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DESIGN AND DEVELOPMENT OF A TEACHING FACTORY (TEFA) INFORMATION SYSTEM IN CHLORINE DIGITAL MEDIA COMPANY TO SUPPORT VOCATIONAL HIGH SCHOOL ENTREPRENEURSHIP PROGRAMS

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Abstract
This study designs and develops a web-based Teaching Factory (TeFa) information system for Chlorine Digital Media Company to enhance vocational high school entrepreneurship programs, supported by Indonesia's Ministry of Education. Addressing manual inefficiencies in TeFa operations, the research employs direct observation, literature review, and UML-based system analysis to create a solution featuring product recording, turnover monitoring, and SWOT-driven business feasibility assessments. Key findings reveal improved data accuracy, real-time collaboration among students, teachers, and industry partners, and automated certificate generation—bridging gaps in existing systems. The system's success underscores its potential to elevate workforce readiness and entrepreneurial skills, with implications for scalable adoption across vocational fields. Future research directions include AI and IoT integration and longitudinal impact studies on employability.
Keywords: *Teaching Factory, Information System, Vocational High School, Student Entrepreneurship, Business Feasibility*

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INTRODUCTION

Today's industrial development is characterized by thorough digitalization, including in the field of entrepreneurship. Digitalization simplifies production and marketing processes and opens new opportunities for students to become successful entrepreneurs. For this reason, the government supports the Teaching Factory (TeFa) program (Rosdiana et al., 2024).

Teaching Factory (TeFa) is an educational concept that combines the world of education and the world of industry, with the main objective of providing practical experience to students through various activities aimed at producing real goods and services (Wahyudin & Rahayu, 2020)This concept allows students to gain theoretical knowledge and be directly involved in the real production process, including planning, implementation, and quality control. (Suhartono & Utami, 2017)

Although the Teaching Factory (TeFa) has been implemented before, it still relies on a manual system, especially for financial record-keeping, production management, and product development. This simple process limits efficiency and hinders optimal data management (Mandulangi et al., 2024). Therefore, an information system is needed to support automation and enhance TeFa's operational effectiveness in schools, making the student entrepreneurship

program more structured and professional (Laudon & Laudon, 2014).

According to (Mulyasa, 2015), Teaching Factory helps develop students' skills by allowing them to apply the theory they have learned practically (Regina, 2015). This allows students to acquire theoretical knowledge and relevant and competent technical skills. For example, students from mechanical engineering, in the Teaching Factory, not only learn the principles of machining but also how to assemble and manufacture products according to industry standards (Sucipto et al., 2020).

Based on (Kemendikbudristek, 2022), Teaching Factory (TeFa) is a program supported by the government, especially in vocational education in Vocational High Schools (SMK) in Indonesia. The program is designed to connect the world of education with industry through the application of production-based learning methods (Wahjusaputri & Bunyamin, 2022). In Teaching Factory (TeFa), students gain learning experience by being directly involved in the production process of goods or services that meet industry standards. This allows them to not only understand the theory, but also gain practical skills that are relevant to the real world of work (Bakrun et al., 2019)v. The Government of Indonesia, through the Ministry of Education, Culture, Research and Technology (Kemendikbudristek), continues to encourage the implementation of Teaching Factory in SMK to improve graduates' work readiness and equip them with entrepreneurial skills. This program also supports the Vocational School Revitalization policy, which aims to improve the competitiveness of the national workforce (Khamidi et al., 2024).

In vocational education, Teaching Factory (TeFa) is an effective method in preparing students to enter the world of work by incorporating information systems in the learning process (Dwijayanthi & Rijanto, 2022; Purwanto et al., 2022). The information system functions in managing production data, monitoring student progress, and connecting schools with industry, so that the production-based learning process can take place more optimally, and by industry standards (Isak, 2025; Sunghayok, 2024)With the implementation of information systems, TeFa can improve record accuracy, operational transparency, and collaboration between students, teachers, and industry partners, which ultimately strengthens students' readiness to enter the workforce.

As part of the support for this program, the Teaching Factory app was developed with several key features. The product input feature allows students to record data on the products they have made easily and also allows them to upload brochures and pamphlets as promotional media. In addition, there is a sales input feature that allows students to record their daily income systematically. To assist in business evaluation, the app is also equipped with a business feasibility checker feature based on SWOT analysis; this feature can help students assess and improve their chances of business success.

Based on direct observation and documentation, Chlorine Digital Media Company determined that the development of Teaching Factory (TeFa) was initially a vocational school program supported by the government, which later became the company's newest service. As a solution to the challenges faced by Chlorine Digital Media Company in managing the Teaching Factory (TeFa) program that involves monitoring students, products, sales, and business feasibility, a web-based application was developed that aims to manage and collect computer-based data on various aspects of the program, including recording student data, products, and business feasibility analysis. The development of this application includes system design, usage scenarios, features, and user interface design (UI/UX). In addition, the database design is also designed to support the required data processing. The purpose of creating this application is to improve the efficiency and effectiveness of the implementation of the Teaching Factory (TeFa) program, facilitate the implementation of business activities for students, and facilitate supervision and management by Chlorine Digital Media Company.

This study aims to design and develop a Teaching Factory (TeFa) information system

at Chlorine Digital Media Company to support entrepreneurship programs in Vocational High Schools. The current research introduces a novel web-based Teaching Factory (TeFa) information system tailored explicitly for Chlorine Digital Media Company, integrating SWOT-based business feasibility analysis and real-time turnover monitoring—features not emphasized in prior studies like (Suhartono & Utami, 2017) or (Kemendikbudristek, 2022). Unlike existing systems that focus on generic academic management or manual TeFa workflows (Wijaya & Devitra, 2023; Yandani & Winarti, 2019), this study leverages UML for systematic design and incorporates dynamic stakeholder roles (admin/user) with automated certificate generation, a gap identified in (Siradjuddin et al., 2024) (Riyadi & Nurhadi, 2019). Additionally, it addresses scalability through future AI/IoT integration, advancing beyond traditional methods documented in (Haryoko & Kasim, 2024).

RESEARCH METHOD

In designing the application, each method provided valuable information to develop a system that improves the efficiency and effectiveness of the TeFa program. The following results were obtained with both methods:

Data collection methods for this study included direct observation and literature review: direct observation revealed that the current TeFa program system lacked full automation, relying on manual processes for recording student data, products, turnover, and business feasibility, leading to real-time monitoring challenges and highlighting the need for a structured, technology-based solution meanwhile, the literature review involved gathering and analyzing relevant references to establish a theoretical foundation, identify research gaps, and support software development decisions (Kendall & Kendall, 2014; Kumar 2018).

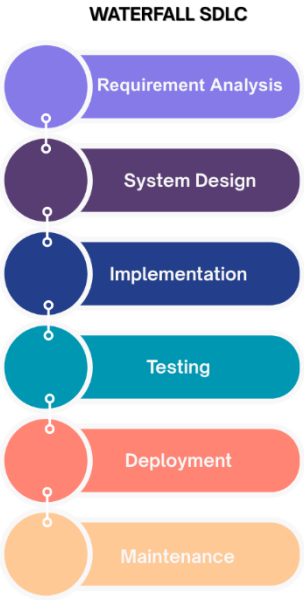


Figure 1. Waterfall SDLC

The Software Development Life Cycle (SDLC) Waterfall model is a sequential development process that flows linearly like a waterfall. This model consists of several phases that must be completed before moving on to the next phase. The key stages of the SDLC Waterfall model include Requirement Analysis, System Design, Implementation, Testing, Deployment, and Maintenance. This methodology is widely used due to its structured

approach, ensuring that each phase is thoroughly completed before proceeding. In applying the Unified Modeling Language (UML) method, the research stages are divided into:

1. Requirement Analysis

a. Information System for Monitoring Business Development

One of the challenges in managing Teaching Factory (TeFa) in vocational high schools is the absence of an integrated information system to document the development of businesses run in the vocational education environment. PT Chlorine Digital Media developed this system to ensure information can be accessed easily and accurately. The obstacles faced include:

1. Business data, product descriptions, turnover, and business feasibility are still not documented systematically.
2. Monitoring business development and determining whether a business is viable in the market is difficult.
3. Lack of access to supporting information, such as capital support, marketing, and industry relations.
4. The absence of a data updating system that allows real-time evaluation and adjustment of business strategies.

b. Business Data Management and Business Feasibility

In the Teaching Factory, a system is needed to record and analyze business development regularly. This system must be able to:

1. Monitor the turnover and business feasibility of each business.
2. Manage data related to marketing strategies, funding, and business expansion.
3. Provide business development reports that can be used for decision-making.

c. Access Rights and Roles in the System

This information system is designed to be used by two leading roles, namely Admin and User (Business Owner/Student), with the following access:

1. User:

a. Register a business and input data related to products, turnover, and business development.
b. Monitor business feasibility and get strategy recommendations based on the input data.

2. Admin:

a. Manage and validate incoming business data.
b. Analyze and compile business development reports.
c. Set business feasibility evaluation parameters by industry standards.

With a more structured information system, Teaching Factory management is expected to be more efficient, transparent, and able to provide strategic insights for students running vocational-based businesses.

2. System Design

Various Unified Modeling Language (UML) diagrams, such as Use Case and Activity Diagrams, are used to visualize the system workflow.

a. Creating a Use Case Diagram

Use Case is a part of the Unified Modeling Language (UML) used to model interactions between actors and systems. In its implementation, Use Case Diagrams are used to visualize the relationship between actors and various processes that occur in the system. According to (Ginting et al., 2024), this diagram serves as a tool in system analysis and design by showing how each actor interacts with the information system to be built.

In this research, Use Case Diagrams were created and designed using StarUML version 5.0.2.1570, which was released on July 11, 2014. With the Use Case Diagram, developers can more clearly understand the system's functional needs, making it easier to implement and test the system at a later stage.

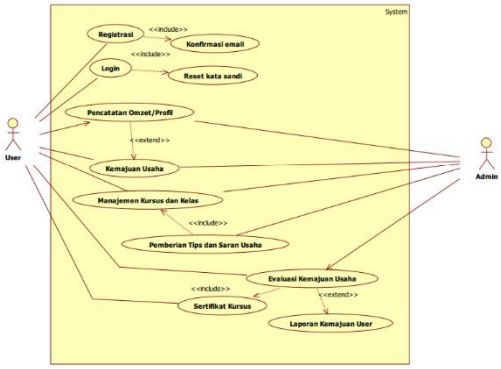


Figure 2. Use Case Diagram

b. Creating an Activity Diagram

An Activity Diagram represents the workflow or activities of a system, business process, or software feature. By utilizing an Activity Diagram, the system can effectively visualize the processes within the Teaching Factory (TeFa) application, ensuring that each feature functions as intended. In the Teaching Factory (TeFa) information system design, there are six activity diagrams, as follows:

Activity Diagram of User Registration and Login

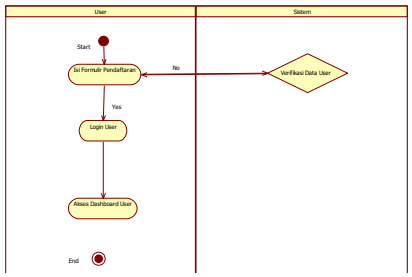


Figure 3. Activity Diagram of User Registration and Login

a. User opens the main page of the Teaching Factory application.
b. The system displays the login page or registration option if they do not have an account.
c. The user inputs the username and password, and then the system verifies the data.
d. The user will be directed to the application's main dashboard if the data is correct.
e. If the data is incorrect, the system will display an error message and request re-input.
f. If the user has no account, they can register first.

1. Course Management Activity Diagram

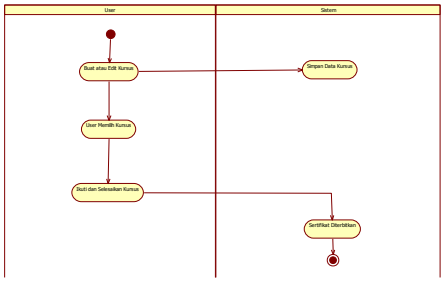


Figure 4. Course Management Activity Diagram

a. User opens the course page in the application.

b. The system displays a list of available courses.
c. The user can select the course they want to join and register.
d. If the course has online materials or classes, the user can access the materials and attend the class.
e. After completing the course, the system will provide a course certificate if eligible.

Activity Diagram of Giving Business Tips

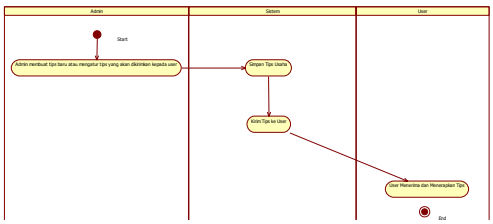


Figure 5. Activity Diagram of Giving Business Tips

a. User opens the Business Tips and Suggestions page in the application.
b. The system provides recommended tips based on the user's business development.
c. The system will adjust the recommended tips if the user has recorded turnover or attended a course.
d. Users can read the tips and use them as a reference for business development.

Activity Diagram of Turnover/Profile Recording

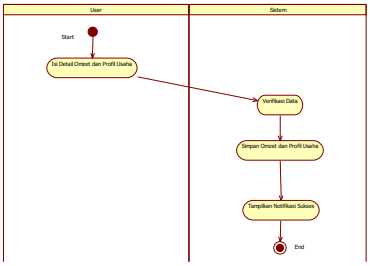


Figure 6. Activity Diagram of Turnover/Profile Recording

a. User opens the Turnover/Profile Recording feature in the application.
b. User inputs data on turnover, source of income, and business feasibility.
c. The system stores the turnover data and analyzes the user's business development.
d. If necessary, the user can update the business data to reflect the latest changes.

Activity Diagram of Business Progress

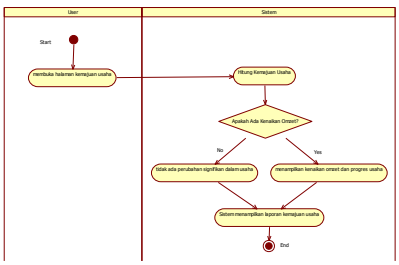


Figure 7. Activity Diagram of Business Progress

a. The system evaluates the turnover data that the user has recorded.
b. If the turnover increases, the system will display the progress of the user's business.

c. If there are obstacles in business development, the system will provide suggestions for improvement.
d. Admin can conduct further evaluation to determine whether the user is eligible for certification or additional support.

Certificate Per Grade Activity Diagram

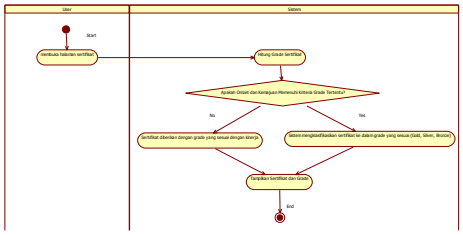


Figure 8. Certificate Per Grade Activity Diagram

a. The system evaluates the turnover and progress of the user's business.
b. If the user meets certain requirements, the system will determine the certificate grade based on business performance.
c. The system generates certificates in specific categories according to the evaluation.
d. Users can download the certificate as proof of achievement in business development.

With the activity diagram, the system can more clearly describe the processes that occur in the Teaching Factory (TeFa) application so that each feature flow can run according to design.

Implementation

a. Backend Development

Coding follows the predefined database design and functional requirements, ensuring data integrity and system functionality. Developers implement business logic and optimize performance while handling authentication and authorization.

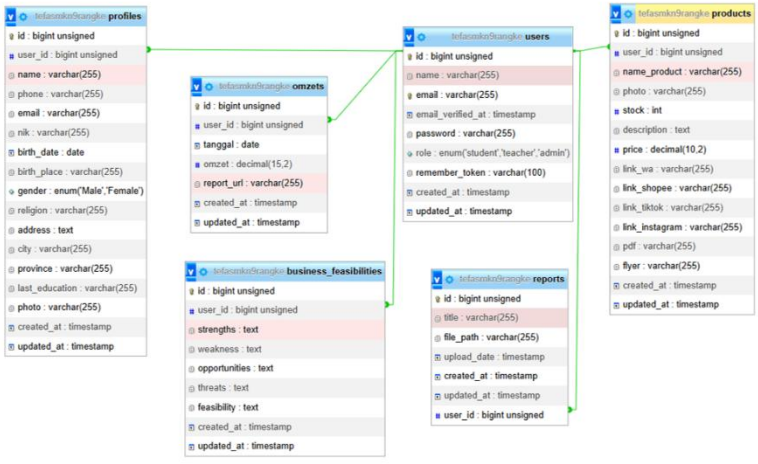


Figure 9. Database Design

The backend supports frontend operations by processing requests, handling errors, and optimizing response times. The focus is creating a scalable, maintainable, and efficient system that aligns with the project architecture.

Frontend Development

The user interface is built using the chosen framework, such as Laravel with Vue.js, ensuring responsiveness and usability. Developers translate UI/UX designs into functional components while managing state, routing, and dynamic content rendering.

3. Deployment

The application is deployed on a local or cloud server. Laragon may be used for local testing, while Virtual Private Servers (VPS) are configured for live deployment. If the application is web-based, domain and database configurations are also set up.

4. Testing

The testing phase ensures that the system functions correctly and meets user expectations through prototype testing methods:

Table 1. Testing Prototyping User

No	Feature	Test Scenario	Expected Result	Conclusion
1	Login	Enter a valid email and password	User successfully logs in and is directed to the dashboard	Valid
	Login	Enter an incorrect email and password	Login fails. An error message appears	Valid
2	Register	Fill in the form with complete and valid data	The account is successfully created, and you can log in	Valid
	Register	Fill in the form with complete but incorrect data	Registration fails, and an error message appears	Valid
3	Product Input	Fill in the product input form with data	The product is saved	Valid
4	Product Edit	Select the product to edit, make changes, and save	The product is successfully edited	Valid
5	Product Delete	Select the product to delete, and delete it	The product is successfully deleted	Valid
6	Revenue Input	Enter revenue data	Revenue is saved	Valid
7	Revenue Edit	Select the revenue data to edit, make changes, and save	Revenue is successfully edited	Valid
8	Revenue Delete	Select the revenue data to delete, and delete it	Revenue is successfully deleted	Valid
9	SWOT Inputs	Fill in the SWOT form	SWOT is saved	Valid
10	SWOT Edit	Edit SWOT data, save	SWOT is successfully edited	Valid
11	Rankings System	View the ranking system based on revenue	The system automatically displays the data	Valid

Table 2. Testing Prototyping Admin

No	Activity	Expected Result	Test Result	Conclusion
1	Login	Enter a valid email and password	Admin successfully logs in and is directed to the dashboard	Valid
	Login	Enter an incorrect email and password	Login fails. An error message appears	Valid
2	Monitoring Input Product	View the list of products entered by users	The system displays product data entered by users	Valid
3	Monitoring Input Revenue	View revenue data entered by users	The system displays revenue data entered by users	Valid
4	Monitoring Input SWOT	View SWOT data entered by users	The system displays SWOT data entered by users	Valid

No	Activity	Expected Result	Test Result	Conclusion
5	Ranking	View the ranking system based on revenue	The system automatically displays the data	Valid

5. Maintenance and Bug Fixing

Continuous monitoring detects bugs and performance issues. Based on user feedback, system updates and feature enhancements ensure optimal performance and usability.

RESULT AND DISCUSSION

Based on the direct observation and documentation results, Figure 1, Use Case Diagram, illustrates the application system design. This figure is designed so admins and users can access the Teaching Factory application by first logging in. If the login process is successful, users can access various main features in the application, while the admin has the right to manage and evaluate user data. The following system design components are designed in the Teaching Factory application:

1. Omzet/Profile, recording is a feature that allows users to record their business development, including income, business feasibility, and capital support.
2. Business Progress is a feature automatically linked to turnover recording. Users can see their business's progress based on the data they input.
3. Course and Class Management is a feature that allows users to register and manage courses available in the application. This feature includes a list of courses, learning materials, and training systems.
4. Providing Business Tips and Advice is an additional feature in course management that provides users with business insight based on their business development.
5. Course Certificate is a feature that allows users to obtain a certificate after completing the course they have attended.
6. Business Progress Evaluation is a feature used by the admin to assess the user's business progress. This evaluation can affect the certification status and recommendations given to the user.
7. User Progress Report is an additional feature of the business progress evaluation that allows the admin to create a report on the user's business progress.

With this design, the Teaching Factory application is expected to help users develop their businesses by recording turnover, conducting training, and evaluating the training conducted by the admin.

Based on direct observation and documentation used to describe the process flow in the Teaching Factory (TeFa) system, this document aims to make it easier to understand. Based on the activity diagram design, here are some of the main flowcharts implemented in the system.

a. User Registration and Login Flowchart

1. Start
2. User opens the main page of the Teaching Factory application
3. The system displays the login page and registration options
4. User inputs username and password
5. The system verifies the data:

If correct, → User is directed to the dashboard

If false → System displays an error message, returns to login input

6. If the user does not have an account, they can register.
7. Done

b. Course Management Flowchart

1. Start

2. The user opens the course page in the application
3. The system displays a list of available courses
4. The user selects a course and enrolls
5. If the course has online materials or classes, the User can access the material and join the class
6. After completing the course, the system evaluates graduation
7. If the user passes, the system provides a course certificate
8. Finish

c. Flowchart for Providing Business Tips

1. Start
2. User opens the Business Tips and Suggestions page
3. The system provides recommended tips based on the user's business development
4. If the user has recorded turnover or attended a course, the system adjusts the recommendation
5. The user can read and apply tips for business development
6. Done

d. Flowchart of Turnover/Profile Recording

1. Start
2. User opens the Turnover / Profile Recording feature
3. User inputs data on turnover, source of income, and business feasibility
4. The system saves the data and analyzes business development
5. If necessary, the user can update the business data
6. Done

e. Business Progress Flowchart

1. Start
2. The system evaluates the turnover data that the user has recorded
3. If the turnover increases, the system displays the user's business progress
4. If there are obstacles in business development, the system provides suggestions for improvement
5. Admin can conduct additional evaluation to provide business support
6. Done

f. Certificate Flowchart Per Grade

1. Start
2. The system evaluates the turnover and progress of the user's business
3. If certain conditions are met, the system determines the certificate grade
4. The system generates a certificate according to the evaluation
5. Users can download the certificate as proof of business achievement
6. Done

This flowchart makes every Teaching Factory (TeFa) system process easier to understand and implement as designed.

1. Teaching Factory (TeFa) Application Display Design

a. Login Interface Design

Users and Admins must log in at the initial stage using their username and password. If successful, they will be directed to the page according to their respective roles.

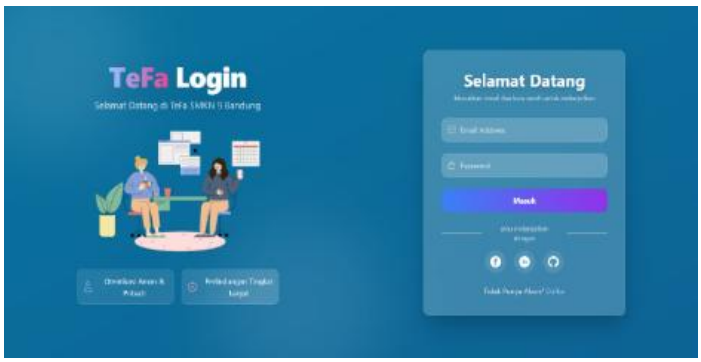
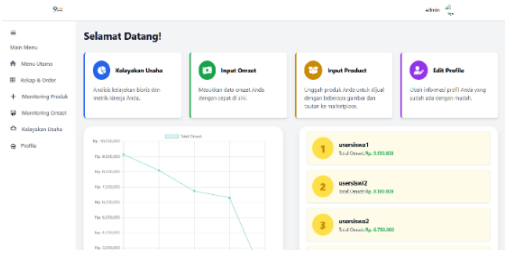


Figure 10. Login Interface Design

2. Dashboard Interface Design



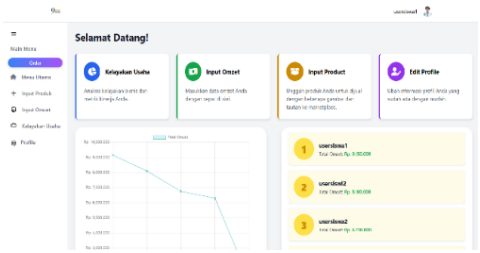


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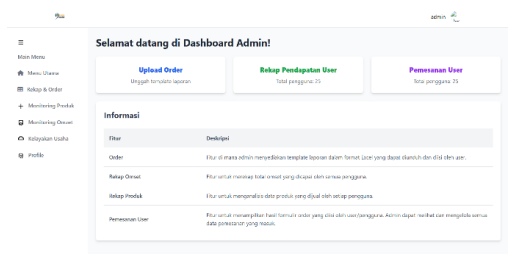
Figure 11 Admin **Figure 12 User**

a. For Admins, the initial display includes a dashboard graph and a user performance table. The sidebar has the main menu, order recap, Product Monitoring, Turnover Monitoring, Business Feasibility, and Profile, which can be edited and include an exit button.
b. For Users, the initial display available includes dashboard charts and user performance tables. For the sidebar, the available menus are the order menu, product input, turnover input, Business Feasibility, and Profile, which can be edited and include an exit button.

3. Interface Design 2, Order Recap Menu for Admin and Order for User



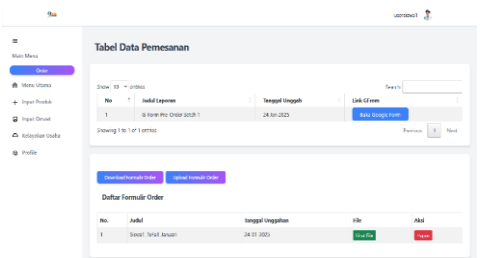


Figure 13 Admin **Figure 14 User**

a. For the admin, the dashboard display includes uploading orders that contain forms to be uploaded, usually in the form of order links that change per period. Then, for user revenue recap, view, evaluate, and report revenue recap associated with user rewards and certificates. User orders contain order data from buyers for products owned by the user.

b. For Users, contains form attachments, download order forms for users to prospective buyers, and upload order formulars from prospective buyers to users who will be forwarded to the admin

4. Interface Design 3, Product Monitoring for Admin and Product & Catalog Upload for Users

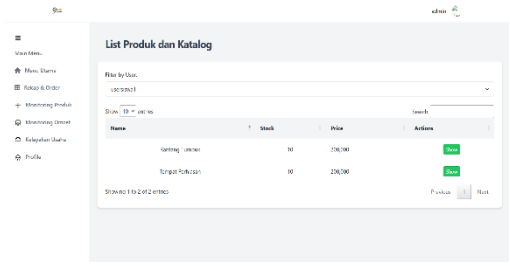


Figure 15 Admin

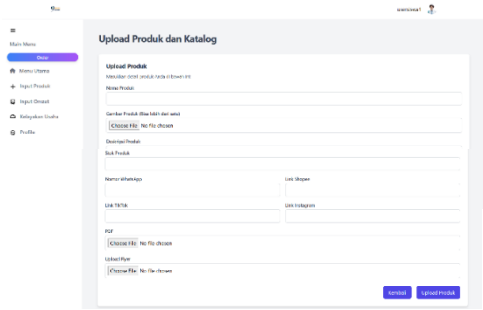


Figure 16 User

a. For Admin, the recap contains a product catalog from the user in the form of filtering that captures the results of the catalog upload recap from the user who has been attached. The recap's contents include filters by user and products that have been uploaded and can be reviewed.

b. For Users, it contains a formula for filling in products and catalogs to be forwarded to the admin. The data must be filled in: the product name, image, description, price, stock, telephone number, social media link, PDF file, and flyer extension JPG or JPEG.

5. Interface Design 4, Turnover Monitoring for Admin and Turnover Input for Users

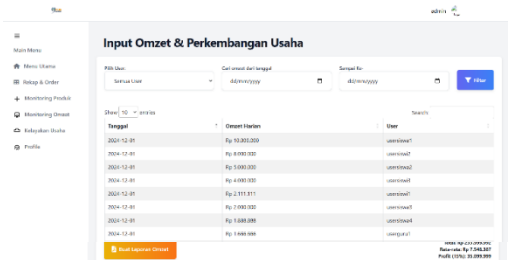


Figure 17 User

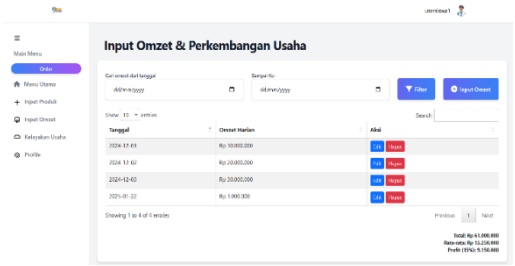


Figure 18 Admin

a. The Admin View contains filtering and lists of several users for revenue results. Filtering can be separated into several categories, such as the selected user and the period. Then, reports can be saved for physical and other report needs.

b. In the User View, there is filtering to check the period to be selected, and the input display for turnover consists of the period (daily) and the amount of turnover that has been obtained. Then, it was saved and forwarded to the admin.

6. Interface Design 5, SWOT Analysis Based Business Feasibility

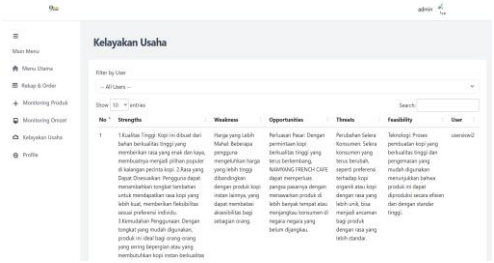


Figure 19 Admin

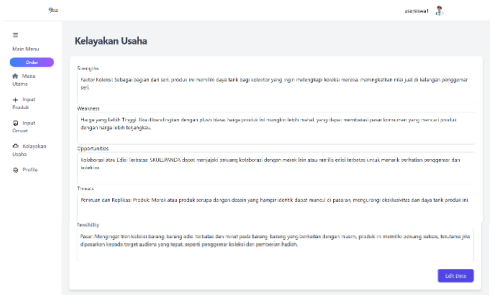


Figure 20 User

a. The Admin gets a recap of the results of the business and business feasibility-oriented SWOT analysis, and this data will be stored to decide whether the product will be promoted further or not *(Rahman et al., 2022)*.
b. Users in business and business feasibility can fill out the form according to the order of the SWOT analysis in User Products and Businesses.

7. Interface Design 6, Profile

Both admin and user can update the identity of the previous data, which is stored as a form of legality in using the application.

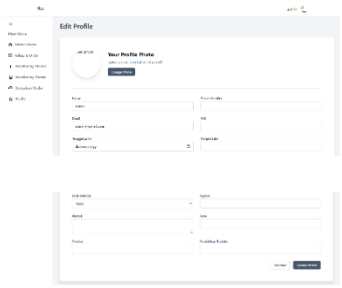


Figure 21 Admin

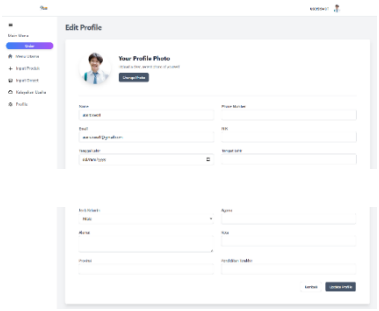


Figure 22 User

CONCLUSION

This research focuses on developing an information system for the Teaching Factory (TeFa) program in Vocational High Schools to enhance student entrepreneurship and workforce readiness through digitalization, supported by Indonesia's Ministry of Education. The system facilitates business data documentation, turnover monitoring, and SWOT-based feasibility analysis. It was designed using UML and developed through direct observation, literature review, and documentation. Key features include product recording, sales tracking, and SWOT-driven recommendations, which improve transparency, data accuracy, and collaboration among students, teachers, and industry partners. The findings suggest that the system strengthens technical and managerial skills and prepares students for real-world business challenges. Future research could assess its long-term impact on employability, compare its effectiveness with traditional methods, explore scalability across different vocational fields, and integrate advanced technologies like AI, blockchain, or IoT while incorporating stakeholder feedback for sustainable improvement.

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