

Musical Traditional Instrument Maker Enterprises e-Commerce System

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Abstract

In Malaysia, integral to cultural events, traditional musical instruments are meticulously crafted by enterprise owners of the musical traditional instrument maker enterprises. However, their manual order management system, reliant on paper records which hard for enterprise owner find related documents and necessitating physical customer visits the shop. This underscores the necessity for an efficient, digitized solution. The project's objective is to develop and implement a web-based MusicTImeS system for enterprises, employing an object-oriented approach. The scope for enterprise, and customer with modules such as register, login, manage profile, manage product, manage order, manage payment, manage feedback, and generate report. The project concludes with alpha testing, utilizing an iterative model for efficient execution, ensuring adherence to the plan and maintaining a clear direction. MusicTImeS streamlines enterprise management, benefiting both enterprise owners and customers by facilitating online orders, inquiries, and providing a transparent and efficient ordering process.

1. Introduction

In Malaysia, traditional musical instruments hold significant cultural and historical importance, playing a vital role in various cultural and celebratory events [1]. Despite the cultural significance, the industry faces challenges in reaching a broader market and adapting to modern technological advancements. Many traditional musical instrument maker enterprises, operating for nearly 20 years or more and continuing their family legacy, manage their businesses manually, which involves customers visiting the shop in person to place orders and relying on hardcopy records for order management and customer interactions.

Our traditional musical instruments risk extinction without integration with modern technologies. Current enterprises rely on manual order management, leading to forgotten or inaccurately recorded orders, dissatisfied customers, and lost sales [2]. Handwritten orders can be misinterpreted, causing mistakes and eroding customer trust. Additionally, hardcopy documents complicate searches and risk loss or damage, hindering efficient information management. Requiring physical visits for ordering and price surveys is inconvenient, discouraging potential customers who prefer online ordering. To address these issues, the Musical Traditional Instrument Maker Enterprises e-Commerce System (MusicTImeS) ensures smooth product and sales report management and facilitates online ordering. This system attracts more customers, increases sales, and enables selling instruments to overseas audiences.

The aim of this project is to create MusicTImeS for a traditional musical instrument maker enterprise, with objectives to design MusicTImeS using an object-oriented approach, develop a web-based system, and test it via alpha testing. MusicTImeS will serve as a platform for supporting and managing products, orders, payments, feedback, and generating reports for enterprise owners and customers. The scope includes four enterprise

owners and their customers, categorized respectively. To ensure efficient execution, iterative models are used to maintain a clear project direction. The data for each component is housed in a MySQL database integrated into MusicTImeS, distributing critical data across customer profiles, product specifications, order details, feedback records, and sales reports.

2. Literature Review

This literature review aims to outline the e-commerce system and compare it with other systems.

2.1 E-Commerce System

Traditional musical instrument enterprises are undergoing a significant digital transformation by adopting e-commerce solutions, driven by the surge in internet usage and web technologies [3]. This shift allows customers to browse, select, and purchase instruments online, catering to modern preferences for convenience and expanding market reach beyond physical locations. The integration of payment gateways within these platforms ensures secure financial transactions [4], enhancing global accessibility and providing a user-friendly experience across various devices and browsers. This digital shift benefits both customers and enterprises by streamlining the purchasing process, reducing errors, and boosting productivity. MusicTImeS exemplifies this trend by offering seamless online browsing, selection, and secure transactions, aligning with the broader digital transformation in the music industry. The system's integration of secure payment gateways ensures smooth and protected transactions, contributing to a trustworthy user experience. Ultimately, MusicTImeS promotes operational efficiency, reduces errors, and mirrors the global trend of digital transformation, enhancing the accessibility and growth of traditional musical instruments [5].

2.2 System Comparison

Table 1 illustrates a comparative evaluation between the proposed system and these three existing systems is also discussed. The existing systems discussed are City Music Melaka [6], LBS Music World [7] and the PBH Music [8] musical instrument ecommerce system.

Table 1 Comparison between exiting system and proposed system

Features/System	City Music Melaka	LBS Music World	PBH Music	MusicTImeS
Platform	Web-based	Web-based	Web-based	Web-based
Multilanguage	No	No	No	Yes
Register	Yes	Yes	Yes	Yes
Login	Yes	Yes	Yes	Yes
Manage Profile	Yes	Yes	Yes	Yes
Manage Product	Yes	Yes	Yes	Yes
Manage Order	Yes	Yes	Yes	Yes
Manage Payment	Yes	Yes	Yes	Yes
Manage Feedback	No	No	No	Yes
Generate Report	Yes	Yes	Yes	Yes

Table 1 provides a comparative analysis of existing systems (City Music Melaka, LBS Music World, PBH Music) and the proposed system, MusicTImeS. The comparison highlights both similarities and differences in their features. All systems operate on a web-based platform, prioritizing modern accessibility through web browsers for convenience and compatibility across various devices. MusicTImeS distinguishes itself by offering a unique multilanguage feature, advantageous for localization. Common functionalities among all systems include register and login features, crucial for user engagement and personalization. Additionally, they share support for manage profile, product, order, and payment features, essential components of e-commerce systems. MusicTImeS stands out with its support for a manage feedback feature, allowing users to provide product ratings. Lastly, all systems incorporate a generate report feature for owners, developed based on the compatibility of e-commerce components.

3. Methodology

The Software Development Lifecycle (SDLC) is a methodology utilized in project development, shown in Figure 1 that illustrates an iterative model [9]. This model is dynamic and cyclic, enhancing efficiency and adaptability. Table 2 defines system development activities and tasks. In contrast to strictly linear approaches, the iterative model allows continuous loops, facilitating repeated refinement and improvement throughout development phases. After completing the initial planning, requirements analysis, and design phases, the project will be executed in two iterations. The first iteration will take place during the implementation phase, focusing on developing the first four to five system modules before transitioning to the testing and evaluation phases. In the second iteration, the development process will continue to address the remaining modules [10]. Subsequently, the testing phase will involve creating test cases and resolving any identified bugs, followed by the evaluation phase.

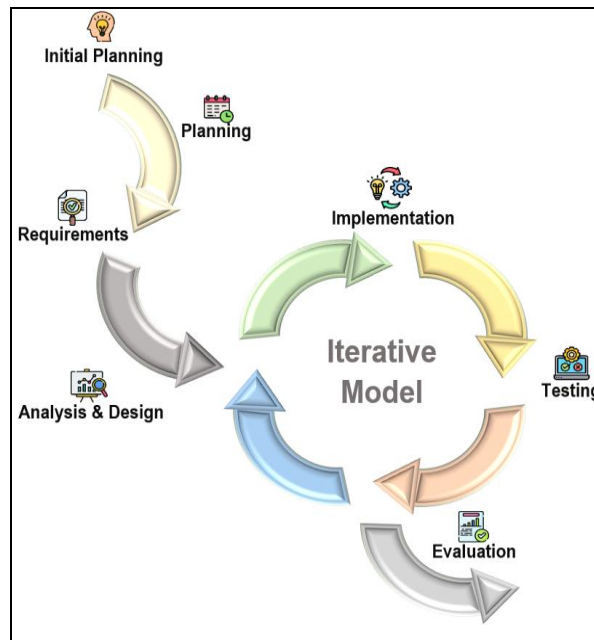


Fig. 1 Iterative model

Table 2 System Development Activities and Task

Phase	Activity	Work Product	Tool
Initial Planning	Brainstorm ideas.	-	-
Planning	Existing problems of current system and schedule timeline and task for the project.	Proposal and Gantt Chart	Discussion (WhatsApp) and Gantt Chart (Google Sheets)
Requirements	Interview session and document requirements.	URD	-
Analysis and Design	Design UML diagram, architecture, system database and interfaces.	SRS and SDD	Visual Paradigm and Draw.io
2 iterations of Implementation, Testing and Evaluation			
Implementation	Create database, develop system module and database integration.	Eight modules and system database	Visual Studio Code, XAMPP and PhpMyAdmin
Testing	System testing, alpha testing and evaluation.	Test cases and test report	-
Evaluation	Upload system to live server and deliver the system.	-	Live server

4. System Analysis and Design

Figure 2 depicts the system architecture of MusicTImeS, an online platform set to be deployed on the Internet. Customer and enterprise owner need to register the account before login to MusicTImeS with registered account. Customer can use the system to manage profile, view product, add cart, checkout, make payment, give ratings and feedback. Enterprise owner can use the system to manage profile, product, order, payment, feedback and generate sales report. If customers wish to place an order and make a payment, they must first log into their accounts. If it is their first time visiting, the customer will need to register an account. Enterprises that want to sell products on this system will also need to register first.

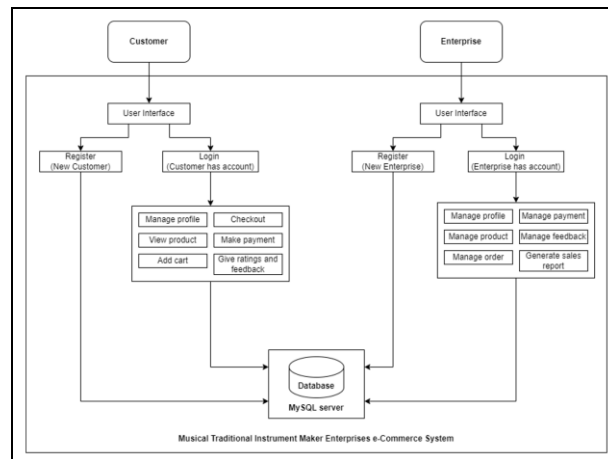


Fig. 2 System Design Diagram for MusicTImeS

4.1 Requirements Analysis

Requirement analysis aids in comprehending and identifying system requirements. Table 3 and Table 4 illustrate the system’s functional and non-functional requirements, respectively.

Table 3 Functional Requirements of the System

Modules	Functionalities
Register	<ul style="list-style-type: none"> •The system shall allow the users to register into the system by entering their name, username, email, password and confirm password. •The system should display error messages if the registration details are either invalid or contain an empty field. •The system should redirect the users to the login page after registration.
Login	<ul style="list-style-type: none"> •Unauthorized users attempting to log in shall be denied access to MusicTImeS. •The system should verify the users’ username and password. •The system should redirect the users to the homepage if the user inputs valid email and password.
Manage profile	<ul style="list-style-type: none"> •The system shall be able to allow the users to change their profile information. •The system shall enable the users to change their password. •The system shall enable the customer to add a new address.
Manage product	<ul style="list-style-type: none"> •The system shall allow the enterprise owners with the ability to add, edit, update, and delete products, product description and quantity.
Manage order	<ul style="list-style-type: none"> •The system should allow the customer the ability to view product description. •The system should allow customers to view detailed information including quantity and descriptions and add desired product to the cart. •The system shall be able to allow the customer to view their order, cancel order and track order. •The system shall be able to allow the enterprise owners to view customer order and order status.
Manage payment	<ul style="list-style-type: none"> •The system shall offer customers the option to select their preferred payment method, including online banking, credit, and debit cards. •The system will enable enterprise owner to view payment list.

Table 3 Functional Requirements of the System (Continue)

Manage feedback	<ul style="list-style-type: none"> •The system shall allow customer to give feedback rating and write feedback description for purchased product.
Generate report	<ul style="list-style-type: none"> •The system will enable enterprise owners to view and control sales reports within a specified date range of interest. •The system should be able to present the five best-selling products.

Table 4 Non-Functional Requirements of the System

Requirement	Descriptions
Security	<ul style="list-style-type: none"> •Access to the system is only possible by entering the correct username and password. •The enterprise owner is only allowed to manage the product. •Customers must register their account before purchasing products.
Operational	<ul style="list-style-type: none"> •The system should be capable of functioning seamlessly across all web browsers. •Customers should be able to log in to the system and conduct the ordering process efficiently.
Performance	<ul style="list-style-type: none"> •The interactions between users and webpages should not exceed five seconds.
Integrity	<ul style="list-style-type: none"> •The password stored in the database should be encrypted.
Security	<ul style="list-style-type: none"> •The system shall enable the users to choose between Malay or English language.

4.2 Use Case Diagram

This section outlines use case diagram for MusicTIMeS.

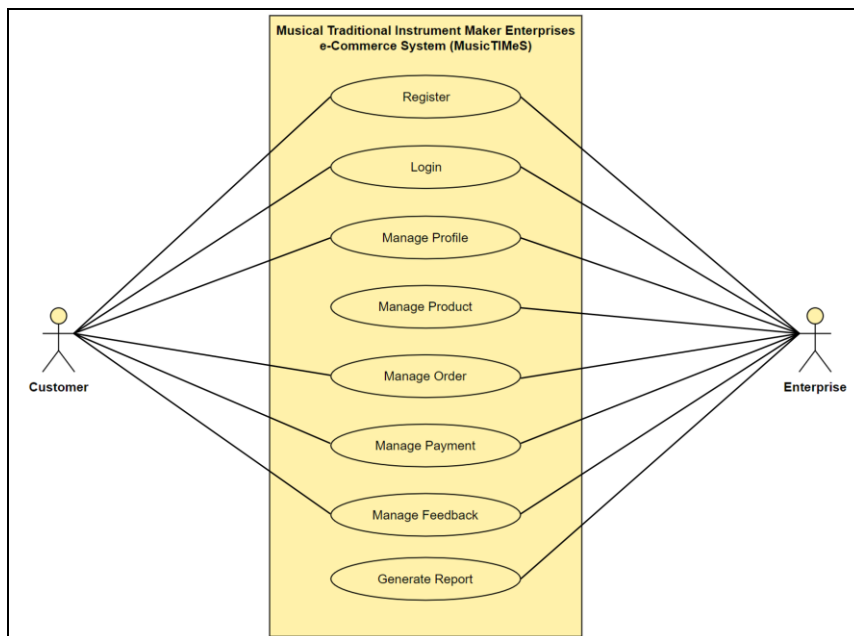


Fig. 3 Use Case Diagram for MusicTIMeS

The use case diagram above, Figure 3, illustrates eight modules integral to the proposed system. These modules include register, login, manage profile, manage product, manage order, manage payment, manage feedback, and generate report. The register module caters to both customers and enterprises, facilitating account registration for system access. Upon registration, users are directed to their respective homepages. The login module permits registered users to log into the system, redirecting them accordingly. Manage profile enables users to view and update their information. For enterprises, the manage product module facilitates product management, allowing addition, editing, and deletion. The manage order module allows customers to place orders and enterprises to view order details. Secure transactions are enabled through the manage payment module, with payment history tracking for enterprises. Manage feedback permits customers to provide ratings, with enterprises analyzing feedback. Lastly, the generate report module empowers enterprises to oversee sales reports, aiding in decision-making and business management.

4.3 Database Design

Figure 4 illustrates the class diagram for MusicTIMeS. The class diagram functions as a visual representation of the data model, illustrating the classes (tables), attributes (fields), and relationships among them. MusicTIMeS consists of 9 classes in its database. Table 5 presents the data dictionary of the class diagram for MusicTIMeS. A data dictionary is a document that provides in-depth information about the data, encompassing definitions of data elements, their meanings, and the relationships existing between them.

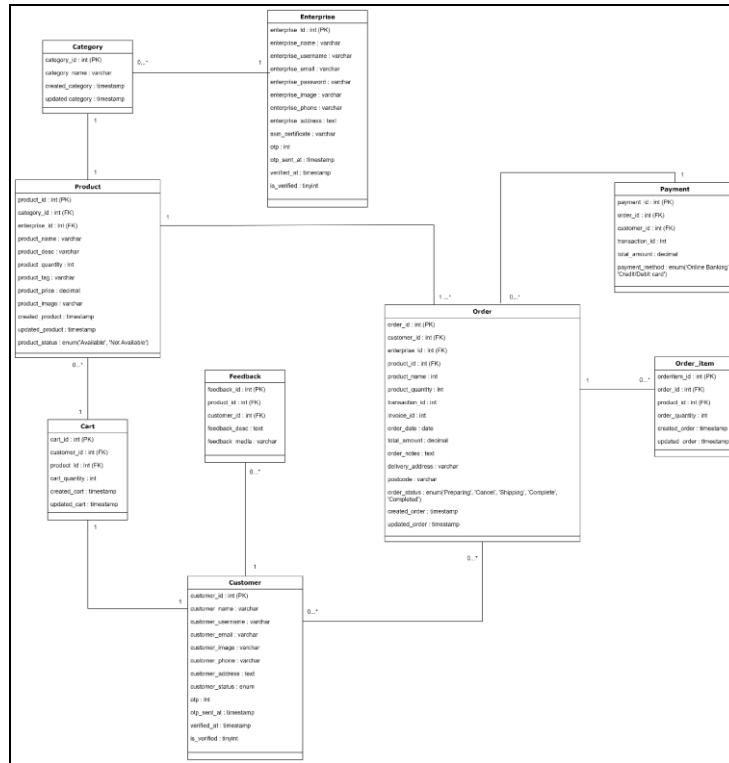


Fig. 4 Class Diagram for MusicTIMeS

Table 5 Data Dictionary of Class Diagram for MusicTIMeS

Table	Attributes
Customer	customer_id(PK), customer_name, customer_username, customer_email, customer_password, customer_image, customer_address, customer_status, otp, otp_sent_at, verified_at, is_verified
Enterprise	enterprise_id(PK), enterprise_name, enterprise_username, enterprise_email, enterprise_password, enterprise_image, enterprise_phone, enterprise_address, otp, otp_sent_at, verified_at, is_verified
Product	product_id(PK), category_id(FK), enterprise_id(FK), product_name, product_desc, product_quantity, product_tag, product_price, product_image, created_product, updated_product, product_status
Order	order_id(PK), customer_id(FK), enterprise_id(FK), product_id(FK), product_name, product_quantity, transaction_id, order_date, total_amount, order_notes, delivery_address, postcode, payment_method, order_status, created_order, updated_order
Order_item	orderitem_id(PK), order_id(FK), product_id(FK), order_quantity, created_order, updated_order
Payment	payment_id(PK), order_id(FK), customer_id(FK), transaction_id, total_amount, payment_method
Cart	cart_id(PK), customer_id(FK), product_id(FK), cart_quantity, created_cart, updated_cart
Feedback	feedback_id(PK), product_id(FK), customer_id(FK), feedback_desc, feedback_media
Category	category_id(PK), category_name, created_category, updated_category

5. Implementation and Testing

This implementation and testing aim to outline the interfaces of each module in MusicTIMeS and all the test cases in this project.

5.1 Software for System Development

The development of MusicTIMeS leveraged several key software tools to ensure a robust and efficient system. Visual Studio Code, with its intuitive interface and extensive features, facilitated both frontend and backend development through its multi-language support and powerful extensions [11]. For database management, phpMyAdmin provided an invaluable open-source solution, enabling seamless MySQL administration and ensuring the integrity of the system's data [12]. XAMPP, a cross-platform web server solution, allowed developers to test and simulate a production environment locally, ensuring optimal performance before deployment [13]. Composer managed project dependencies, including crucial packages for payment processing, email generation, Excel report creation, and PDF invoice generation [14]. GitHub's version control platform was instrumental in organizing and managing the project's source code, enabling smooth collaboration and efficient issue tracking [15]. Collectively, these tools contributed significantly to the successful development and deployment of MusicTIMeS.

5.2 Implementation

This implementation outlines all the interfaces for each module in MusicTIMeS such as register, login, manage profile, manage product, manage order, manage payment, manage feedback, and generate report.

5.2.1 Register Module

This module provides an interface for customers to create and verify their account, as well as for enterprise to create and verify their account. Based on Figure 5(a), the customer register page interface is handling the customer registration process by sanitizing and validating user inputs, checking password matches and email format, verifying the uniqueness of username or email, hashing the password, inserting the new customer data into the database, and redirecting to a script for sending an OTP code to the email. Figure 5(b) shows the customer account verification interface, where it verifies the customer's account by checking the OTP code against the database, marking the account as verified if the OTPs match, and sending a confirmation email via PHPMailer, or displaying an error message if the OTP is incorrect.

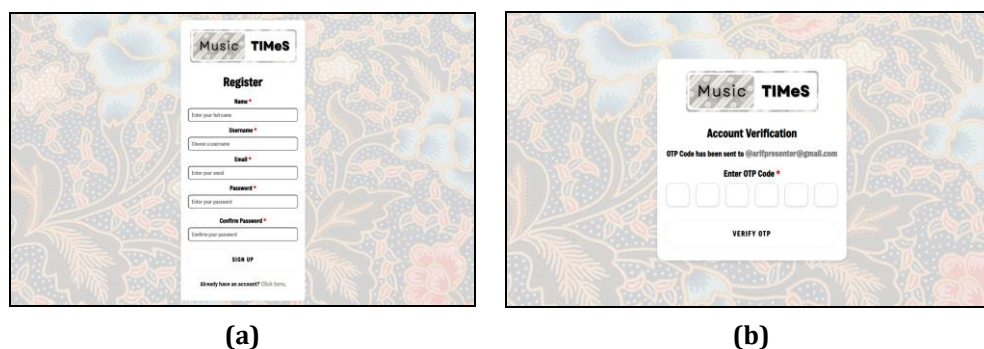


Fig. 5 (a) Customer Register; (b) Customer Account Verification for MusicTIMeS

Figure 6(a) depicts the enterprise register interface, handling inputs like enterprise name, username, email, SSM certificate, and passwords, validating them, and following similar steps for database insertion and OTP email. Figure 6(b) illustrates the enterprise account verification interface, where it checks the OTP code for the enterprise's account, verifies it, sends a confirmation email, or displays an error message if the OTP is incorrect, managing potential errors during the email-sending process.

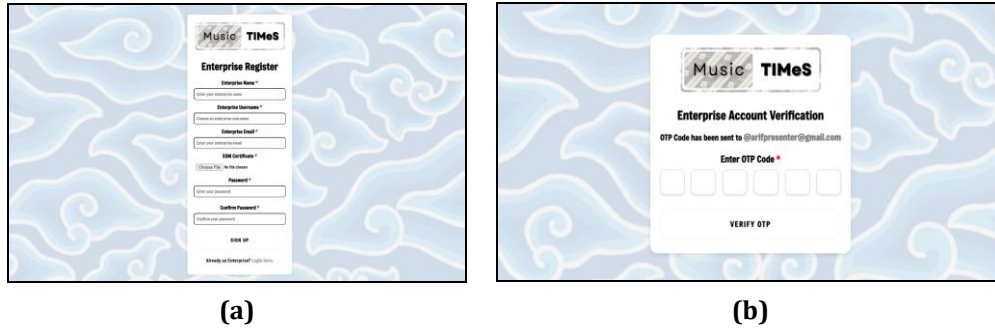


Fig. 6 (a) Enterprise Register; (b) Enterprise Account Verification for MusicTIMeS

5.2.2 Login Module

This module provides an interface for customer to log in to MusicTIMeS and recover their password by verifying their email through an OTP code sent to their email. It also allows enterprise to log in to MusicTIMeS. Based on Figure 7(a), the customer login page interface which processes login credentials by sanitizing inputs to prevent SQL injection, validating the username and password against the database, checking account verification, and matching the provided password with the hashed password in the database. Successful logins initiate a session storing the customer's ID and username, redirecting to the customer's homepage, while failed logins redirect back to the login page with an error message. Figure 7(b) shows the customer forgot password interface, that handles the password reset process by checking if the user's email is stored in the session, hashing the new password, using prepared statements to prevent SQL injection, updating the password if the email exists, and redirecting the user to the login page with a success message or displaying error messages if any issues occur.

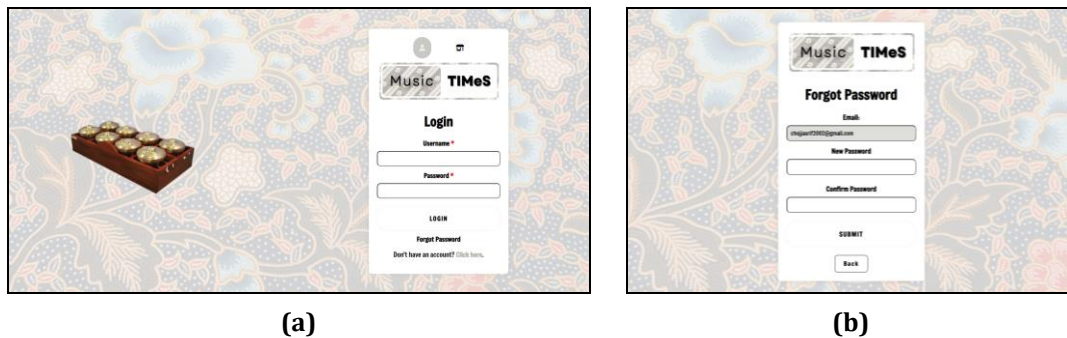


Fig. 7 (a) Customer Login; (b) Customer Forgot Password for MusicTIMeS

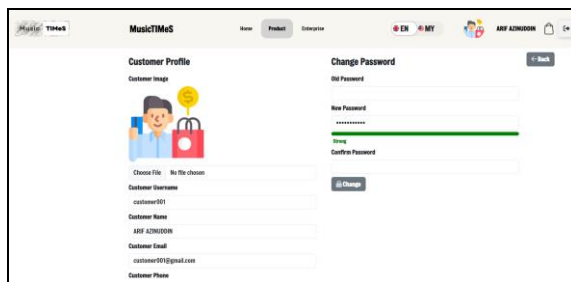
Figure 8 illustrates the enterprise login interface, that sanitizes inputs, queries the database for a matching enterprise username, checks account verification, verifies the provided password, starts a session storing the enterprise ID and username upon successful login, and redirects to the product listing page, while failed logins redirect back to the enterprise login page with an error message.



Fig. 8 Enterprise Login for MusicTIMeS

5.2.3 Manage Profile Module

This module provides an interface for customers to change their account details and password as logged-in users, as well as for enterprise and customer to change their account details and password as logged-in users. Based on Figure 9(a), the customer manage profile page interface is handling updates to customer profile details such as name, phone, address, and optionally a profile image, displaying a default image if none is uploaded. It sanitizes inputs, manages image uploads, and updates the database using prepared statements to prevent SQL injection, redirecting the user to their profile page upon successful updates. It also manages password changes for logged-in customers by ensuring the old password matches the current one, validating and hashing the new password, and updating the database, with successful changes redirecting the user back to their profile with a success message and errors redirecting with appropriate error messages. Figure 9(b) shows the enterprise manage profile interface, handles updates to enterprise profile details, including name, phone, address, and optionally a profile image, displaying a default image if none is uploaded. It sanitizes inputs, manages image uploads, and updates the database using prepared statements to prevent SQL injection, redirecting the user to their profile page upon successful updates. It also manages password changes for logged-in enterprises by ensuring the old password matches the current one, validating and hashing the new password, and updating the database, with successful changes redirecting the user back to their profile with a success message and errors redirecting with appropriate error messages.



(a)

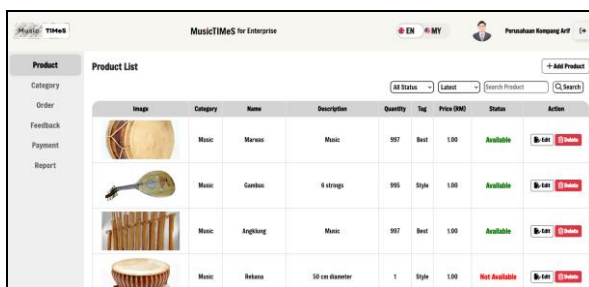


(b)

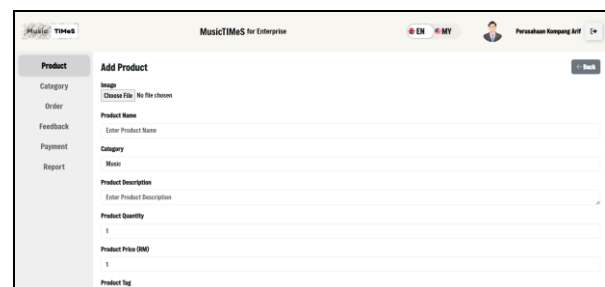
Fig. 9 (a) Customer Manage Profile; (b) Enterprise Manage Profile for MusicTIMeS

5.2.4 Manage Product Module

This module allows enterprises to manage the products and categories they sell on MusicTIMeS by adding, updating, and deleting products in the system. Based on Figure 10(a), the enterprise product listing page interface is displaying a table of products for the logged-in enterprise, including images, categories, names, descriptions, quantities, tags, prices, statuses, and action buttons for editing or deleting products, with features for filtering, sorting, and searching. Figure 10(b) shows the enterprise add product interface to handles adding new products by sanitizing input data, validating images, ensuring category selection, and inserting product details into the database with success or error messages directing the user accordingly.



(a)



(b)

Fig. 10 (a) Enterprise Product Listing; (b) Enterprise Add Product for MusicTIMeS

Figure 11(a) illustrates the enterprise edit product interface, that updates existing product details, handling optional image uploads, and constructing SQL queries to update the product table, redirecting the user to the product listing page upon success. Figure 11(b) depicts the enterprise delete product interface to manage product deletion by fetching product details for confirmation, executing an SQL DELETE query upon user confirmation, and redirecting to the product listing page with a JavaScript alert for successful deletion, including a styled confirmation dialog to prevent accidental deletions.

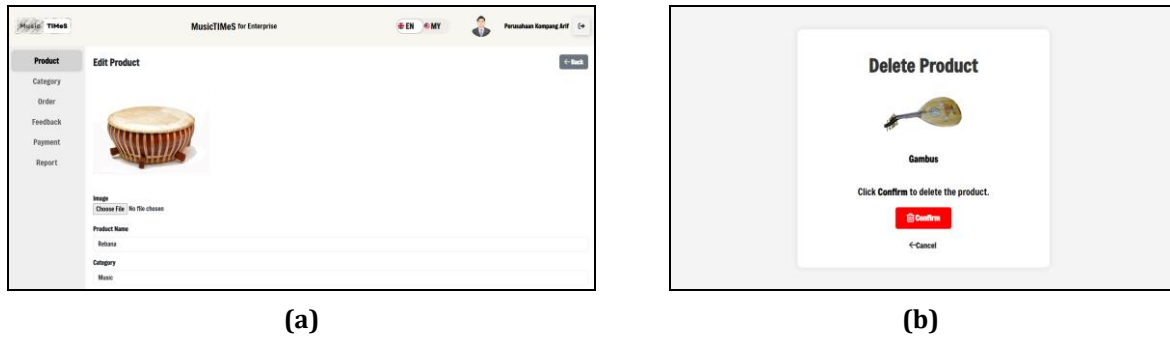


Fig. 11 (a) Enterprise Edit Product; (b) Enterprise Delete Product for MusicTIMeS

5.2.5 Manage Order Module

This module allows customer to view product details, add products to their cart, view order details, cancel orders, and track their orders also customer can download the invoice of the order in PDF format. It also enables enterprise to view order details, prepare orders for shipment, and provide tracking numbers to customers. Based on Figure 12(a), the customer product listing page interface is displaying a list of products with filtering by price, enterprise, and search queries, and using SQL to retrieve and display product details. Figure 12(b) shows the customer product details interface, to retrieve detailed product information and handles quantity adjustments and cart additions via JavaScript and AJAX.

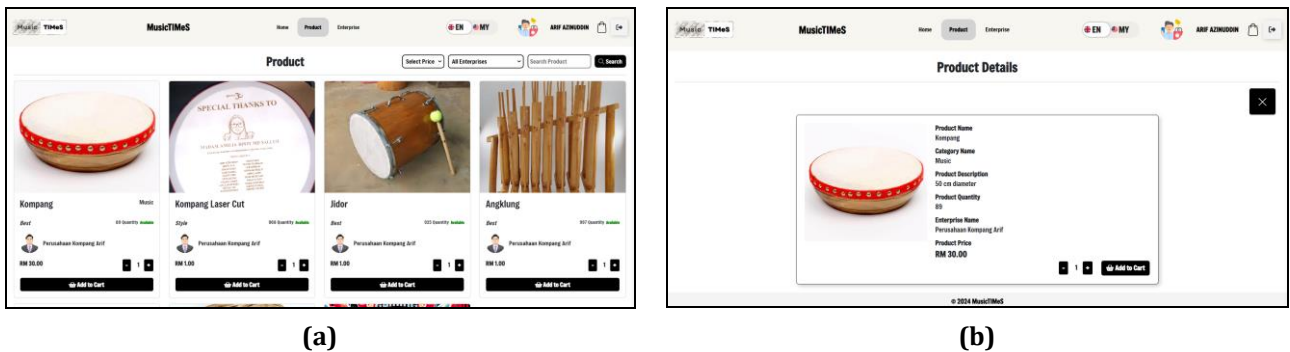


Fig. 12 (a) Customer Product Listing; (b) Customer Product Details for MusicTIMeS

Figure 13(a) depicts the customer cart interface, functioning to retrieve cart items, allows quantity adjustments and deletions via AJAX, and ensures real-time updates of total quantity and price, with checkout functionality. Figure 13(b) illustrates the customer my order interface, where it retrieves orders, allows filtering and sorting, and manages order details and cancellations via JavaScript and AJAX.

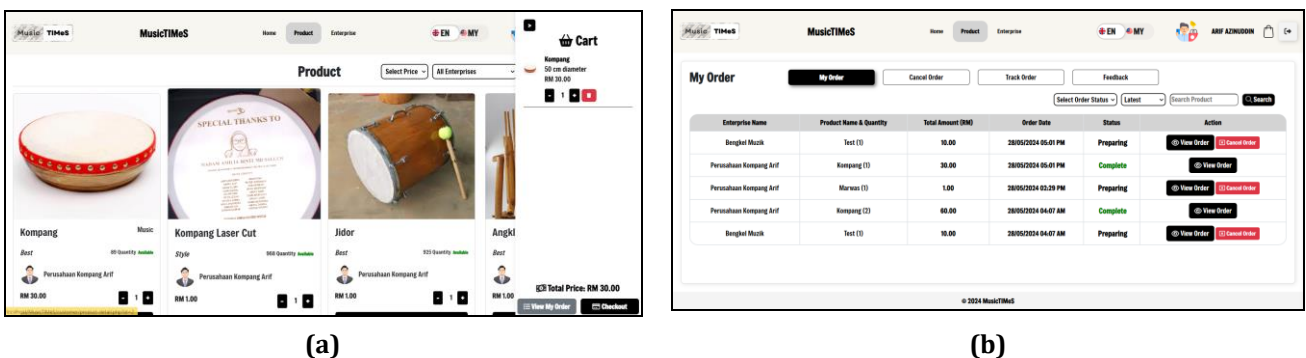
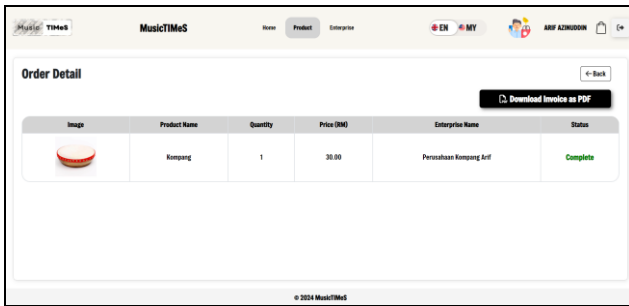
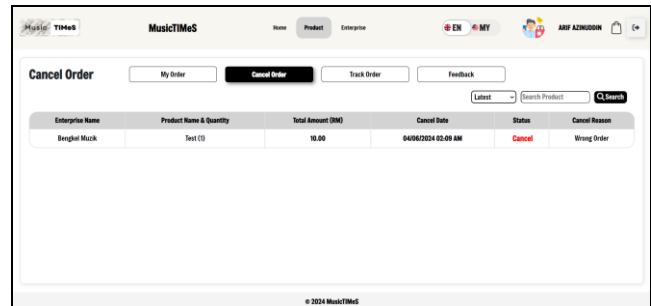


Fig. 13 (a) Customer Cart; (b) Customer My Order for MusicTIMeS

Figure 14(a) shows the customer order detail interface, displaying detailed order information using SQL queries, with options to download invoices and return to the previous page. Figure 14(b) depicts the customer cancel order interface, managed to retrieve and display canceled orders, allows sorting and searching, and presents order details and cancellation reasons.



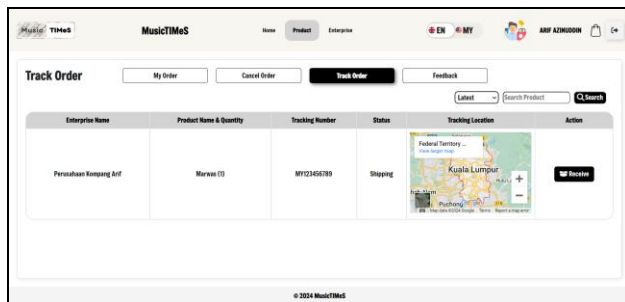
(a)



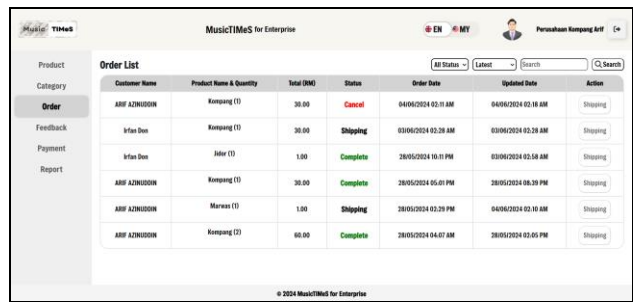
(b)

Fig. 14 (a) Customer Order Detail; (b) Customer Cancel Order for MusicTIMeS

Figure 15(a) shows the customer track order interface, it retrieves orders being shipped, allows sorting and searching, displays tracking information with an embedded Google Maps iframe, and includes a Receive button to update order status. Figure 15(b) illustrates the enterprise order listing interface, it retrieves relevant orders, allows filtering and sorting, and includes actions for updating order status and sending notification emails via PHPMailer, ensuring efficient order management for enterprises.



(a)

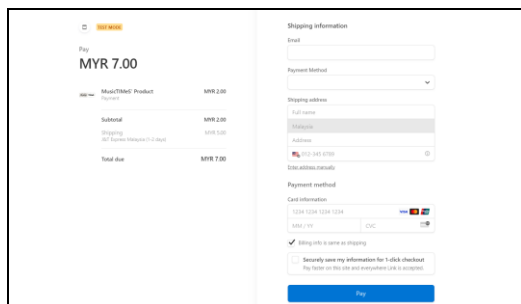


(b)

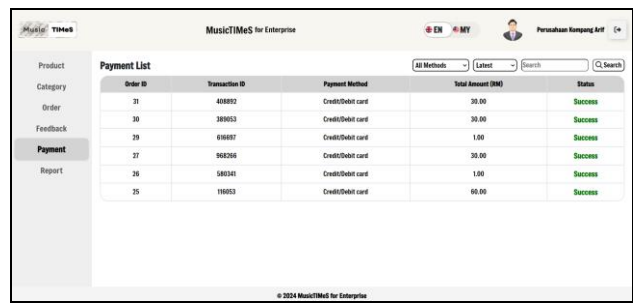
Fig. 15 (a) Customer Track Order; (b) Enterprise Order Listing for MusicTIMeS

5.2.6 Manage Payment

This module allows customer to checkout products in their cart and proceed to the payment page, which uses a Stripe payment link for the transaction. It also enables enterprise to view the payment listings of customer transactions to complete the payment. Based on Figure 16(a), the customer payment page interface is managed by payment links of Stripe API, dynamically creating secure payment links based on customer order information and redirecting customers to Stripe’s hosted payment page for secure entry of payment details, ensuring sensitive information is handled by Stripe and enhancing the payment experience. Figure 16(b) shows the enterprise payment listing interface, which fetches and displays payment details for the logged-in enterprise, including order IDs, transaction IDs, payment methods, and total amounts, in a table with filters and sorting options. Payment details are retrieved using prepared statements to prevent SQL injection, ensuring secure database interactions, with the table dynamically displaying filtered and sorted records, highlighting successful transactions and providing an intuitive search functionality.



(a)

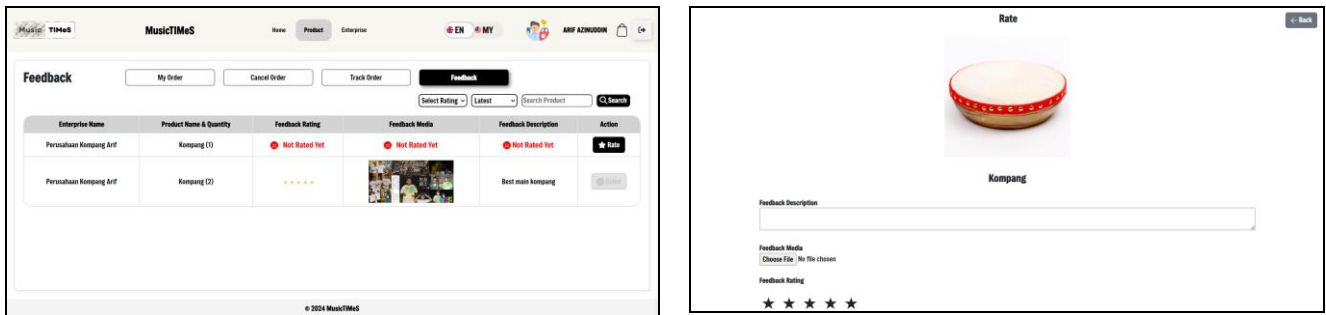


(b)

Fig. 16 (a) Customer Payment; (b) Enterprise Payment Listing for MusicTIMeS

5.2.7 Manage Feedback

This module allows customer to add ratings to completed orders and enables enterprise to view feedback ratings from customer. Based on Figure 17(a), the customer feedback page interface is retrieving completed orders of the logged-in customer and displaying product details, ratings, feedback media, and descriptions, with options to filter by rating, sort by various criteria, and search for specific products. Each product row includes an option to rate unrated products, directing users to a feedback creation page, enhancing customer engagement and satisfaction. Figure 17(b) shows the customer create feedback interface, where handles form submissions for product feedback, validating input fields, storing feedback, ratings, and uploaded images in the database, and sending a thank-you email via PHPMailer, with a star rating system for a user-friendly feedback process.



(a)

(b)

Fig. 17 (a) Customer Feedback; (b) Customer Create Feedback for MusicTIMeS

Figure 18 illustrates the enterprise feedback listing interface, it retrieves feedback data filtered by enterprise ID, with options for filtering by rating, sorting by date or alphabetically, and searching by customer or product name, displaying feedback details in a styled HTML table and using prepared statements to prevent SQL injection.

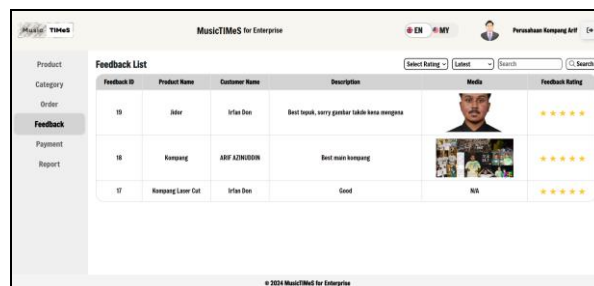


Fig. 18 Enterprise Feedback Listing for MusicTIMeS

5.2.8 Generate Report

This module allows enterprises to view sales reports of their operations in MusicTIMeS. It provides a report card, a bar chart using Chart.js, and a table of their top-selling products also the enterprise can download the report as CSV format. Based on Figure 19(a), the enterprise generate report card page interface is dynamically generating a report summary displaying metrics such as completed, ongoing, and canceled orders, total sales, total products, and total feedback, with JavaScript for date validation and enhanced visual representation using icons and styles. Figure 19(b) shows the enterprise generate report chart interface, where manages a sales graph feature using Chart.js and an export as CSV feature, allowing enterprises to visualize sales performance over a selected period and download report data in CSV format for offline analysis. The PHP code fetches sales data from the database, converts it into JSON, and passes it to Chart.js for dynamic updates based on user criteria, while the CSV export feature queries the database for filtered data and formats it into a downloadable CSV file.

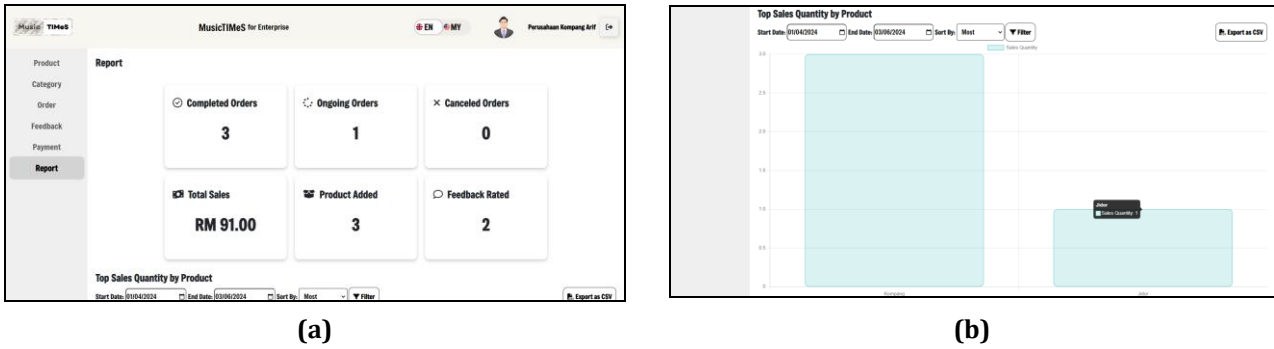


Fig. 19 (a) Enterprise Report Card; (b) Enterprise Report Chart for MusicTIMeS

Figure 20 illustrates the enterprise generate report table interface, managed to query the database for sales data and formats it into an HTML table listing top-selling products with images, names, total quantities sold, price per unit, and total sales. The table provides a comprehensive view of top-selling products, with dynamic image URLs and a message displayed if no data is found, enabling enterprises to analyze their best-performing items.

Product Image	Product Name	Total Quantity	Price Per Unit	Total Sales
	Komang	3	RM 30.00	RM 90.00
	Jidor	1	RM 1.00	RM 1.00

Fig. 20 Enterprise Report Table for MusicTIMeS

5.3 Testing

Table 6 illustrates the test plan for all modules within the system.

Table 6 Test plan for MusicTIMeS

Test Plan	Test Case	Expected	Result
Register	TC_100	Users can register an account and verify their account.	PASS
Login	TC_200	Users can login into MusicTIMeS and redirect to their respective homepage also customer can forgot password.	PASS
Manage Profile	TC_300	Customer can update their personal information and enterprise can update their enterprise information.	PASS
Manage Product	TC_400	Enterprise can manage their product.	PASS
Manage Order	TC_500	Customer can place an order and enterprise can manage order.	PASS
Manage Payment	TC_600	Customer can make payment and enterprise can manage the payment.	PASS
Manage Feedback	TC_700	Customer can give rating and enterprise can manage feedback.	PASS
Generate Report	TC_800	Enterprise can view and download sales report.	PASS

5.4 Overall Result

Table 7 illustrates the summary of all test results will be provided. A total of 8 modules with 83 test cases were conducted in this system.

Table 7 Test result of test cases for MusicTIMeS

Test Case	Total Test Cases	Total Success	Total Fail
TC_100	13	13	0

Table 7 Test result of test cases for MusicTImeS (Continue)

TC_200	11	11	0
TC_300	9	9	0
TC_400	7	7	0
TC_500	18	18	0
TC_600	12	11	1
TC_700	8	8	0
TC_800	5	5	0
Total	83	82	1

5.5 User Acceptance Testing

User Acceptance Testing (UAT) for MusicTImeS is a critical phase where primary users, the customers and enterprises, evaluate the system to ensure it meets their needs and expectations. This stage verifies that the implemented system aligns with real customer and enterprise requirements. UAT includes several modules tailored for both customer and enterprise users. For instance, the manage product module allows enterprises to create, read, update, and delete products, while the manage order module enables customers to manage their carts, orders, and order statuses, and enterprises to handle order details and shipping. The generate report module provides sales summaries in CSV format. Additionally, other essential modules include the register module with OTP verification to prevent bot registrations, the login module for secure access, and the manage profile module for updating account details. The manage payment and manage feedback modules facilitate order payments and feedback, with enterprises accessing transaction details and feedback. UAT ensures the system is suitable for musical traditional instrument maker enterprises, involves necessary improvements, and tailors the system to specific user requirements, ensuring successful deployment based on feedback from this phase. The UAT form is detailed in Appendix A.

6. Conclusion

The development of MusicTImeS successfully achieved its primary objectives by designing the platform using an object-oriented approach for modularity, scalability, and maintainability. It was developed as a web-based e-commerce solution with a PHP backend and a responsive frontend using HTML, CSS, and JavaScript. Rigorous alpha testing was conducted, with 82 out of 83 test cases passing. The system offers numerous advantages, such as efficient product management, simplified order processes, PDF invoice downloads, account detail changes, OTP-based account verification, customer ratings, and CSV report generation. However, it has some disadvantages, including the lack of mobile platform integration and the absence of Laravel framework support. Future enhancements could address these issues by integrating mobile support for better accessibility and using Laravel for improved performance and scalability. Overall, the project met its objectives and system requirements, with recommendations for further improvement enhancing its future prospects.

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Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

Author Contribution

This journal requires that all authors take public responsibility for the content of the work submitted for review. The contributions of all authors must be described in the following manner:


The authors confirm contribution to the paper as follows: study conception and design: Mohamad Arif Azinuddin Bin Zaidi, Mohd Zainuri Bin Saringat; data collection: Mohd Zainuri Bin Saringat; analysis and interpretation of results: Mohamad Arif Azinuddin Bin Zaidi, Mohd Zainuri Bin Saringat; draft manuscript preparation: Mohd Zainuri Bin Saringat. All authors reviewed the results and approved the final version of the manuscript.

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Appendix A: User Acceptance Testing

USER ACCEPTANCE TESTING (UAT) FOR ENTERPRISE



Music TIMES


MUSICAL TRADITIONAL INSTRUMENT MAKER ENTERPRISES e-COMMERCE SYSTEM
(MusicTIMeS)


Name : Mokhtar B. A. Hamid
 Date : 9 Jun 2024
 Phone Number : 012-7508281
 Enterprise Name : Pernikahan Komang & Jidat Point Sumarto.

No	Module/Acceptance Criteria	Test Result		Remark (if any)
		Pass	Fail	
1 Register				
a)	Display the register page for create new account for enterprise.	/		
b)	I am able to input registration details on register page.	/		
c)	I am able to receive an email OTP code for account verification.	/		
d)	I am able to receive an email notification after the account is verified.	/		
2 Login				
a)	Display the login page for login to system.	/		
b)	I am able to input username and password on login page and redirect to enterprise dashboard.	/		
c)	An error message is shown if incorrect credentials are entered.	/		
3 Manage Profile				
a)	Display enterprise profile page to manage their profile.	/		
b)	I am able to change the enterprise profile details.	/		
c)	I am able to change the password of the enterprise account.	/		
4 Manage Product				
a)	Display manage product page.	/		
b)	I am able to add, edit, and delete categories and products.	/		
5 Manage Order				

a)	Display manage order page.	/		
b)	I am able to view orders from customers.	/		
c)	I am able to enter the tracking number for shipping purposes.	/		
6 Manage Payment				
a)	Display manage payment page.	/		
b)	I am able to view payment list from customer's order.	/		
7 Manage Feedback				
a)	Display manage feedback page.	/		
b)	I am able to view the feedback list from completed customer orders.	/		
8 Generate Report				
a)	Display generate report page.	/		
b)	I am able to view report card, bar chart and product table.	/		
c)	I am able to set a range of dates to filter the sales report.	/		
d)	I am able to download report as CSV format file.	/		

I am Mokhtar B. A. Hamid hereby declare that the information provided is true and correct.



Agreed by,  Name : Mokhtar B. A. Hamid
 Position : Enterprise Owner
 Date : 9 Jun 2024



Witnessed by,  Name : MUHAMMAD HAZIQ HAZLAM & MOKHTAR
 Position : MANAGER
 Date : 9 JUN 2024

Fig. A.1 User Acceptance Testing Form for Enterprise

USER ACCEPTANCE TESTING (UAT) FOR CUSTOMER



Music TIMES

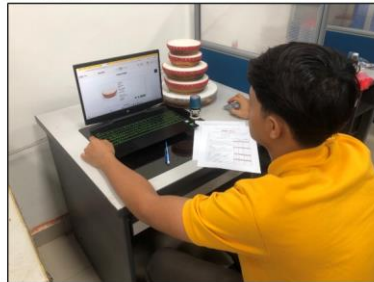
MUSICAL TRADITIONAL INSTRUMENT MAKER ENTERPRISES e-COMMERCE SYSTEM
(MusicTIMeS)


Name : MUHAMMAD HAZIQ HAZLAM & MOKHTAR
 Date : 9 JUN 2024
 Phone Number : 019-9319006

No	Module/Acceptance Criteria	Test Result		Remark (if any)
		Pass	Fail	
1 Register				
a)	Display the register page for create new account for customer.	/		
b)	I am able to input registration details on register page.	/		
c)	I am able to receive an email OTP code for account verification.	/		
d)	I am able to receive an email notification after the account is verified.	/		
2 Login				
a)	Display the login page for login to system.	/		
b)	I am able to input username and password on the login page and redirect to the customer homepage.	/		
c)	An error message is shown if incorrect credentials are entered.	/		
d)	I am able to forgot password.	/		
3 Manage Profile				
a)	Display my profile page to manage profile.	/		
b)	I am able to change profile details of my account.	/		
c)	I am able to change the password of my account.	/		
4 Manage Order				
a)	Display product listing page.	/		
b)	I am able to view product details.	/		
c)	I am able to add to cart the product.	/		

d)	Display cart page.	/		
e)	I am able to add, edit, and delete the products in the cart page.	/		
f)	I am able to view My Order, Cancel Order, Track Order pages.	/		
g)	I am able to download invoice of the order as PDF format file.	/		
5 Manage Payment				
a)	I am able to checkout the product on cart page.	/		
b)	Display payment page.	/		
c)	I am able to complete the transaction and receive email notification also clear the cart.	/		
6 Manage Feedback				
a)	Display feedback page.	/		
b)	I am able to give rating to completed order.	/		

I am MUHAMMAD HAZIQ HAZLAM & MOKHTAR hereby declare that the information provided is true and correct.



Agreed by,  Name : MUHAMMAD HAZIQ HAZLAM & MOKHTAR
 Position : MANAGER
 Date : 9 JUN 2024


Witnessed by,  Name : Mokhtar B. A. Hamid
 Position : Enterprise Owner
 Date : 9 Jun 2024

Fig. A.2 User Acceptance Testing Form for Customer