

Development of an E-Commerce Platform as a Medium for Promotion and Marketing of Vocational School Products

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ABSTRACT

This study aims to develop a web-based e-commerce system to optimize the marketing and branding of vocational school products under the Teaching Factory (TEFA) program. The research employed a Research and Development (R&D) approach using the Waterfall model, consisting of requirement analysis, system design, implementation, and testing. The system was built using PHP (CodeIgniter), MySQL, Bootstrap, and JavaScript, integrating features such as product management, point of sales (POS), transactions, and dashboard analytics. Validation through Black Box Testing showed a 100% functionality success rate, while user evaluation obtained an 82% feasibility score, categorized as "very feasible." The results indicate that the developed platform is effective in supporting product promotion, digital branding, and entrepreneurship learning for vocational students, serving as a sustainable model for digital-based vocational education.

INTRODUCTION

Vocational education plays a strategic role in producing a workforce equipped with skills that are relevant to industrial demands. The learning process, which focuses on mastering specific competencies, requires the implementation of an appropriate instructional model. One such approach is the Teaching Factory (TEFA), which is designed to equip students with competencies aligned with industry needs (Nurtanto et al., 2017). However, the marketing of products resulting from the teaching factory activities is often conducted conventionally. Although social media and marketplace platforms are available, their utilization remains suboptimal (Rachman et al., 2024).

Teaching factory-based learning aims to cultivate character and work ethics that are aligned with the needs of industries, businesses, and the labor market. Moreover, this model emphasizes the improvement of learning quality – from competency-based training to production-based training – focusing on the ability to produce marketable products or services (Rizal, 2025). Nevertheless, the implementation of the teaching factory program still faces challenges in marketing aspects. The use of digital marketing strategies has not been fully optimized, resulting in products that lack market competitiveness (Nurhadi et al., 2023).

Marketing strategy is a well-planned effort designed to achieve optimal marketing results. Its role is crucial, as even with proper segmentation and positioning, marketing objectives cannot be achieved without the right strategy. Specifically, marketing strategies serve as the key to reaching the widest possible customer base (Anggraini & Fitriana, 2024). One important aspect of modern marketing strategy is the utilization of e-commerce. E-commerce encompasses various activities such as sales, purchasing, distribution, and marketing conducted through internet-based platforms or electronic media (Melina et al., 2025).

E-commerce represents one of the major innovations in information technology that leverages digital platforms to support marketing activities. Through e-commerce, information can be presented attractively, interactively, and accessed anytime without limitations. This makes e-commerce a relevant tool for both established companies and emerging businesses seeking to enhance marketing effectiveness (Diskhamarzaweny & Ammar, 2022).

THEORETICAL REVIEW

The Concept of E-Commerce

E-commerce is an electronic trading system that utilizes internet networks to carry out buying and selling activities of goods or services. It does not merely serve as a transaction medium but as an integrated digital ecosystem combining marketing, customer service, and consumer behavior analysis within a single platform. Through information technology, e-commerce enables producers or service providers to reach consumers globally at lower costs and with more personalized interactions (Rosário & Raimundo, 2021).

The main benefits of e-commerce include broader market reach, reduced distribution costs, and simplified data management for marketing decision-

making. However, challenges such as transaction security, logistics efficiency, and consumer trust remain critical issues, especially for small enterprises and educational institutions (Gupta et al., 2023).

Strategies in E-Commerce

In the digital era, marketing strategy plays a pivotal role in determining the success of e-commerce. E-commerce marketing strategies combine multiple approaches such as content marketing, social media marketing, recommendation systems, and sentiment analysis. These integrated strategies help organizations build long-term relationships with customers and enhance brand loyalty. (Yuri de Souza Odagui Enes -yuri et al., 2022).

Furthermore, the application of artificial intelligence (AI) in e-commerce strengthens personalization and customer experience. AI can identify user preferences based on search behavior and purchase history, enabling more targeted marketing strategies (Bawack et al., 2022).

In the context of vocational education, implementing digital marketing strategies is essential to support the promotion of school-based products. Through e-commerce platforms, schools can communicate product value, student skills, and institutional image effectively to a broader audience. In the context of vocational education, implementing digital marketing strategies is essential to support the promotion of school-based products. Through e-commerce platforms, schools can communicate product value, student skills, and institutional image effectively to a broader audience.

Supporting Technologies for E-Commerce

The success of e-commerce implementation is highly influenced by supporting technologies such as recommendation systems, supply chain management, and logistics. Recommendation systems are essential elements of personalization, helping users discover products that suit their preferences. (Michalis & Michael, 2021).

Logistics efficiency, inventory management, and delivery time are critical factors affecting customer satisfaction. In educational institutions, managing the production and distribution of vocational products also serves as practical learning for students, nurturing digital entrepreneurship and operational skills. (Risberg, 2023).

Vocational School Product Excellence

The flagship products of vocational schools are the results of production-based learning activities that integrate creativity, technical skills, and market needs. Flagship products are not only economically valuable but also serve as learning media that help students understand the business cycle and innovation process (Riki Satia Muharam et al., 2025).

A study by Universitas Abdurachman Saleh Situbondo shows that developing vocational school products can be optimized through e-commerce platforms as promotional and transactional media. The use of school-based e-

commerce websites expands market reach, increases the commercial value of student products, and enhances the school's public (Tyasari et al., 2025).

Therefore, developing e-commerce-based vocational school products becomes an effective strategy to strengthen the link between education and industry while fostering digital entrepreneurship among students.

Vocational Education and Digital Entrepreneurship Skills

The primary goal of vocational education is to prepare students with technical expertise and professional attitudes that meet industrial requirements. Vocational education must be adaptive to technological advancements and new business models, including e-commerce (Sari et al., 2024).

Innovation in vocational education should integrate classroom learning with real-world projects, such as product development and online marketing. This approach allows students to gain not only technical competence but also managerial and digital marketing skills necessary for modern industry demands (Purwanto, 2025).

METHODOLOGY

Research Design

This study employed a Research and Development (R&D) approach aimed at designing and developing an E-commerce platform to optimize the promotion and marketing of vocational school products. The R&D method was chosen because it allows researchers to produce a functional product prototype through systematic stages of development and validation (Sugiyono, 2022).

The research process was divided into two main stages:

1. Research Phase, which focused on needs analysis, data collection, and determining user requirements; and
2. Development Phase, which concentrated on system design, implementation, and testing.

This dual-stage process ensures that the developed E-commerce platform is relevant to user needs and effectively enhances the marketing capability of vocational school products.

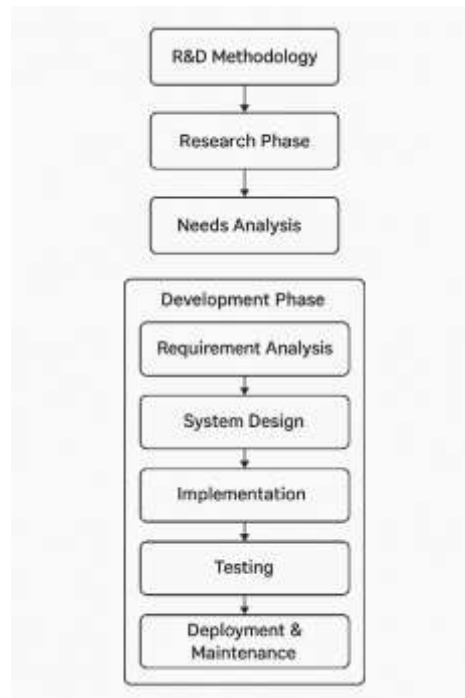


Figure 1. Research Design Process

System Development Model

The system was designed using the Waterfall Model, a structured and sequential software development approach consisting of the following stages (Pressman, 2015).

1. Requirement Analysis

Data related to user needs were collected through observation, interviews, and documentation of existing marketing activities at vocational schools. The analysis focused on identifying functional and non-functional requirements for the E-commerce system, including product catalog management, user interface design, and online transaction support.

2. System Design

At this stage, the system architecture, database schema, and user interface were designed. The design process utilized tools such as Unified Modeling Language (UML) diagrams (Use Case, Class Diagram, Activity Diagram, and Sequence Diagram) to ensure clarity of system workflow and component relationships.

3. Implementation

The system was developed using PHP and MySQL as the main programming and database technologies. The front-end interface was created using HTML, CSS, and JavaScript to enhance user interaction and accessibility.

4. Testing

The developed system was tested using Black Box Testing to verify the functionality of each module and ensure that all features work according to the specified requirements. Usability testing was also conducted by involving users (students and teachers) to assess system ease-of-use.

The Super Admin holds the highest level of access authority, managing the entire system, including product listings, user data, and financial reports. Super Admin oversees the Landing Page Management, User Management, and Dashboard Monitoring.

The Admin Usman actor manages day-to-day operational activities such as product updates, transaction monitoring, and cash flow reporting. The admin has direct access to features like Dashboard, Cash Flow Reports, and Marketplace Control.

2. Entity Relationship Diagram (ERD)

The Entity Relationship Diagram (ERD) (Figure 2) defines the logical data structure and relationships among entities in the database. The system consists of five main entities: user, usman, id-item, id-transaksi, and keuangan.

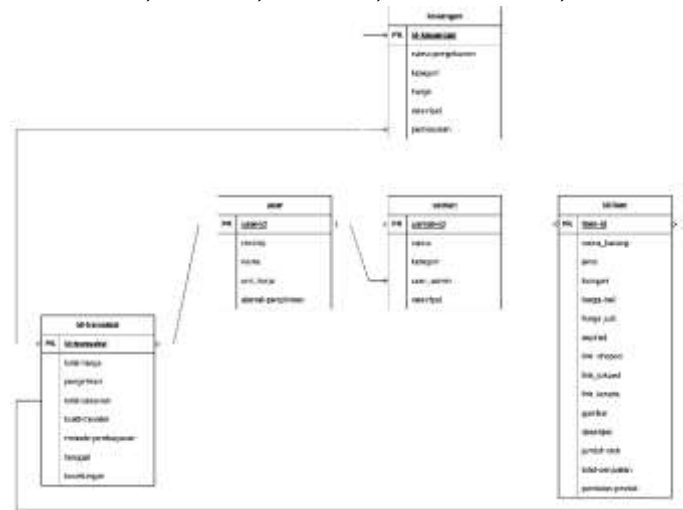


Figure 3. Entity Relationship Diagram (ERD)

The ERD ensures referential integrity through primary key (PK) and foreign key (FK) relationships among entities. The design allows the system to perform integrated financial management, product inventory control, and user transaction tracking efficiently.

Implementation Results

The development process followed the Waterfall model, in which all verified design specifications were translated into executable code. The initial prototype was uploaded to a hosting environment for accessibility and testing. The implementation output includes several main components representing the system's functional modules: Landing Page, Product Display, Checkout System, Point of Sales (POS), and Dashboard Analytics.

Landing Page

The Landing Page serves as the primary access point for visitors and external users. It provides an overview of the institution's identity and showcases vocational school products created under the Teaching Factory (TEFA) program. Figure 3 presents the homepage interface, which uses a clean and responsive

layout adapted from the Nest template, ensuring modern visual standards and ease of navigation.



Figure 4. Landing Page

The landing page is designed to support school branding and to enhance the visibility of student products to external audiences. It integrates both informational and transactional elements, allowing users to learn about the school's creative initiatives while seamlessly browsing and purchasing products online.

System Functionality Overview

The system implementation produced the following major features:

a. Product Management Module

Enables administrators and teachers to upload, edit, and categorize products based on production units (departments, cooperatives, or independent student enterprises).

b. Transaction and Checkout Module

Facilitates online purchases through a simple checkout flow that records transaction data, payment methods, and order details.

c. Point of Sales (POS) Module

Supports offline sales managed by internal administrators, with synchronized data integration into the central database to ensure real-time financial updates.

d. Dashboard and Analytics Module

Provides summary data visualization such as total sales, profit margins, and user transactions to support decision-making and performance monitoring.

e. User Access Management

Differentiates access levels among Super Admin, Admin Usman, Student, and External User, ensuring data security and functional integrity.

System Deployment

The finalized version of the system was deployed to a web hosting service under a school-managed domain. The deployment allows users to access the platform in real-time through any web browser. This implementation marked the completion of the initial development phase of the vocational school product marketing system, meeting the 82% functionality success criterion defined in the validation stage.

The implemented system demonstrates a successful translation of design concepts into an operational e-commerce platform tailored for educational institutions. It effectively bridges learning, production, and market promotion, providing a sustainable digital ecosystem for vocational entrepreneurship.

Testing and Evaluation

The testing phase aimed to verify that all system components functioned according to their specified requirements. Two evaluation methods were conducted: (1) Black Box Testing for technical validation of system functionality, and (2) User Evaluation for usability validation through questionnaires.

1. Black Box Testing

The Black Box Testing method was employed to examine whether the input and output of each module corresponded to the expected outcomes. This testing focused on the system's operational behavior without assessing the internal code structure.

The testing process involved checking all key modules: login, product management, checkout, payment, and reporting. Table 1 presents a summary of the results.

Table 1. Black Box Testing Results

No	Feature Tested	Expected Result	Actual Result	Status
1	User login and authentication	System allows registered users to log in successfully	Works as expected	Valid
2	Product display on homepage	Products appear according to database records	Works as expected	Valid
3	Product management (add/edit/delete)	Admin can update product data correctly	Works as expected	Valid
4	Checkout and order placement	Users can add items to cart and proceed to checkout	Works as expected	Valid
5	Payment confirmation upload	System stores uploaded proof of payment	Works as expected	Valid
6	Transaction record saving	All transaction data are saved and visible to admin	Works as expected	Valid
7	Point of Sales (POS) transaction	Admin can create direct sales record in POS	Works as expected	Valid
8	Dashboard analytics	Dashboard displays accurate summary data	Works as expected	Valid

No	Feature Tested	Expected Result	Actual Result	Status
9	Report generation	System generates daily and monthly sales reports	Works as expected	Valid
10	Logout function	User session ends and redirects to login page	Works as expected	Valid

All ten test cases were successfully executed with positive outcomes. The overall system functionality was validated as compliant with the predefined requirements. The functional success rate (FSR) was calculated using the formula:

$$FSR = \frac{\text{Number of Valid Test Cases}}{\text{Total Test Cases}} \times 100\%$$

$$FSR = \frac{10}{10} \times 100\% = 100\%$$

The results indicate that all system modules functioned correctly according to user expectations and system requirements.

2. User Evaluation

The usability evaluation was conducted to assess user satisfaction and system usability after implementation. A total of 30 respondents, consisting of administrators, teachers, and students, participated in the evaluation using a Likert scale questionnaire ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The evaluation focused on five indicators: Ease of use, Interface design clarity, System responsiveness, Function reliability, and Overall satisfaction. The total score was computed using the formula adapted from (Sugiyono, 2022):

$$P = \frac{\sum x}{n \times x_{max}} \times 100\%$$

Where:

$\sum x$ = total obtained score

n = number of respondents

x_{max} = maximum Likert score (5)

Total score collected = 615 points from 30 respondents:

$$P = \frac{615}{30 \times 5} \times 100\% = \frac{615}{750} \times 100\% = 82\%$$

Thus, the overall usability level achieved 82%, which falls under the "Very Feasible" category according to standard R&D evaluation criteria.

DISCUSSION

The results of this research confirm that the development of an institutional e-commerce platform can effectively support the promotion and branding of vocational school products. The implemented system integrates the principles of

digital marketing and production-based learning, aligning with the concept of Teaching Factory (TEFA) in vocational education.

CONCLUSIONS AND RECOMMENDATIONS

This study successfully developed a web-based e-commerce system designed to optimize the marketing and branding of vocational school products. Using the Research and Development (R&D) method and the Waterfall model, the system was developed systematically through stages of requirement analysis, system design, implementation, and testing.

FURTHER STUDY

Future studies are encouraged to expand the system by integrating mobile applications, automated accounting modules, and API connections with external marketplaces. Moreover, longitudinal research should be conducted to evaluate the system's long-term impact on student entrepreneurship skills and institutional branding.

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