cycle (SDLC) that emphasizes obtaining immediate input from users prior to the complete development of the final product. There are two categories in the technique of prototyping (Mulyani, 2017), the first is Evolutionary Prototype, the prototype is created in an ongoing manner to ensure that the resulting functions and processes align with the requirements of the system being designed. The second is Requirements Prototype, developers create prototypes by outlining system functions and processes, especially when users or system owners struggle to articulate system requirements clearly.

The prototyping approach is a technique for system development that utilizes a model to give users a glimpse of the development process that will take place (Mulyani, 2017). This technique aims to give a summary of the application's design, which will be assessed by the user initially. The user

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evaluated the prototype application and subsequently utilized it to create applications that incorporate it as a final production item (B. H. Rambe et al., 2020). Additionally, the prototyping technique is a repeated process where the needs of users are converted into a functioning system that is continually refined through teamwork between users and analysts (Muharto & Ambarita, 2016). This approach is especially beneficial for gathering requirements, obtaining customer input, and pinpointing, analyzing, or reducing potential risks in a project where the product idea is innovative or not entirely understood (Devadiga, 2017).

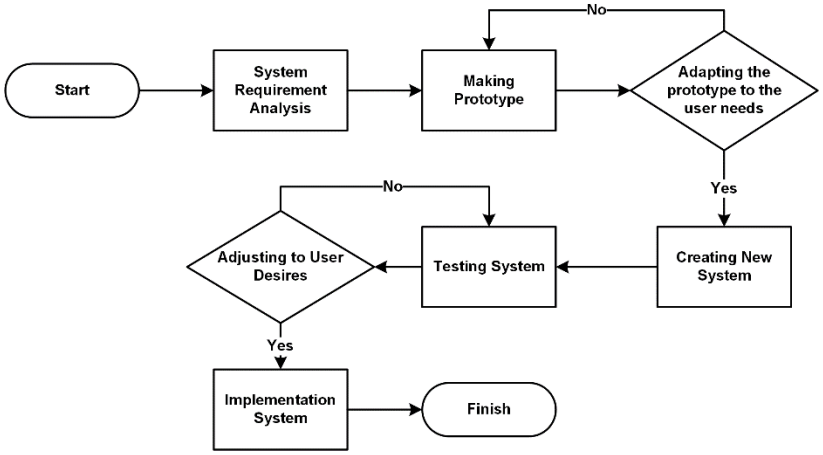

Figure 1. Prototyping Method Cycle using Requirement Technique
Source: (Wulandari et al., 2021)

In Figure 1 explains that there are several stages of the research process carried out, and the details of each phase are described below:

1. System Requirement Analysis,
   This stage involves system requirements analysis, which is collecting information from users to understand what is desired and needed in the system. This information becomes the basis for building an initial prototype.
2. Making Prototype
   Based on the results of the needs analysis, an initial prototype is made. This prototype is a simple representation of the system to be built, usually focusing on the main functions to help users understand how the system will work.
3. Adapting the Prototype to the User Needs
   The prototype is tested with users to see if it meets their needs. If users disagree, the prototype is adjusted or improved based on user feedback. If the prototype is suitable, the process continues to the next stage.
4. Creating New System
   Once the prototype is approved, the new system begins to be developed by implementing the final design based on the customized prototype.
5. Testing System
   The developed system is tested to ensure that all features work as needed and there are no significant errors. If the system does not meet the needs or there are bugs, then further adjustments are made.
6. Adjusting to User Desires
   If there is additional feedback from users during testing, further adjustments are made to ensure the system truly meets the user's desires. Once everything has been adjusted, the system is considered ready.
7. Implementation System

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Once the system has been tested and adjusted, the final step is to implement the system into an operational or user environment.

RESULTS AND DISCUSSION

The management system for exhibitions was created employing the prototyping approach, specifically through the use of the requirement prototype method. The second technique of prototyping is utilized because the developer builds the system by outlining its functions and processes, especially when the user or owner of the system is unable to accurately define the system's requirements. The ensuing section details the stages of system development that were executed by adhering to the steps outlined in the Requirement Prototype technique.

A. System Requirement Analysis

This first phase is a crucial part of the system development process that should occur between the system owner and the developer. The aim is to guarantee that the system being created aligns with user requirements and fulfills the business and technical objectives that will be established through conversation. This involves activities such as identifying, documenting, and validating the necessary needs or features that the system should include. This way, a clear understanding is formed about how the system will work and function in accordance with what the users want.

One of the diagrams used in designing system requirements to describe the interaction between users and the system being developed is by using a use case diagram (Kurniawan, 2018). The method for use case modeling uses UML (Unified Modeling Language) which is a standard for visual modeling, design and documentation of a system that produces a blueprint of the application (Setiyani, 2021).

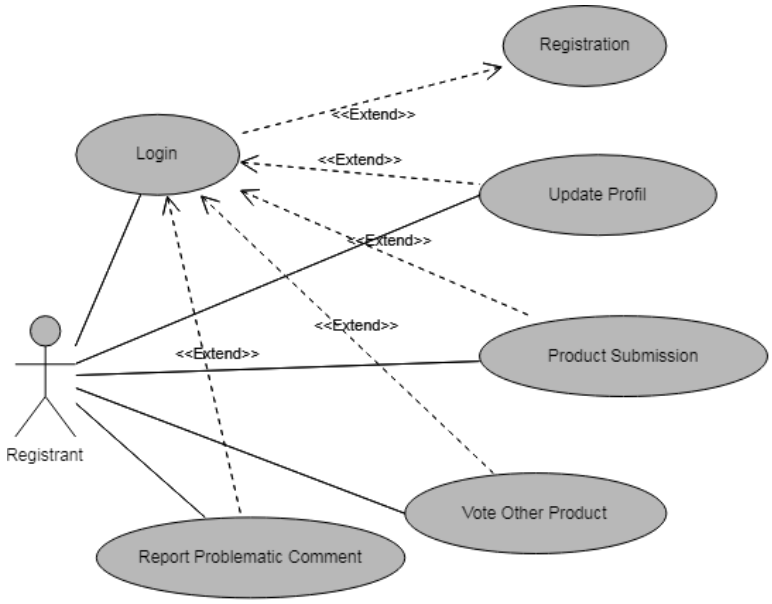

Figure 2. Use Case Diagram of Registrant User Role
Source: (Setiyani, 2021)

Figure 2 is explaining how the business process for registrants and the access they can engage in while using the system.

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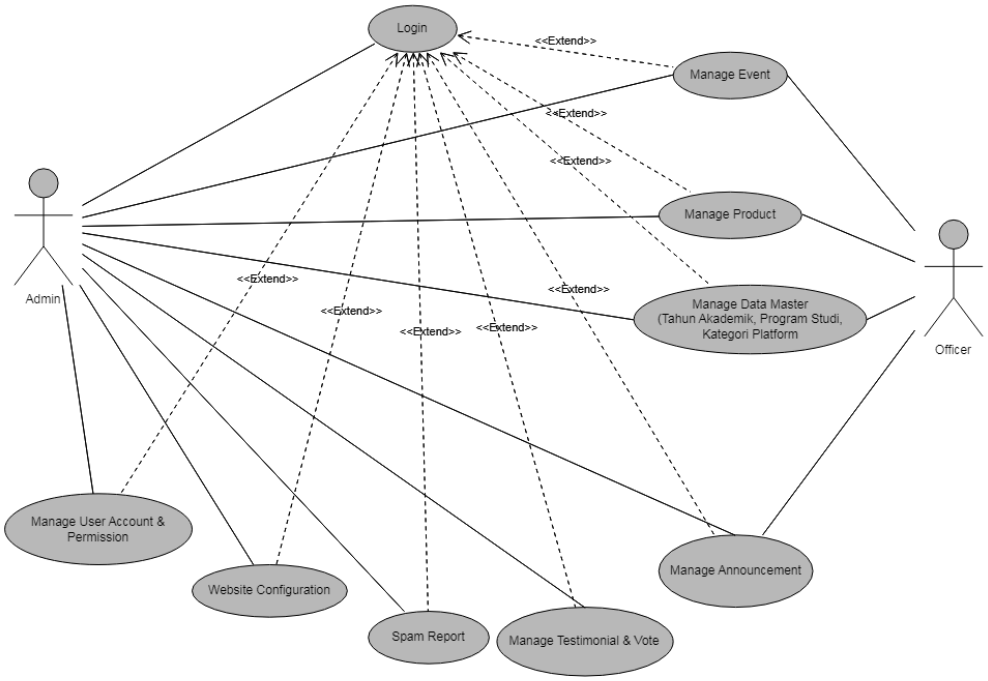

Figure 3. Use Case Diagram of Officer and Admin User Role
Source: (Setiyani, 2021)

Figure 3 is explaining how the business process for administrator and officer which has almost the same access rights they can engage in while using the system with extra privileges for the administrator user role. From Figure 2 and Figure 3, three user roles are implemented., namely registrants, officers, admins, here are the needs of each type of system user:

1. Registrant
   As a registrant, the user has the ability to log into the website, enter information about exhibition products, watch and provide feedback on those products, report any inappropriate comments, and update their profile.
2. Officer
   The officer user role includes permissions such as overseeing products, handling master data, and managing information and notifications.
3. Admin
   In the admin role, a user has the same permissions as an officer but with extra capabilities, including managing user accounts, handling testimonials and comments, reviewing reports of inappropriate comments, and adjusting system settings.

B. Making Prototype

After analyzing the system and user needs, the following phase involves designing a user interface (UI) represented as a wireframe for both the frontend and backend. A wireframe is a design layout represented in a Low-Fidelity (Lo-Fi) format that helps designers showcase interface details, outlines the structure of the interface, and accelerates the design workflow (Santoso, 2024). This research emphasizes developing a UI design for the frontend since the backend UI has been supported by the CRUD Framework Kit, namely Laravel Backpack, a tool within the Laravel Web Development Framework for aim of facilitating developers in developing the system.

When crafting wireframe layouts with the tool called Figma, it's important to note that Figma is an online design platform that enables individuals to: develop and work together on designs

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simultaneously, design digital items like websites and mobile applications, produce prototypes for websites or apps, and make diagrams (Huang, 2024). The frontend pages that will be designed are the home page, event page, product detail page and archive page. For more details on the wireframe design, you can access the following link: https://s.id/EMS-Wireframe

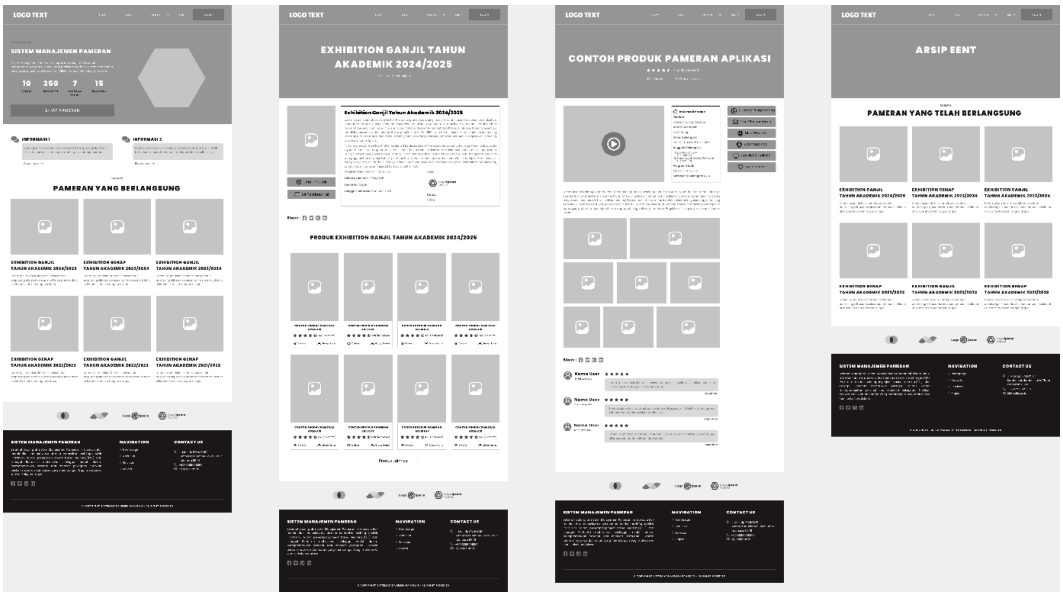

Figure 4. Frontend Wireframe Design of Exhibition Management System
Source: (Ariyadi, n.d.)

Figure 4 shows the results of the wireframe design created with Figma consisting of the Home Page, Event Page, Product Detail Page and Archive Page.

C. Adapting the Prototype to the User Needs

Once the wireframe for the front-end design is finalized, the next step for the developer is to seek feedback from the user to ensure that the prototype meets the outlined system specifications. Should there be any elements that do not meet expectations, the developer will adjust the prototype to better accommodate the user's needs.

D. Creating New System

Once the wireframe for the UI design aligns with user requirements, the developer gets ready to build a brand-new system. The system in development is an information system focused on the web that employs the PHP coding language. along with the Laravel framework and MySQL for data storage. Consequently, it is essential to design a database that features interlinked table entities, represented through an Entity-Relationship Diagram (ERD). ERD is one of the main diagrams representing a conceptual data model that reflects user data requirements in a database system (Pulungan et al., 2023).

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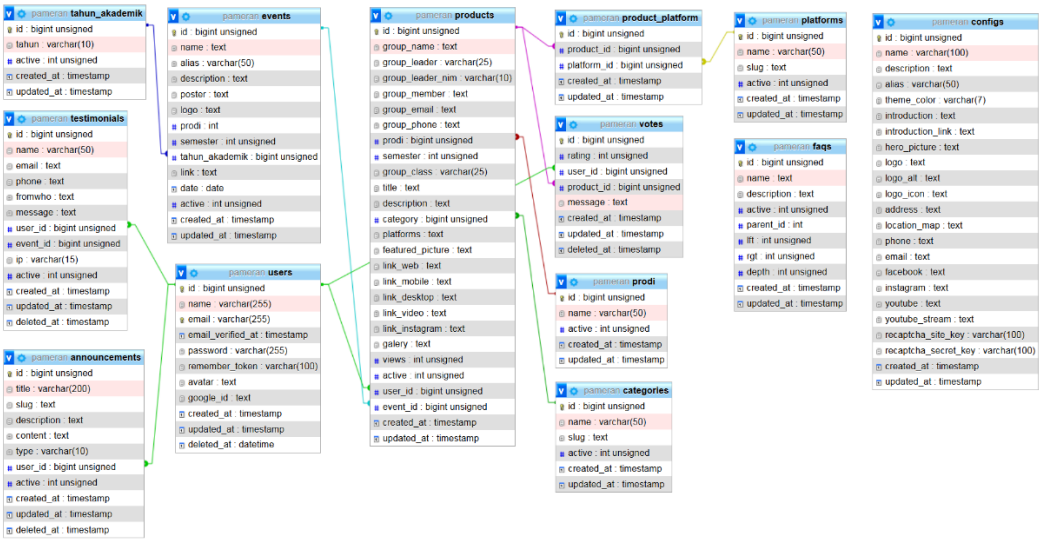

Figure 5. Design Database of Exhibition Management System
Source: (Ariyadi, n.d.)

Figure 5 shows the database design using the PhpMyAdmin designer feature to represent the use of Entity-Relationship Diagram (ERD) to determine the relationship between tables in data storage.

At this stage, several sample UI programs are depicted according to the wireframe layout that has been created and accepted by the users (registrants, officers, and admins). The following is an illustration of the program contained in the Exhibition Management System:

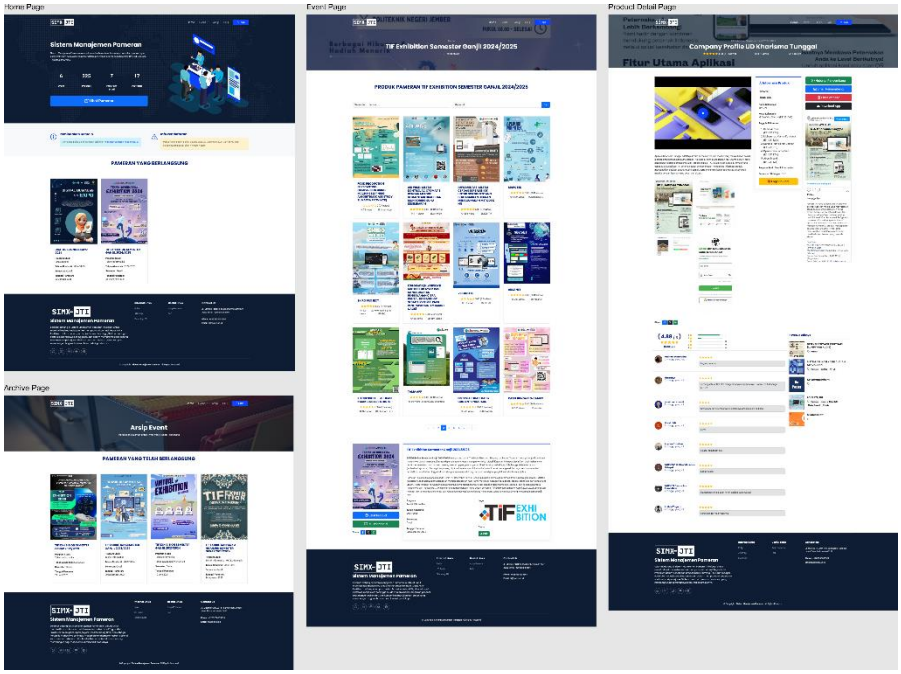

Figure 6. Home Page, Event Page, Product Detail Page and Archive Page
Source: (Information Technology Department, n.d.)

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Figure 6 shows the results of the frontend design created with Bootstrap Style Framework consisting of the Home Page, Event Page, Product Detail Page and Archive Page implemented according to the wireframe design that has been accepted by the user.

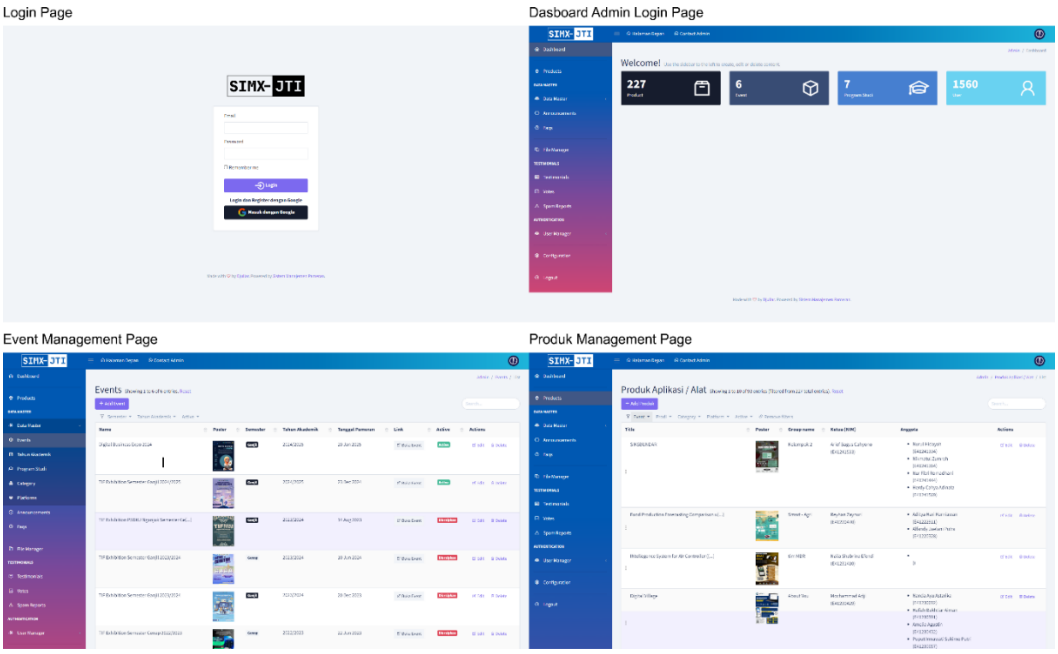

Figure 7. Sample of Admin Management Page
Source: (Information Technology Department, n.d.)

Figure 7 shows the backend view created with the Laravel Backpack Framework Kit which consists of CRUD Master Data, Managing Products, Information and Announcement, Testimonials, Product Vote, Managing User Accounts, User Permissions and also Website Configuration.

E. Testing System

So far, the system has been successfully built, but the system has only been tested by the programmer during the development stage. Perhaps, there are still errors that have not been realized by the system developer. Therefore, it is important to test the reliability of the system so that if there is an error, it can be recognized early and fixed so that the system functions properly.

One of the stages in system development is direct testing by system users with User Acceptance Test (UAT) using the Black Box method. This method involves evaluating software based on its functional requirements while excluding the assessment of its design and code to verify if the software's functions, inputs, and outputs align with the specified requirements (A. R. Rambe & Prihantoro, 2022). Other studies also strengthen the statement that this testing method is carried out by analyzing the outcomes via testing information and verifying the system's performance (Krismadi et al., 2019). Table 1 shows some of the test results from the User Acceptance Test (UAT) that have been carried out.

Table 1. User Acceptance Test (UAT) Result

No.	Use Case	Role	Status	Tested By	Test Date
1.	Test Name: Login & Register Test Overview: Users who are registered have the ability to view	Registrant, Officer, Admin	Success	Bety	2 December 2024

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	web pages based on the permissions provided to them. Test Case: -Username: <correct> - Password: <correct> Expected results: - Upon success, the system acquires login information to gain entry, subsequently directing the user to the administrator dashboard featuring various side menu options. - If unsuccessful, the system will reject access and show the notification "These credentials do not align with our records."				
2.	Test Name: Product Submission Test Overview: Users with the registrant role access the product menu and add an add product button and fill in all the forms required to complete the product data. Test Case: All required form filled Expected results: - Upon success, the system will direct the display to a table page that already contains the previously saved product data added and the product details appear on the website frontend. - If unsuccessful, the user is redirected back to the add product page with an error message displayed above the form, and the user is expected to correct the form contents according to the required data and then try to save it again.	Registrant	Success	Bety	2 December 2024
3.	Test Name: Vote Other Product Test Overview: Registered users can give star rating votes and provide testimonials regarding products displayed on the product detail page.	Registrant	Success	Bety	2 December 2024

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	Test Case: Choose 1 to 5 stars and type comments and save. Expected results: - Upon success, the number of stars selected and the comments given will appear below the product details. - If unsuccessful, the message "Your vote failed to be added!" will be displayed.				
4.	Test Name: Report Problematic Comment Test Overview: Registered users can report comments with inappropriate words to the Admin. Test Case: Click the "Report" link then select the report type and submit the report. Expected results: - Upon success, the report is sent to the Admin and displays the message "Your report has been successfully submitted!". - If unsuccessful, the message "Your report failed to be submitted!" will be displayed.	Registrant	Success	Bety	2 December 2024

Source: (Information Technology Department, n.d.)

F. Adjusting to User Desires

The reported system testing shows successful results as expected. Consequently, when the system meets the requirements of the users and the business process align with the original system design, the system can then be prepared for its release. If the system is still considered to have errors, the developer will fix and adjust it accordingly. Admin testing is carried out by Lecturers and Officer Testing is carried out by Technicians in the Information Technology Department.

Table 2. Registrant Interface and Function Test Result

Participant	Registration	Login	Access Right			
			Update Profile	Product Submission	Vote Other Product	Report Problematic Comment
1	✓	✓	✓	✓	✓	✓
2	✓	✓	✓	✓	✓	✓
3	✓	✓	✓	✓	✓	✓
4	✓	✓	✓	✓	✓	✓
5	✓	✓	✓	✓	✓	✓
Success	5	5	5	5	5	5
Result	100%	100%	100%	100%	100%	100%

Source: (Information Technology Department, n.d.)

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Table 3. Registrant Interface and Function Test Result

Participant	Manage							
	Event	Product	Master Data	Announce-ment	Testimonial & Vote	Report	User Account	Website Configuration
1	✓	✓	✓	✓	✓	✓	✓	✓
2	✓	✓	✓	✓	✓	✓	✓	✓
3	✓	✓	✓	✓	✓	✓	✓	✓
Success	3	3	3	3	3	3	3	3
Result	100%	100%	100%	100%	100%	100%	100%	100%

Source: (Information Technology Department, n.d.)

Table 1 and Table 2 Demonstrate that the outcomes of the system testing align with the requirements of users and the business operations of the organization. Therefore, it can be inferred that the system is prepared for deployment and is to be uploaded to the web server.

G. Implementation System

After going through numerous processes and phases, the final phase of this approach is the system utilized by the individual. This system is to be presented to the public, socialization activities are also carried out to users such as lecturers, students and stakeholders and ended with direct submission to the Information Technology Department as the client for the development of this system. Additionally, the developed system is now available and can be accessed through the online link https://pameran-jti.polije.ac.id/.

Figure 8. Socialization Activities with Student and Lecturer
Source: (Information Technology Department, n.d.)

CONCLUSION

The design and development of the Exhibition Management System (EMS) through the Prototyping Method exemplifies a workable solution to the challenges of organizing exhibitions aimed at showcasing products developed from Project Based Learning (PBL) in practicum activities. By integrating features such as participant registration, product submission, feedback collection, and archive management, this system presents an organized platform that boosts user interaction and streamlines operations.

The iterative cycle of the prototyping method ensured that user needs and feedback were consistently incorporated throughout the development process, resulting in a system that aligns closely with its intended purpose. Utilizing advanced development tools, such as the Laravel framework and Figma for user interface design, further optimized the development process and guaranteed a superior user experience.

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This system not only aids in the digital modernization of exhibition management but also serves as a replicable model for other educational institutions seeking to enhance experiential learning through digital solutions. The successful implementation of this system showcases its potential to encourage innovation, teamwork, and effective outcomes in project-based learning.

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