E-INVOICE MANAGEMENT SYSTEM

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ABSTRACT

Small and medium-sized businesses (SMEs) often struggle to manage their invoicing processes because of manual workflows, lack of automation, and insufficient digital infrastructure. To streamline creating invoices, verifying payments, and reporting, this project outlines the development of a web-based e-invoice management system for SMEs. Due to the system's multi-tenant architecture, which is protected by Laravel's middleware and policies, multiple companies can safely utilize the platform with separate data access. Customers can be managed, structured invoices can be created step-by-step, taxes can be automatically calculated, and proof of payment can be uploaded for validation. Based on payment decisions, administrators can update invoice statuses and automatically accept or reject payments. Dynamic reporting features enable exporting to PDF and Excel formats, with filtering options for payment and customer trend data. To ensure security and operational integrity, the platform also incorporates role-based access control, restricting module access according to user roles. Technologies such as Laravel, MySQL, Bootstrap, and Vite were used during development. The system is hosted on Hostinger to guarantee public availability and accessibility. Software testing focused on key quality factors like functionality, usability, dependability, and performance. Results showed that the system is responsive, stable, and user-friendly for both administrators and SME staff. Overall, the project successfully provided SMEs with a secure, portable, and effective invoicing solution. It enhances financial accuracy, reduces manual work, and increases transparency in invoicing operations. The e-invoice management system is a valuable digital tool for companies aiming to modernize their financial processes while complying with tax regulations.

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CHAPTER 1 INTRODUCTION

1.1 Introduction

To increase productivity, lower errors, and improve financial data management, companies are switching from manual and paper-based invoicing procedures to an automated e-invoice management system in the current digital era. An organized, digital record of a transaction, an e-invoice takes the role of traditional invoices. Malaysia's effort for digital invoicing aligns with national initiatives to support tax compliance and digital transformation for small and medium enterprises (SMEs). With the help of real-time reporting capabilities, this project seeks to provide a safe e-invoice system with a user-friendly interface for SMEs.

1.2 Problem Statement

Many SMEs continue to use traditional manual invoicing techniques that are not automated, insecure, and are prone to human error. The inefficiencies underline the necessity for a safe and automated e-invoice system by causing late payments, erroneous financial reports, and higher operating expenses.

1.3 Project Scope

The e-invoice management system will be a lightweight web-based e-invoice management platform for SMEs. It focuses on automating invoice generation, tracking, and management while ensuring tax compliance. This solution will eliminate the inefficiencies of conventional invoicing by digitizing the process in a secure and user-friendly manner.

Each business operates within its environment and has its data filtered by company_id in this multi-tenant system. Every company must complete a setup process, and role-based access control (RBAC) is in place to protect private information.

Core Function:

1. **User Management**
    a. **Company (Admin):** Can manage users, and invoices.
    b. **User (Company Staff):** Can manage invoices only.
2. **Invoice Management**
    a. Generating invoices with auto-generated invoice numbers.
    b. Edit, delete, and send invoices to customers.
    c. Automated tax calculations based on predefined rates, including VAT/GST, configurable by the user.
3. **Payment Tracking**
    a. Company admin/staff can manually update invoice statuses (Paid, Pending, Overdue) based on external payment confirmations (e.g., bank transfer, or cash payment).
    b. Company admin/staff can add payment remarks (e.g. transaction reference, or payment method).

c. Option to upload proof of payment (e.g., bank receipt, or screenshots of transactions).

d. A dashboard provides an overview of the transaction history.

4. **Secure Data Storage & Access Control:**

    a. Invoices and transaction records are securely stored with role-based access control (RBAC) to prevent unauthorized access.

5. **Data Export**

    a. Company admin/staff can download invoices and reports in PDF and CSV formats for record-keeping and financial analysis.

Limitations:

- This e-invoice management system does not integrate with third-party payment gateways. SMEs must track the payments externally and update the invoice status manually.

1.4 Aims and Objectives

This project aims to develop a user-friendly e-invoice management system that enhances SMEs' efficiency, security, and compliance. The following were the project's objectives:

- Create a system that allows users to generate, read, modify, and delete invoices.
- Ensure invoices are stored and retrieved securely, shielding data from unauthorized access.
- Enable users to manually track invoice payments by updating invoice statuses (Paid, Pending Overdue).
- Provide financial tracking and reporting to help SMEs manage cash flow.

1.5 Methodology

A modified waterfall methodology, which is sequential but permits some flexibility between phases, will be used to create this project. The modified waterfall model allows for limited loops, enabling alterations based on discoveries from later stages, in contrast to the classic waterfall model, which requires that each phase be completed strictly before going on to the next phase.

Requirement Analysis: The research will yield the specific requirements in phase one. Keep track of every function, such as the ability to create invoices, save them securely, integrate payments, and generate reports.

System Design: The requirements will guide the database structure development and overall system design.

Implementation: Coding the system with the design standards will start the implementation phase. The frontend interface, backend functionality, security features, and payment gateway integration will all be covered during the implementation phase.

Testing: A testing step will be required to ensure the system is operating as intended.

Deployment: Deploy the finished system to the web server to make it available to users. Configure the production environment, including any required data protection settings.

Maintenance: Following deployment, keep an eye out for any possible problems with the system and carry out last-minute assessments based on user input. Based on early user interactions, address any issues or improvements.

1.6 Significance of Project

To overcome the difficulties SMEs encounter in efficiently managing invoices and tracking payments, the e-invoice management system is crucial. The primary things this project has to contribute are:

- **Improve Efficiency:** Create and track invoices automatically to cut down on human labor and the mistakes that come with traditional paper bills.
- **Enhance Financial Management:** Better cash flow management is maintained by SMEs when they have information about the status of payments (Paid, Pending, and Overdue).
- **Ensure Tax Compliance:** Facilitates automatic tax computation (such as VAT/GST) according to preset tax rates, making it easier for SMEs to operate by financial requirements.
- **Increase Security and Data Integrity:** Use role-based access controls to safely store transaction information and invoices to avoid data loss and unwanted access.
- **Reduce Operational Costs:** Eliminating manual tracking and paper invoices will increase accuracy and decrease administrative expenses.
- **Support Business Growth:** By giving SMEs the digital tools they need to manage invoices effectively, they can stop worrying about maintaining accurate financial records and concentrate on expanding their businesses.

By implementing this system, SMEs will access a cutting-edge, safe, and affordable invoicing solution that improves financial control and streamlines operations.

1.7 Expected Outcome

A functional e-invoice management system that provides SMEs with a safe and easy-to-use system is anticipated due to the project. This system allows them to create, track, and manage invoices effectively. While company staff can only manage invoices, the admin can manage both users (admin/company staff) and invoices using the system's protected user access. Automatic tax computations, human payment monitoring, and user-inputted status updates (Paid, Pending, Overdue) will all be included. Financial reports and invoice records can also be exported to PDF or CSV format for improved financial management. The technology will improve compliance, expedite invoicing, and increase SMEs' cash flow visibility in the long term.

CHAPTER 2 LITERATURE REVIEW

2.1 Introduction

This section will describe the introduction, theoretical framework, existing literature, reviewed system, current challenges, comparison of features between the existing systems, discussion of features in the existing system, and conclusion. The literature review's introduction will be expanded upon in the introduction. The existing literature section will cover the current e-invoicing management system in more detail. Additionally, this chapter includes a section on the existing system, whether the system is a mobile application or a web-based application, which will be analyzed.

This literature review chapter can be regarded as research because it reviewed online sources and examined the current system. This chapter chooses and reviews systems that carry out tasks comparable to the proposed system. The system specification and its strengths and weaknesses will be included in the analysis.

This literature review analysis aims to study the existing research. The methods utilized to design the system, the environment of the current system, and the tools selected to create a functional system are all determined by the literature review, which supports that claim. Therefore, a review of the literature will assist in determining the advantages and disadvantages of the current system that may be utilized to improve the proposed system. Company admin/staff may handle their invoices much more easily and effectively with the help of the E-invoice Management System.

2.2 Theoretical Framework

The theoretical framework adopted in this literature review is rooted in the digital integration of invoices, which provides a solid foundation for understanding e-invoices within businesses. This framework highlights the importance of understanding how e-invoices can help enhance operations.

Problems with operations result from the not automated, inefficiencies, errors, and delays that define traditional manual invoicing techniques in SMEs. Using e-invoicing to automate these procedures offers a revolutionary way to boost financial management, guarantee accuracy, increase productivity, and save more time.

2.3 Existing Literature

Nowadays, e-invoices are essential for business. Sutisna et al. (2024) stated that an e-invoice system is a digital platform that replaces conventional paper-based methods for creating, sending, receiving, and storing invoices. Businesses can automate the invoicing process with e-invoicing, which lowers expenses and human error while accelerating payment processing times. “Globally, e-invoicing is becoming more popular, which aids businesses in successfully achieving their objectives for digital transformation. This solution improves accuracy and efficiency by streamlining the finance and invoicing procedures (Sands, 2024).”

Recent studies have indicated that e-invoice management systems greatly enhance firms' financial reporting, operational efficiency, and compliance accuracy.

Table 2.1: Comparison between traditional paper-based invoices and e-invoices

Traditional paper-based invoices	E-invoices
The majority of individuals are familiar with manual invoicing.	Business process automation
No technical skill is required.	Increase productivity
Prone to human error	Accuracy
	Cost reduction
	Faster invoice processing
	Increased business effectiveness
	Process monitoring better business

Table 2.1 lists the comparison between manual and electronic invoicing as Sutisna et al. (2024) stated. The comparison between conventional paper-based invoices and e-invoices above (*Table 2.1*) shows that e-invoicing is more efficient than manual paper-based invoicing.

Sutisna et al. (2024) declared that despite the obvious advantages of e-invoicing, many businesses are still reluctant to embrace this technology. Among the difficulties commonly encountered include technological problems, the initial expenses of implementation, and opposition to change. Many advantages come with e-invoicing, such as improved productivity through process simplification and decreased dependence on paper, which lowers printing and storage expenses. It boosts productivity by freeing up staff members to concentrate on higher-value work, enhances accuracy by limiting human mistakes, and promotes sustainability by using less paper. Additionally, by improving operational efficiency, e-invoicing promotes greater user happiness, better financial data management, and overall corporate success.

2.4 Review on Existing System

In comparison to the proposed approach, this section examines existing e-invoicing management systems, highlighting their features, technologies, frameworks, benefits, and shortcomings, A comparison of tools, techniques, database architectures, programming languages, and system capabilities is part of the examination. Findings from the study will point out aspects of the proposed system that could be enhanced or implemented.

2.4.1 System 1 (Zoho Invoice) – Review on Technology and Functionalities

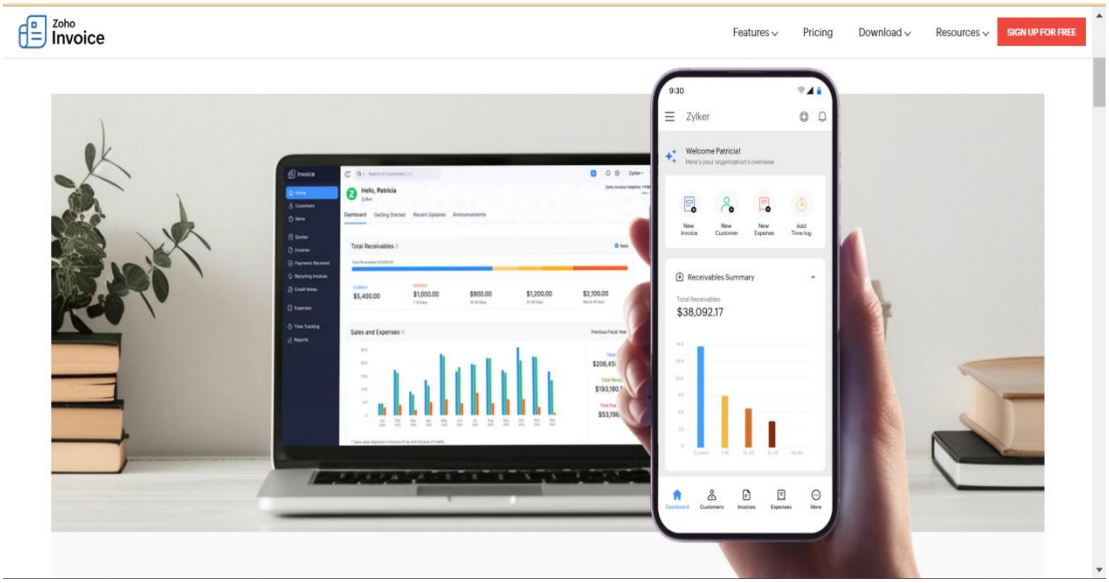

Figure 2.1: Zoho invoice

Zoho Invoice (*Figure 2.1*) is a cloud-based invoicing tool that provides automated invoicing, payment tracking, and tax calculation functionalities. The ability to handle invoicing from both desktop and mobile devices is ideal for small business owners. It enables users to build invoice templates rapidly, email them to clients, and collect payments.

Zoho Invoice allows users to personalize templates, support other languages, send invoices to customers automatically depending on a set date, and create recurring

invoices automatically. The customer receives the invoice automatically on the scheduled date.

Technologies Used:

- **Framework:** Web-based application using Zoho's cloud platform
- **Database:** Proprietary cloud database
- **Languages:** Java, Python (backend), JavaScript (frontend)
- **Security:** Role-based access control, encryption

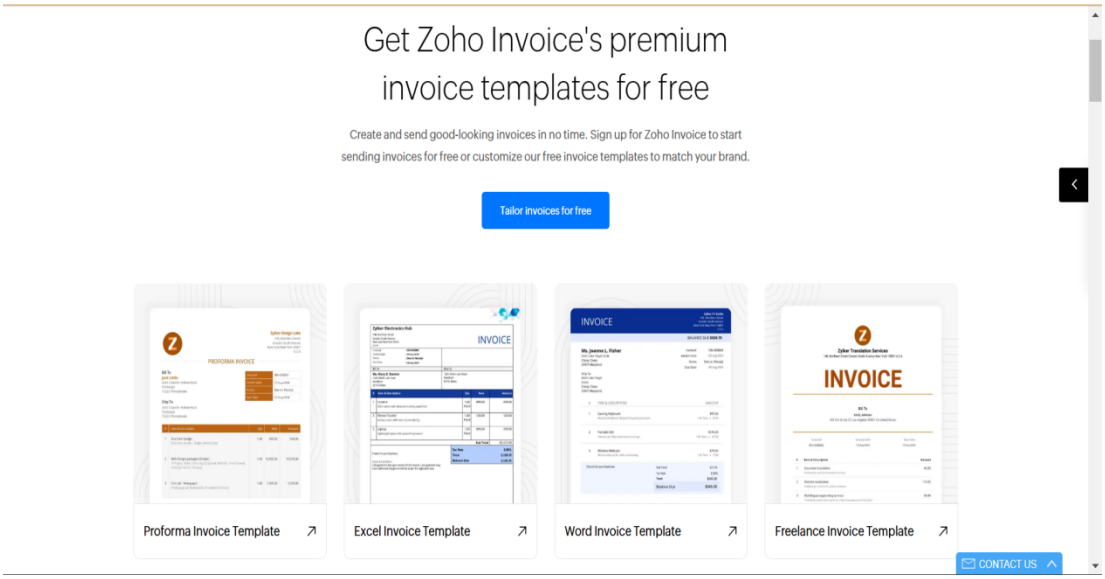

Figure 2.2: Invoice's template

The variety of editable invoice templates that Zoho Invoice offers is displayed in *Figure 2.2*. These templates are intended to assist companies in producing branded, expert invoices quickly. Proforma, Excel, Word, and freelance templates are among the formats from which users can select, and each is appropriate for a certain set of invoicing requirements. In order to maintain consistency with corporate image, Zoho Invoice also lets customers customize templates by changing components like company logos, color schemes, fonts, and layouts.

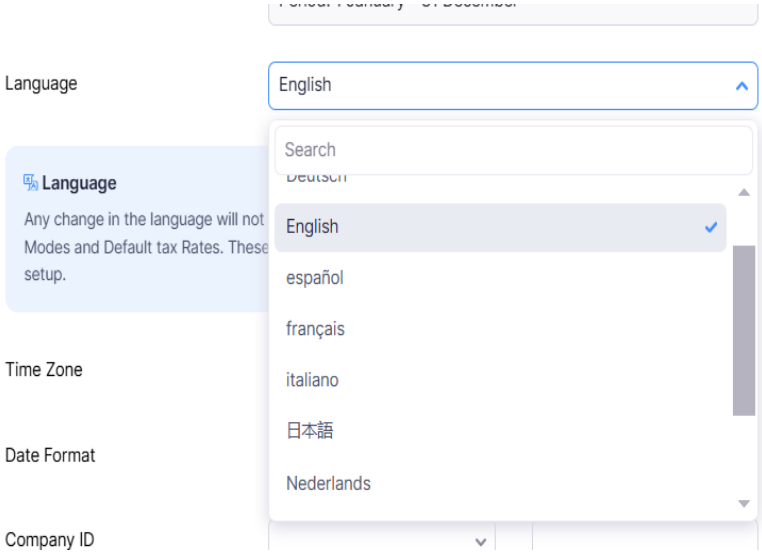

Figure 2.3: Language option in Zoho Invoice

Zoho Invoice supports multiple languages (*Figure 2.3*)—up to ten. For the best possible communication, the user can send the consumer an invoice in their native language.

2.4.2 System 2 (QuickBooks) – Review on Technology and Functionalities

Intuit created and began selling QuickBooks, an accounting software program, in 1992. It targets mostly small and medium-sized enterprises that handle payroll, manage and pay invoices, and take business payments.

Although QuickBooks offers many accounting features, its most complex features depend on the user's subscription.

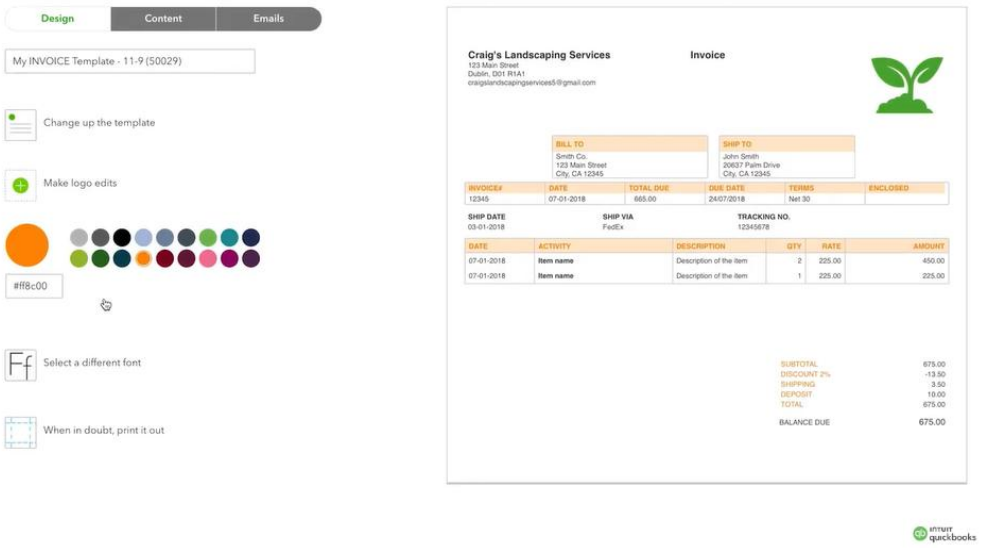

Figure 2.4: Invoice template

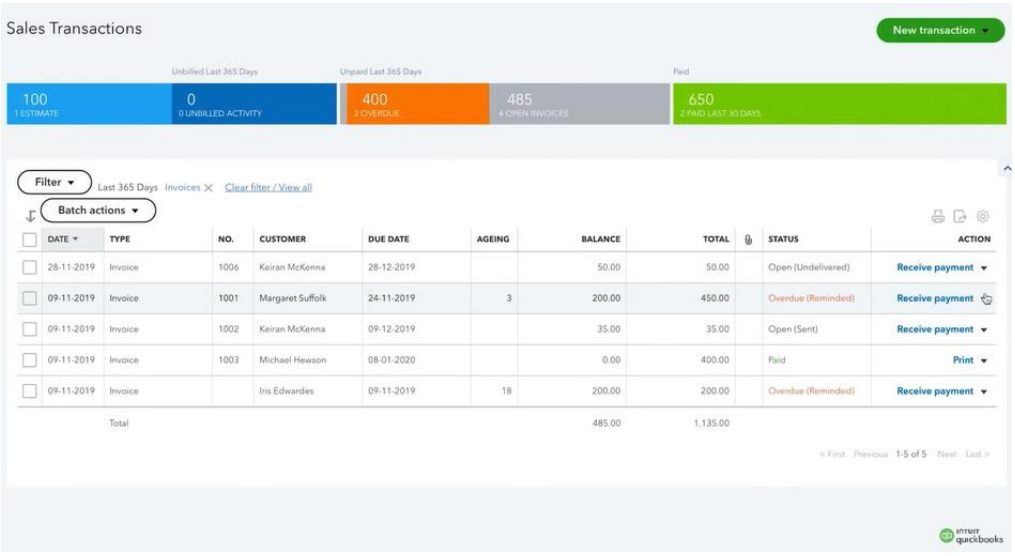

Figure 2.5: Sales Transaction

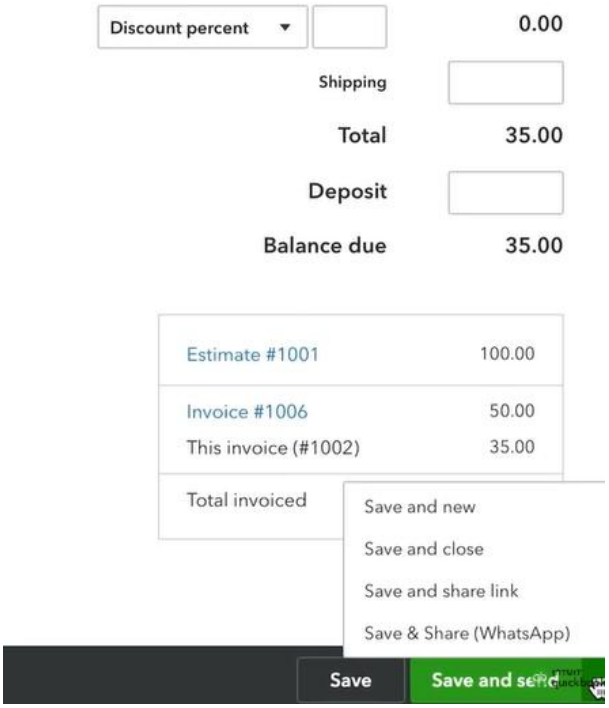

Figure 2.6: Track invoice

The purpose of Figures 2.4, 2.5, and 2.6 is to graphically depict important aspects of current invoicing systems, particularly QuickBooks. Real-world examples of standard invoice design (*Figure 2.4*), sales transaction recording (*Figure 2.5*), and the invoice status tracking procedure (*Figure 2.6*) are illustrated by these diagrams. By displaying not only descriptive differences but also the actual user interface and characteristics that impact the user experience, these visualizations enhance the comparison study. The suggested e-invoice management system's usability issues and potential enhancement areas—such as streamlined tracking, personalized invoice templates, and connection with manual payment processing—can only be found with the use of these graphic aids.

2.4.3 System 3 (Wave Accounting) – Review on Technology and Functionalities

Wave Invoice is a free invoicing tool designed for self-employed workers and small enterprises. It provides basic payment tracking and invoicing capabilities without charging a membership fee.

Technologies Used:

- **Framework:** Web-based, Laravel (PHP)
- **Database:** PostgreSQL
- **Languages:** PHP (backend), Vue.js (frontend)
- **Security:** Basic encryption, RBAC

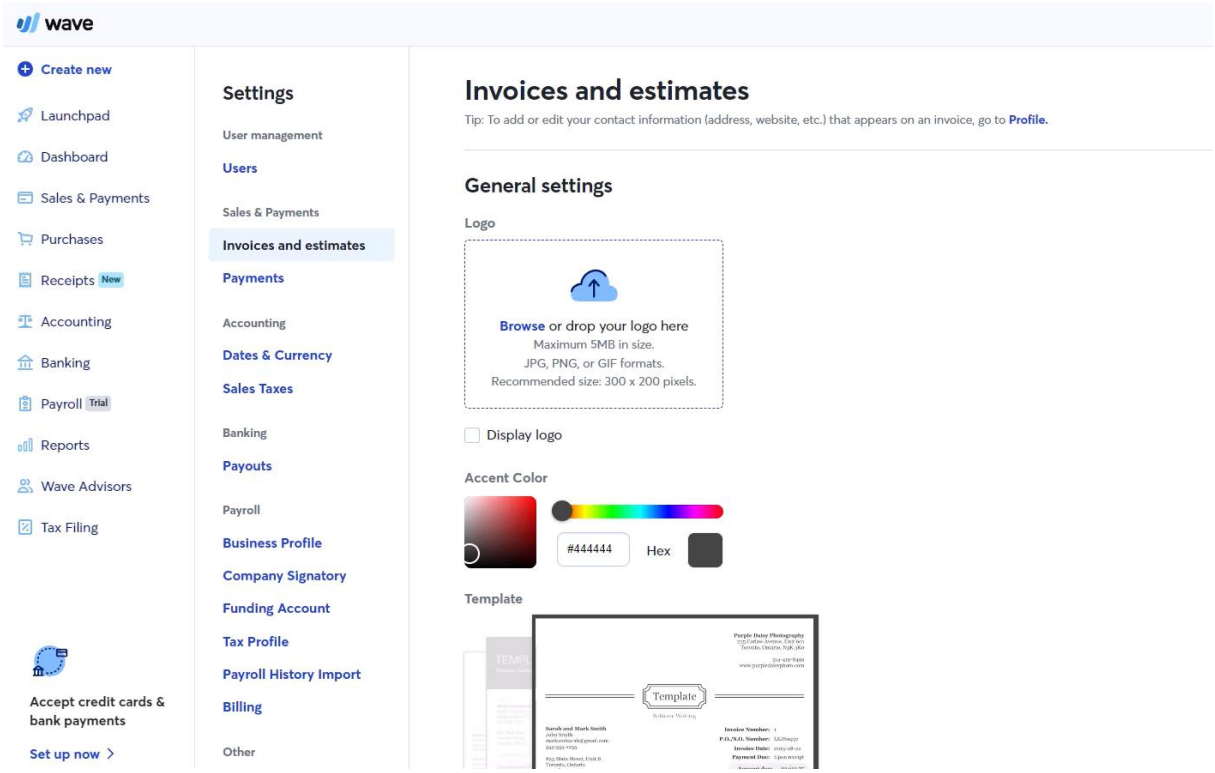

Figure 2.7: Free invoice generations with customization

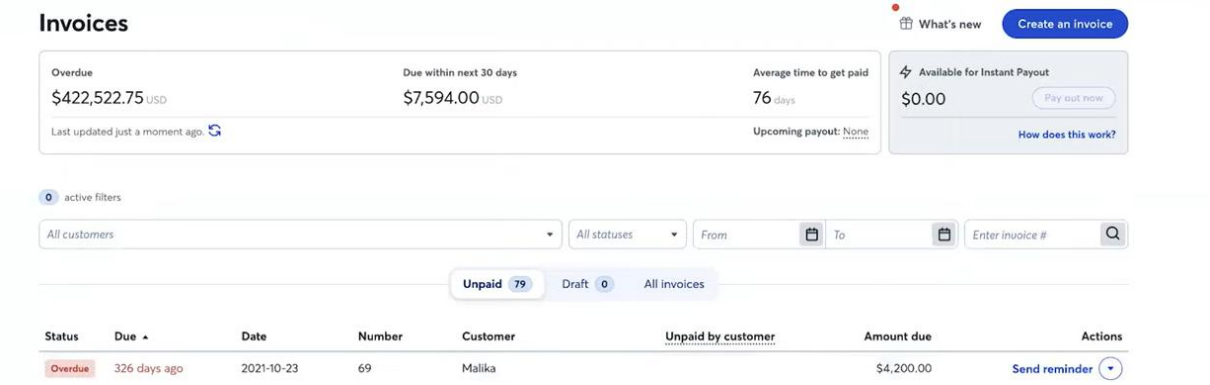

Figure 2.8: Payment tracking and status updates

The purpose of Figures 2.7 and 2.8 is to show particular aspects of Wave Accounting in connection with the current system study. Wave's free invoice creation capability with customization possibilities is highlighted in *Figure 2.7*. This feature is especially helpful for small and medium-sized businesses looking for an affordable tool. The platform's payment tracking and status update methodology is shown in *Figure 2.8*, which offers insight into how the current system manages the post-invoice cycle. Both the strengths that can be maintained and the weaknesses that the proposed electronic invoice management system seeks to address—such as increased customization capabilities, integration of manual payment tracking, and improved user role access controls—are supported by these figures, which also assist in identifying the key comparisons in *Table 2.3*.

2.5 Current Challenges

Although considerable research has been carried out on e-invoice management systems and their benefits for small and medium-sized enterprises (SMEs), many unanswered questions and limitations still prevent the full potential of these systems from being realized.

In today's rapid commercial world, the shortcomings of manual invoicing techniques are becoming more apparent. Many SMEs still use outdated paper-based invoicing methods, which are ineffective and vulnerable to human mistakes, late payments, and false financial reporting. Additionally, these difficult processes increase operational expenses, which automation could reduce. The shortcomings of these conventional approaches highlight the need for a secure, automated e-invoice management system that can manage invoice creation, modification, and monitoring.

The existing studies have stated many advantages of e-invoicing, but there are still obstacles to overcome in developing e-invoice management systems. According to Sutisna et al. (2024), the challenges include internal challenges, coordination requirements, the time it takes for staff to learn and adjust to new procedures when implementing a new system, and data security issues, which arise when sensitive financial data is transmitted. High initial implementation costs and technical problems may make the shift even more difficult. Apart from that, a corporation may be hesitant about implementing e-invoicing due to a lack of knowledge and understanding about using it successfully. The challenges emphasize how crucial thorough preparation, staff training, and robust safety protocols are to a successful transfer.

Wagiman et al. (2023) suggested improving the e-invoice system by boosting system performance during periods of high demand, guaranteeing reliability, and strengthening

integration. It indicates enhancing the quality of services by implementing features like live chat and quicker help desk responses. Strategies to raise public awareness about taxes and the implementation of e-invoicing are advised to improve performance. Continuous analysis of user input and extensive training materials, such as tutorials and guides, are highly valued to enhance user interest and navigation. Putting these strategies into practice can improve tax management overall by making the system more effective and user-friendly.

2.6 Comparison of Features between the Existing Systems

Table 2.2: Features between existing systems

Features	Zoho Invoice	QuickBooks	Wave Accounting
Invoice Generation	✓	✓	✓
Automated Invoice Numbering	✓	✓	✓
Customizable Invoice Templates	✓	✓	✓ (Limited)
Recurring Billing	✓	✓	×
Customizable Invoices	✓	✓	✓(Limited)
Tax Calculation (VAT/GST)	✓	✓	×
Manual Payment Tracking	×	×	✓
Payment Gateway integration	✓	✓	✓
Invoice Status Updates	✓	✓	✓
Proof of Payment Upload	×	×	×

Financial Reporting	✓ [Basic reporting (profit & loss, taxes)]	✓ [Advanced financial reporting (Cash Flow, Balance Sheet, Tax reports)]	×
Multi-currency support	✓	✓	✓
Role-Based Access Control (RBAC)	✓	✓	×
Data Export (PDF/CSV)	✓	✓	×
Mobile App	✓	✓	✓
Customer support	✓	✓	×
Pricing	Free (Limited) & paid plans	Paid plans only	Free

Comparison features between existing systems (*Table 2.2*):

This section contrasts the proposed system's capability with the current e-invoicing management systems (Zoho Invoice, QuickBooks, and Wave Accounting). The comparison draws attention to each system's advantages and disadvantages and aids in locating the gaps that the proposed fixes seek to fill.

Comprehensive invoicing features like financial reporting, multi-currency compatibility, and payment gateway integration are provided by Zoho Invoice, and QuickBooks. Although Wave Accounting provides a free invoicing system, it does not consist of key essential functions

including financial reports, tax computations, and recurring billing. Small and medium-sized enterprises (SMEs) are the main objective of the proposed system, which prioritizes manual payment tracking and uploading payment proofs, which are features that rivals frequently ignore while offering basic invoicing capability. SMEs must manually track payments because the proposed system does not integrate payment channels like current solutions do. For small enterprises, however, this lowers expenses and streamlines financial administration. While rivals provide live chat, phone, and email assistance, the proposed system only provides minimal support through a FAQ and documentation.

The comparison points out the benefits of current systems while pointing out the shortcomings that the proposed system seeks to address. The proposed system is designed especially for SMEs and offers minimal invoicing capability, emphasizing simplicity, affordability, and manual tracking, even if well-known platforms like Zoho Invoice and QuickBooks provide strong solutions.

2.7 Discussion of Features in Existing Systems

Table 2.3: Discussion of existing systems

Existing Systems	Strengths	Weaknesses	Improvement
Zoho Invoice	• Simple and user-friendly interface. • Automated Invoicing and Tax Calculation. • Payment Gateway Integration. • Cloud-Based Storage.	• Limited Free Plan. • Complex Customization. • No manual tracking option.	• Provide a free version with essential features for SMEs. • Implement payment tracking for SMEs who handle offline payments. • Add a proof of payment upload feature (e.g., bank receipts, screenshots).
QuickBooks	• Comprehensive Accounting Features. • Automated Invoicing and Reporting. • Bank Integration.	• Expensive for SMEs. • Complex Interface. • Overloaded with Features.	• Focus on a simple, user-friendly design tailored for SMEs. • Provide manual payment tracking and proof of payment uploads.

			• Offer a cost-effective alternative for SMEs.
Wave Accounting	• Completely Free, no hidden charges for invoicing. • Simple and easy-to-use. • Basic Payment Tracking.	• No Tax Calculation Features. • Limited Reporting Capabilities. • No Role-Based Access Control (RBAC).	• Incorporates tax computations (VAT/GST) to make compliance easier for SMEs. • There are branded invoice templates that may be customized. • Improve user management by putting role-based access control (RBAC) into practice.

Table 2.3 shows the comparison of current invoicing systems (Quickbooks, Wave Accounting, and Zoho Invoice) in order to identify their advantages, disadvantages, and potential areas for development. This critical evaluation provides the groundwork for determining the drawbacks of current systems, which the suggested electronic invoicing management system seeks to rectify. Understanding the advantages and disadvantages of popular platforms allows the table to support the design choices made for the new system, including role-based access control, manual payment monitoring, payment voucher uploads,

and price strategies for SMEs. By including this table, the project shows that it is grounded in genuine tools and addresses real user needs.

In addition to highlighting the advantages and disadvantages of the current e-invoice management systems (Zoho Invoice, QuickBooks, and Wave Accounting), a study of their features also identifies possible enhancements for the proposed system. Zoho Invoice cannot upload payment proofs or track manual payments, but it does include periodic billing, customization, and comprehensive financial reporting. SMEs cannot access QuickBooks due to its expensive pricing and lack of proof of payment upload, despite its effective invoice customization and seamless payment connection. Despite being free and easy to use, Wave Accounting does not have role-based access control (RBAC), recurring billing, or tax computation, proof of payment upload, RBAC, customized invoice templates, and manual payment tracking, the proposed system seeks to close these gaps while remaining affordable for SMEs.

2.8 Conclusion

This chapter examines the various e-invoicing management systems that are now in use, such as Zoho Invoice, QuickBooks, and Wave Accounting. Each system offers advantages in terms of creating invoices, automating taxes, and tracking payments, but it also has limitations, such as being expensive, complicated, or lacking fundamental features that small and medium-sized enterprises might find useful.

These shortcomings are intended to be filled by the suggested e-invoicing management system for SMEs by offering cost-effective, user-friendly solutions, uploading evidence of payment to enable manual payment tracking, offering encryption and RBAC for safe invoice storage, and including financial reporting and automatic tax computation. The suggested system will give SMEs a simple, safe, and effective invoicing platform by including these enhancements.

In conclusion, e-invoice management systems have proven unique in financial administration, providing notable advantages in terms of cost and efficiency. Nonetheless, user acceptance, compliance, and technological integration issues still exist. With an emphasis on scalability, compliance, and convenience of use, this project seeks to address these issues by creating a comprehensive e-invoice management system designed specifically for SMEs.

CHAPTER 3 REQUIREMENT ANALYSIS AND DESIGN

3.1 Introduction

E-Facturo, an e-invoice management system designed for small and medium-sized businesses, resolves the issue of manual invoicing's low efficiency. Inspired by the French word “invoice”, it represents the system’s complexity and accuracy.

Development methodology is a procedure or approach used to gather data, design the system, and obtain all the required information and needs. This chapter covers the design and analysis of an e-invoice management system, as well as the requirements collection method, gathering, and user negotiation of the system specifications. It also covers the study’s outcome, which includes a variety of models, including data flow diagrams (DFD), and key design artifacts that serve as the foundation for the system design.

The methodology used to develop an e-invoice management system is a modified waterfall methodology from the System Development Life Cycle (SDLC) (*Figure 3.1*). In addition, this chapter describes the methods and strategies for developing and evaluating e-invoice management systems for small and medium-sized businesses. It opens with an analysis to record the system’s requirements and expectations. Then, it proceeds to thorough design, which includes database design, user interface (UI), architecture, and algorithmic logic. These elements serve as the system’s foundation, guaranteeing that it aligns with project objectives.

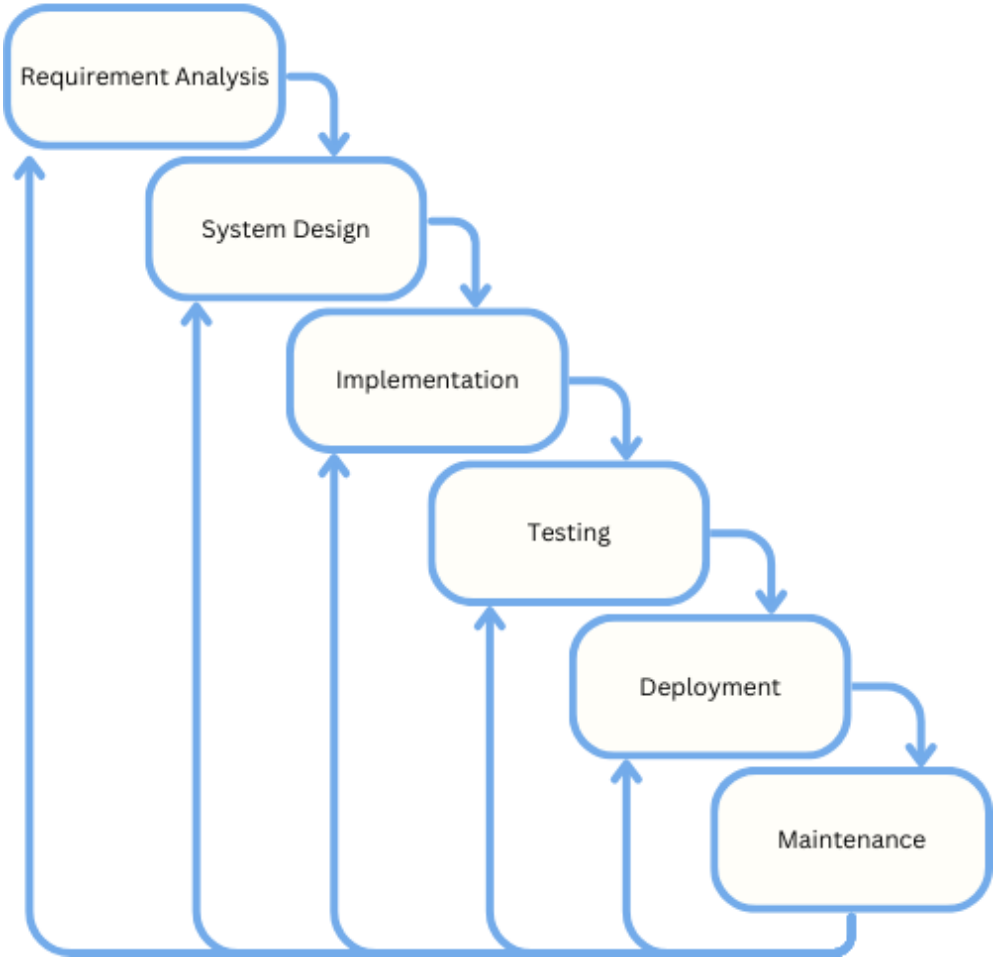

Figure 3.1: Modified Waterfall Methodology

3.2 Analysis Process/Activities

Following the data collection, the requirements were examined and categorized as follows:

Functional Requirements:

These outline the essential functions an e-invoice management system must have to meet user requirements.

- **User Authentication & Access Control**
    - If the company exists, then redirect to the Login Page.
    - If the company is new (to the e-invoice management system), then redirect to the company setup page for initial configuration.
    - Registration is not needed, as only admin can add users or additional admins.
    - Security features include user authentication.
    - Security features require users to generate a strong password for login that consists of a mix of characters, numbers, and symbols
- **Invoice Management**
    - The ability to create, modify, delete, or retrieve invoices.
    - The system automatically generates unique invoice numbers.
- **Payment Tracking**
    - Admin/Staff can manually update payment statuses (Paid, Pending, Overdue).
    - The ability to upload proof of payment.
- **Financial Reporting & Data Export**
    - Users (admin/staff) can generate reports on invoices.
    - Data can be exported in PDF/CSV format.

Non-Functional Requirements:

These specify system limitations and quality features to guarantee availability and dependability.

- **Performance, Usability & Accessibility**
    - SMEs with little technological expertise should be able to navigate the UI easily.
    - Duplicate invoice entries are appropriate to be avoided by the system.

While non-functional requirements ensure the system runs effectively, safely, and dependably, functional requirements specify what the system must perform. These specifications serve as a roadmap for the system's design and development, guaranteeing that it successfully satisfies SMEs' needs.

3.3 Product and Describe the Output

The context diagram (*Figure 3.2*) provides a high-level overview of the e-invoicing management system and illustrates how it interacts with external parties, including the company (admin), customer, and user (company staff). This diagram is the foundation for understanding the system's scope and design.

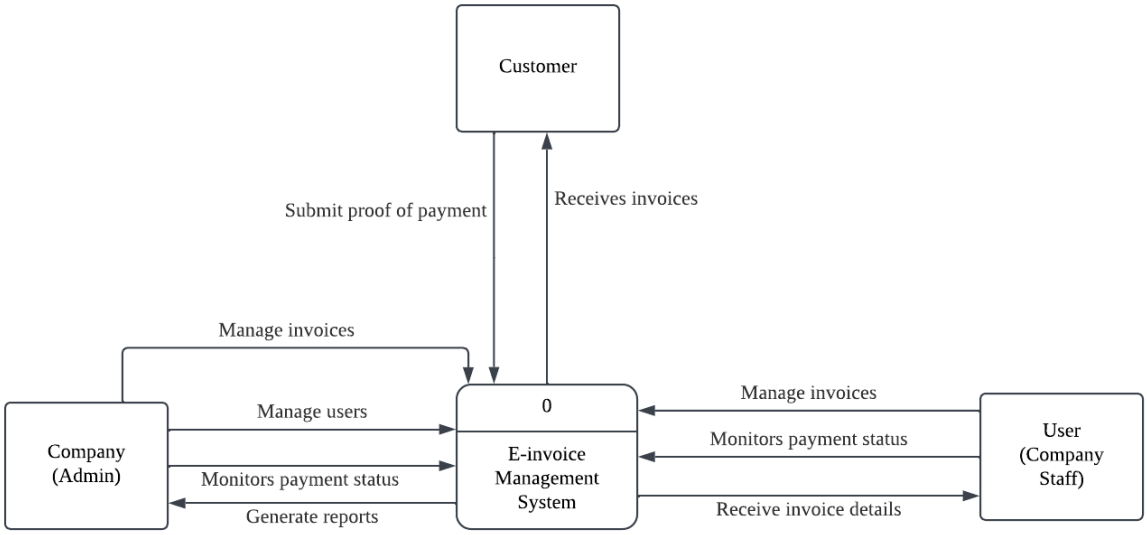

Figure 3.2: Context Diagram for the E-invoice Management System

The E-invoice Management System provides the following functionality:

Table 3.1: Entity with their functionality

Entity	**Functionality**

Company (Admin)	• **Login details**
	  ○ Enter username and password to log into the system.
	• **Manage users**
	  ○ User cannot register their account themselves.

	○ Only admin can add, edit, delete the user. ○ Admins handle user accounts, assigning roles. • **Manage invoices** ○ The system enables companies to: ▪ Create a new invoice. ▪ Read saved invoices. ▪ Update invoices. ▪ Delete invoices. • **Monitors Payment Status** ○ Checks whether invoices have been paid and update the system accordingly. • **Export data in PDF/CSV format** ○ The company can export data in PDF/CSV format for: ▪ Generate invoices, financial reports, or summaries for customers. ▪ Export invoice data.
User (Company Staff)	• **Manage invoices** ○ The system enables companies to: ▪ Create a new invoice. ▪ Read saved invoices. ▪ Update invoices. ▪ Delete invoices. • **Monitors Payment Status**

	○ Tracks payments and follows up on pending invoices • **Receives Invoice Details** ○ Access invoice information.
Customer	• **Submits Proof of Payment** ○ Customers sends proof of payment to the company's admins/staffs. The company staff/admin manually uploads the proof to the system. • **Receives Invoices** ○ Customers receive invoices generated by the company.

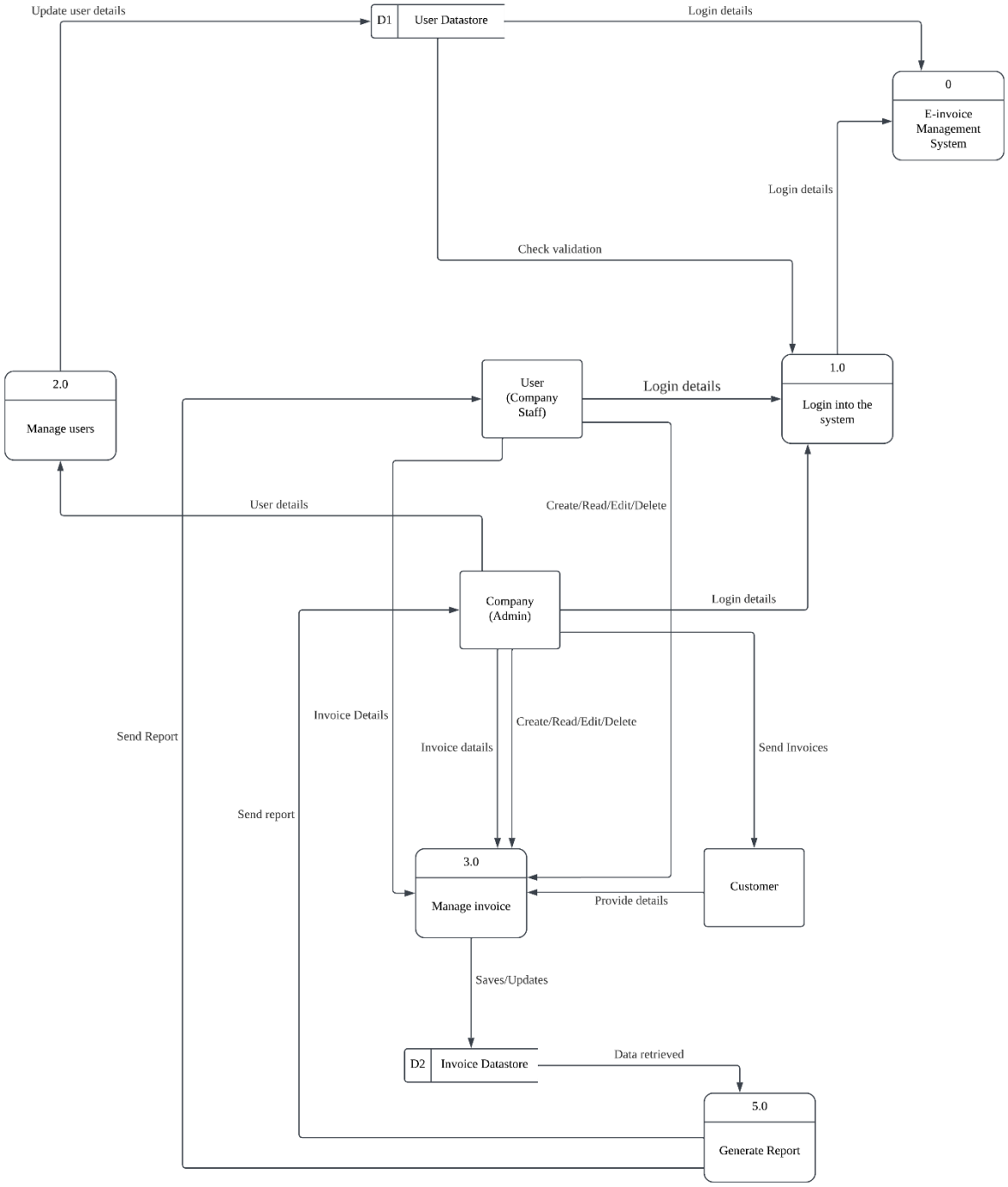

Figure 3.3: DFD Level 0 for the E-invoice Management System

The high-level data flow between external entities (users, customers), internal system activities, and data stores within the e-invoice management system is shown in Data Flow Diagram (DFD) Level 0 (*Figure 3.3*). To manage users, create and process invoices, confirm

payments, and generate reports, the system consists of several essential modules that work together.

The data flow diagram (DFD) illustrates how users—administrators and staff of the company—interact with the system through user management, login, and invoice-related tasks. Invoices are sent to customers, who then provide proof of payment. By consulting the user data store (D1), the login module confirms the user's credentials. Authorized users can access services like invoice management (process 3.0), report generating (process 5.0), and user administration (process 2.0) following a successful login. While employee or administrator-created or amended invoices are kept in the invoice data store (D2), administrator-managed user data is kept in the user data store.

Through external proof of payment, which staff and administrators review before changing the invoice status to "paid" or "pending," customers indirectly participate. Data about invoices and payments is retrieved from the invoice data storage to create reports. *Table 3.2* provide specifics about the two data stores that are involved: the user data store and the invoice data store.

Process Descriptions:

1. User Log In:
    a. The system uses the User Database to validate login credentials.
2. Invoice Creation:
    a. The admin/company staff enters customer details, and invoice details.
    b. The system stores the invoice in the invoice database.
3. Invoice Retrieval:
    a. Admin/company staff can view invoices stored in the database.

4. Proof of Payment Submission:
    a. Customers send proof of payment.
    b. The system stores the proof of payment in the database.
5. Invoice Status Update:
    a. The admin/company staff review the proof of payment.
    b. If valid, the invoice status is updated to “Paid”.
    c. If not valid, the invoice remains in “Pending” status.
6. Report Generation:
    a. The admin/company staff can generate reports.
    b. The system retrieves relevant invoice information from the database.

Table 3.2: Datastore with description

Data Store	Description
D1 User Datastore	• Store company(admin)/user info. • Admin can add more users to log into the system. • Only the admin can add/edit/delete users. • Essential information such as username and password to log into the system.
D2 Invoices Datastore	• Store invoice info.

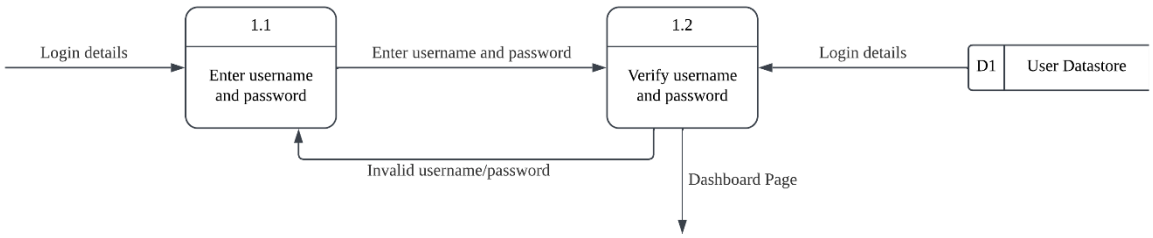

Figure 3.4: DFD Level 1 Process 1 for the E-invoice Management System

Figure 3.4 shows the company(admin)/user login process. Admin/company staff must enter their login details such as username and password to log into the system.

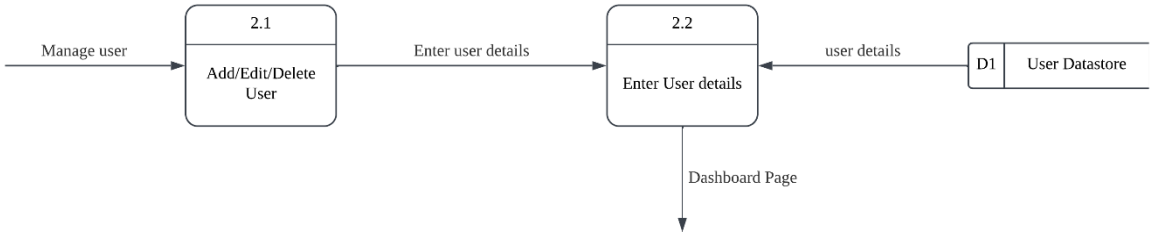

Figure 3.5: DFD Level 1 Process 2 for the E-invoice Management System

Figure 3.5 shows that the admin manages users. Only the admin can add, edit, or delete users. To log into the e-invoice management system. The system will check user details in the data store.

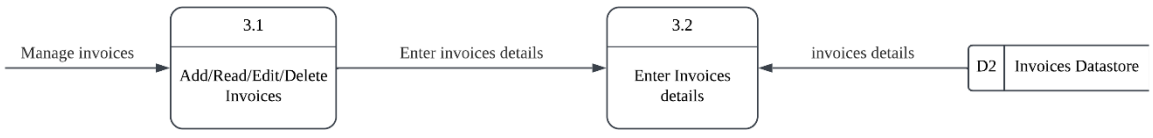

Figure 3.6: DFD Level 1 Process 3 for the E-invoice Management System

Figure 3.6 shows the process admin/staff manages the invoices.

- Customer

- Provide the invoice details that are used to create invoices.
- View invoice details.
- Process payment outside the system
- Request generated report.

- Company
  - Manage invoices (Create, Read, Update, Delete)
  - Export data in PDF/CSV format.
  - Update payment status after confirmation.

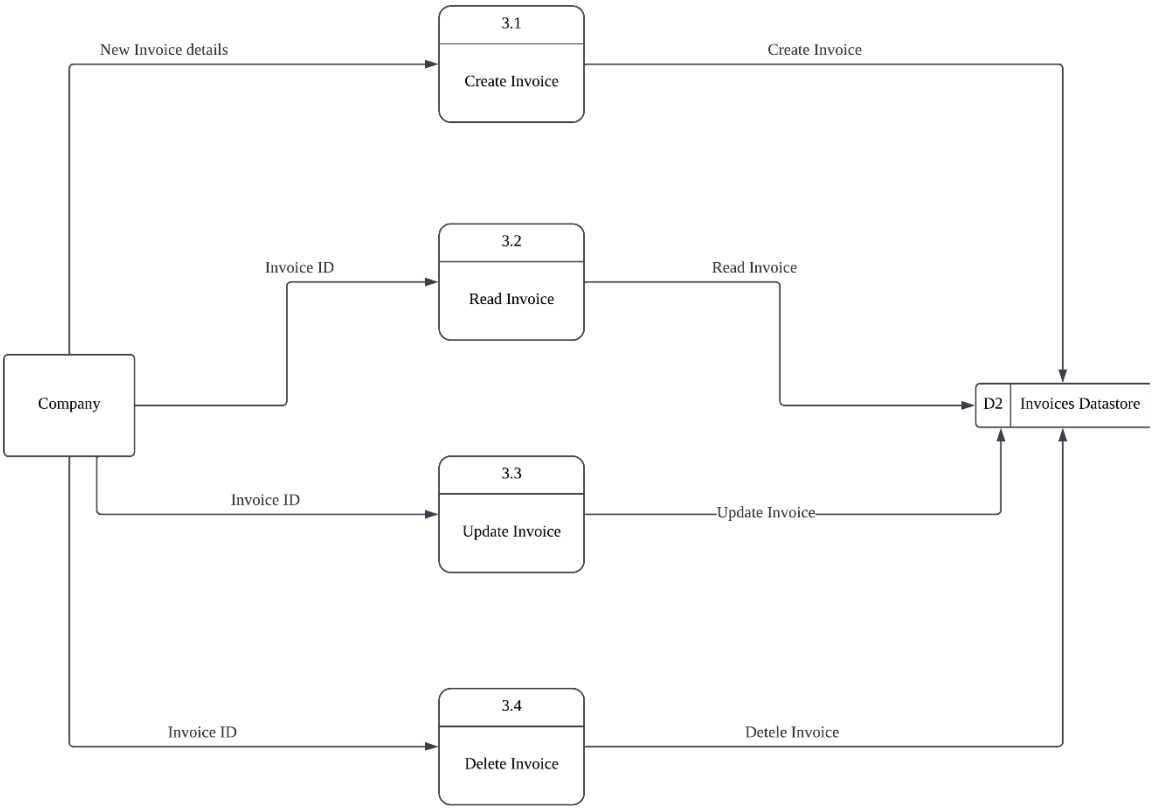

Figure 3.7: DFD Level 2 for the E-invoice Management System

The DFD Level 2 for the e-invoice management system's invoice module is displayed in *Figure 3.7*. The system's primary purpose, invoice management, is broken down into its

component CRUD (create, read, update, delete) actions. The graphic aids in illustrating the data processing between the invoice data storage area and company users by decomposing the process. An essential tool for system design verification and implementation, this diagram aids in understanding the system's core logic, data interaction, and functional needs.

- Create Invoice
    - Invoice details [customer name, invoice amount, payment status].
    - Validate input data for accuracy.
    - Generate a unique invoice ID.
    - Store the invoice in the invoice database.
- Read Invoice
    - Retrieve the requested invoice information from the invoice database.
    - Display requested invoice details.
- Update Invoice
    - Update existing invoices.
    - Existing invoice ID to identify the record for modification.
    - Retrieve the existing invoice from the invoice database.
    - Save the updated invoice in the invoice database.
- Delete Invoice
    - Request to delete invoice.
    - Remove the invoice from the invoice database.

3.4 Design

3.4.1 Architecture Design

- **Frontend (User Interface):** Where the admins/company staff interact with the system.
- **Backend (Laravel):** Manages user authentication and data operations.
- **Database (MySQL):** Stores users, invoices.
- **External system (Payment Gateway):** Payments are processed outside, and admins update payment statues manually.

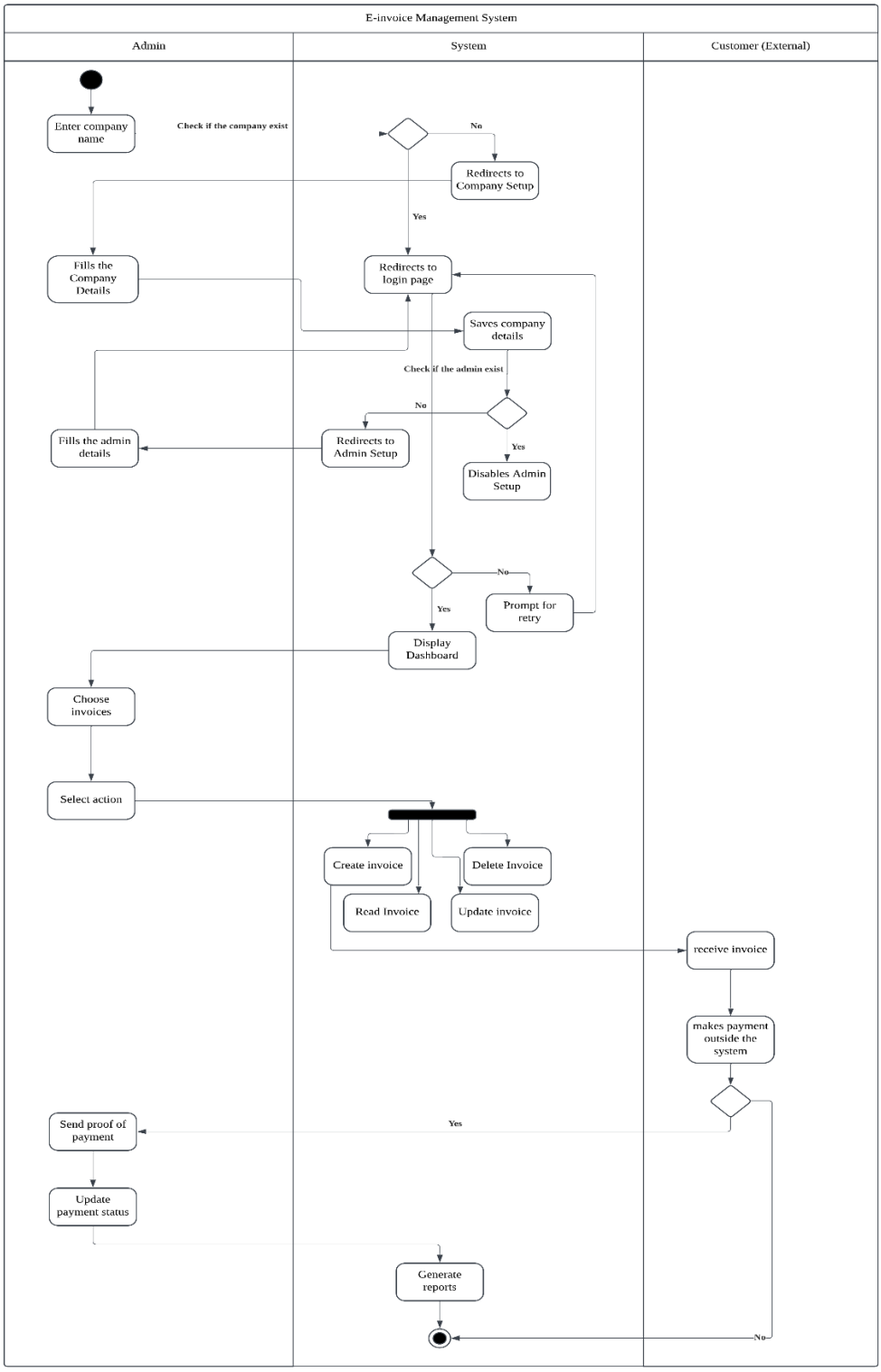

Figure 3.8: Activity diagram for E-invoice Management System

The workflows and procedures used in the e-invoice management system are shown in detail in *Figure 3.8*. From initial company establishment and invoice management to payment processing and report generation, the activity diagram shows how various roles—particularly administrators and external customers—interact with the system. By depicting the conditional flows, decision points, and sequential actions involved in a typical system use process, the diagram aids in understanding the system logic. This diagram confirms the system architecture's practical usability and aids the reader in understanding the functional requirements.

3.4.2 Algorithm Design

Table 3.3: Main System Workflow

Algorithm: Main System Workflow

Start
 	
Display “Welcome to E-Facturo”
 	
FUNCTION login():
 	
Input username, password
 	
IF valid credentials(username, password) then
 	
Display “Login Successfully”
 	
Return True
 	
ELSE
 	
Display “Invalid username or password”

```
            Return False

        END IF

END FUNCTION

FUNCTION display_dashboard():

        WHILE True DO

            Display “Invoice Management Option:”

            Display “1. Create Invoice 2. Read Invoice 3. Update Invoice 4. Delete Invoice
            5. Generate Report 6. Logout”

            Input option

            Process_option(option)

        END WHILE

END FUNCTION

FUNCTION process_option(option):

        SWITCH option

            Case “1”:

                create_invoice()

            Case “2”:

                read_invoice()

            Case “3”:
```

```
                update_invoice()

            Case “4”:

                delete_invoice()

            Case “5”:

                generate_report()

            Case “6”:

                logout()

            Default:

                Display “Invalid Option. Try Again.”

        END SWITCH

END FUNCTION

FUNCTION create_invoice():

        Display “Create New Invoice”

        Input Customer_Details

        If Invoice Details is NOT NULL THEN

            Save Invoice

            Set Invoice_Status = “Pending Payment”

            Send notification to company and customer
```

```
                Display “Invoice created successfully. Waiting for payment…”

        END IF

END FUNCTION

FUNCTION read_invoice():

        Input Invoice_ID

        Retrieve and display invoice

END FUNCTION

FUNCTION update_invoice()

        Input Invoice_ID

        Update Invoice Details

        Display “Invoice Updated Successfully”

END FUNCTION

FUNCTION delete_invoice()

        Input Invoice_ID

        Delete Invoice

        Display “Invoice Deleted Successfully”

END FUNCTION

FUNCTION generate_report():
```

```
        Generate Report

        Display “Report Generated Successfully”

END FUNCTION

FUNCTION update_payment_status():

        Input Invoice_ID

        Input New_Status (“Paid” or “Unpaid”)

        IF New_Status == “Paid” THEN

                Update Invoice_Status = “Paid”

                Display “Payment status updated to Paid”

        ELSE

                Display “Invoice remains unpaid”

        END IF

END FUNCTION

FUNCTION logout():

        Display “Thank you! You are logout from the system.”

        EXIT WHILE

END FUNCTION

//Start Execution
```

```
IF login() THEN
        display_dashboard()
END IF
Stop
```

3.4.3 UI Design

Since a draft of the proposed system's appearance, creating a mock-up is our responsibility during the implementation phase.

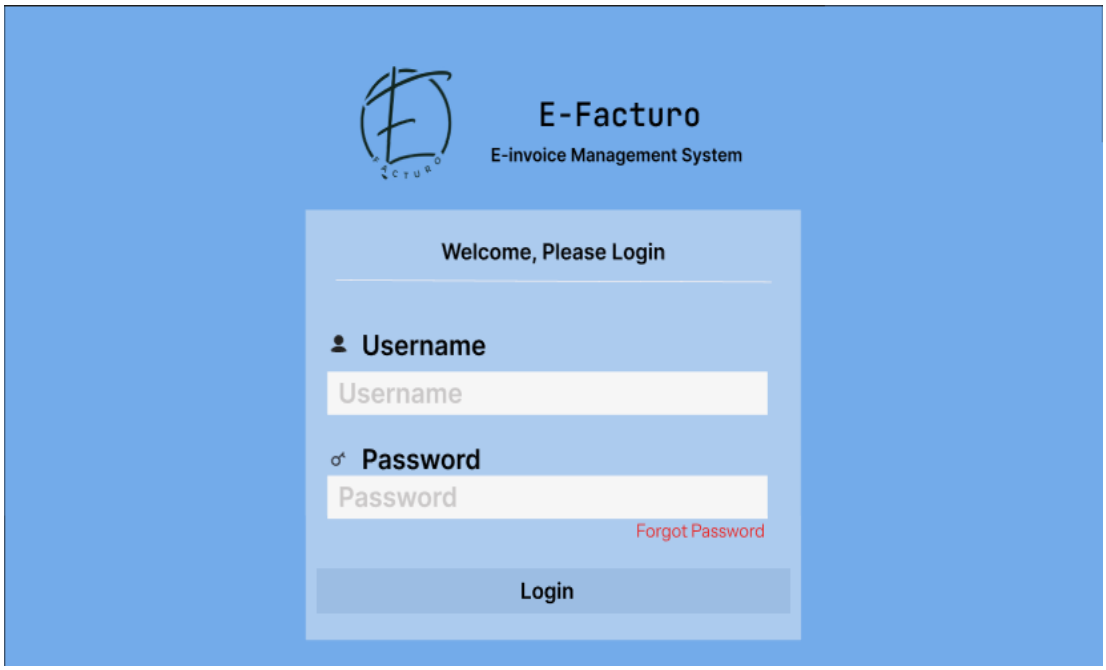

Figure 3.9: Login Page

When entering the E-Facturo, e-invoice management system, the company's admin/staff needs to log in using a username and password (*Figure 3.9*). In addition, if the admin/staff forgets the login information, there have the option to reset their password or username.

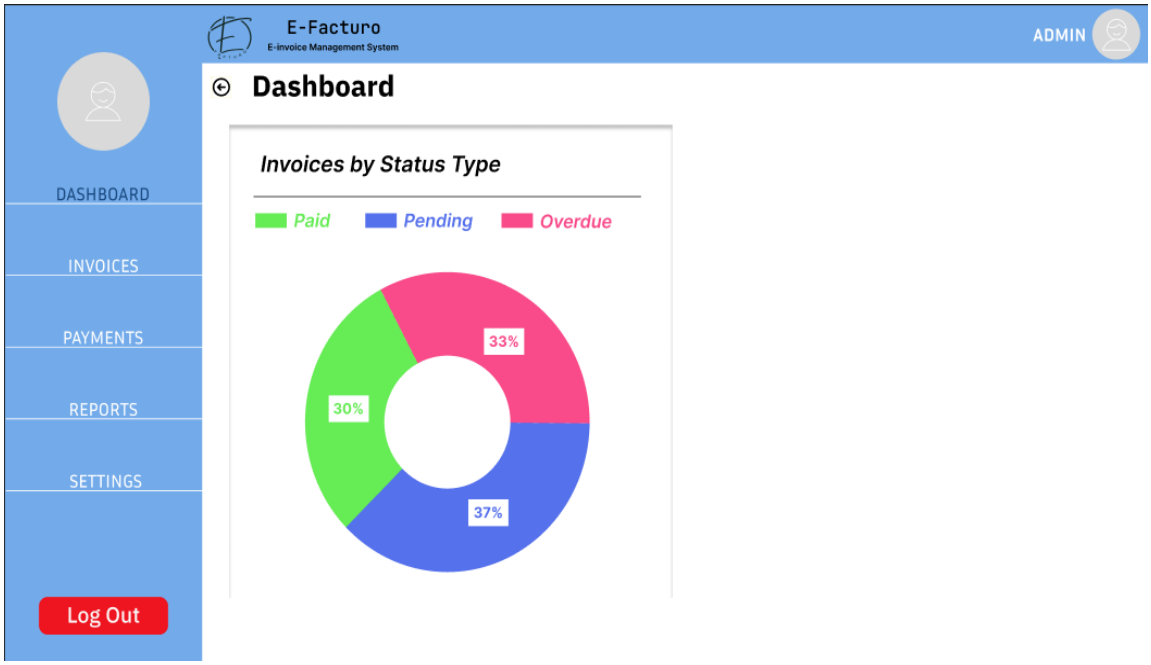

Figure 3.10: Dashboard Page

Figure 3.10 shows the dashboard page after the admin successfully logs into the system. As mentioned, only the admin can add and delete user accounts. Therefore, the user button will only appear when the admin logs into the system.

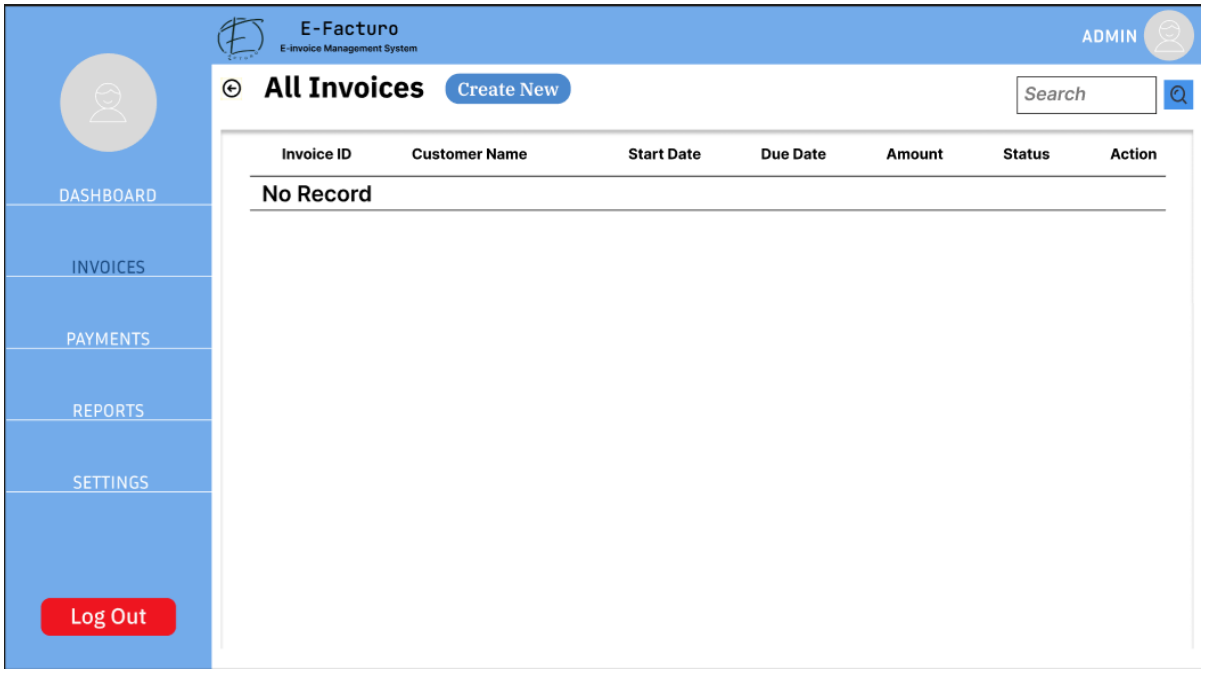

Figure 3.11: Invoice Page

The invoices page is displayed in *Figure 3.11*, where the users can click the "Create New" button to create a new invoice.

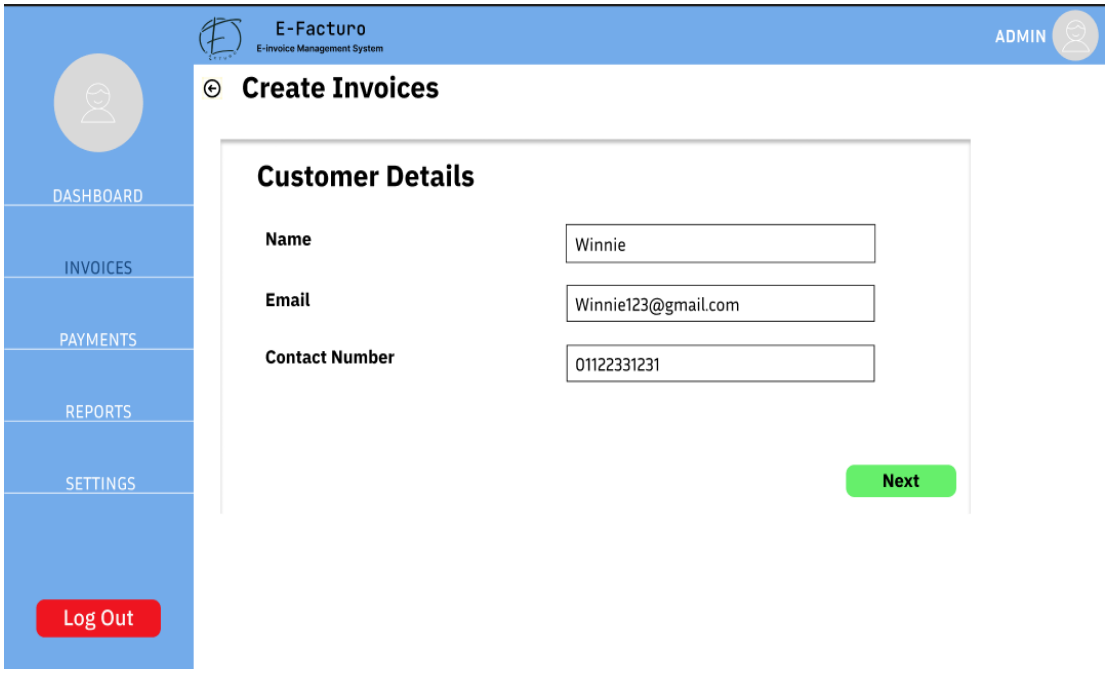

Figure 3.12: Invoice Page-Customer Details

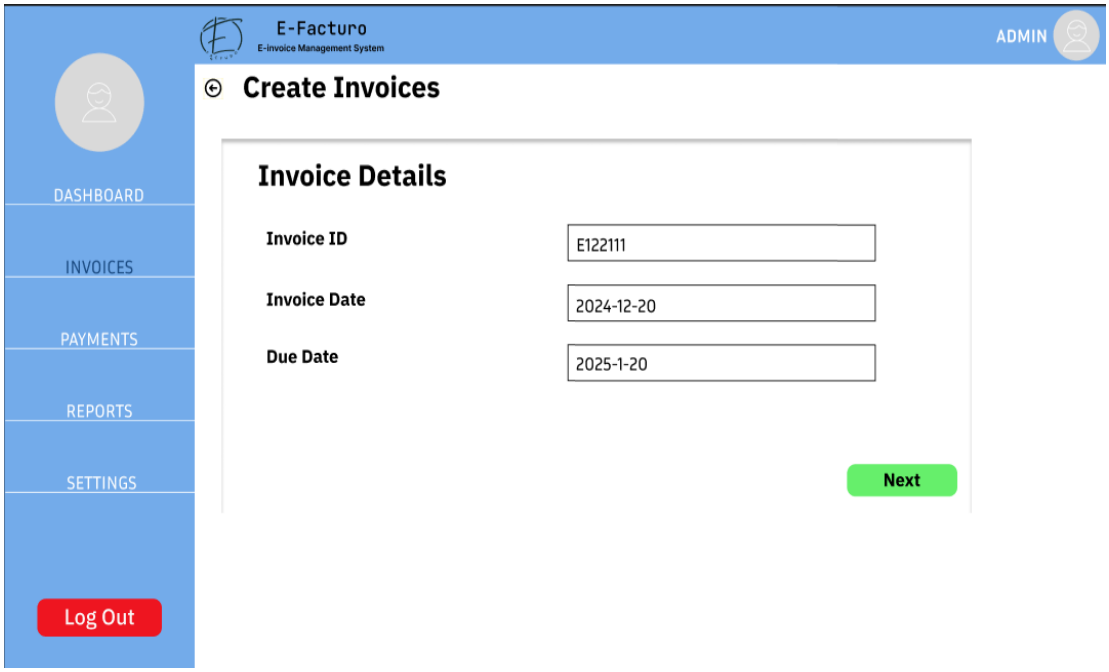

Figure 3.13: Invoice Page-Invoice Details

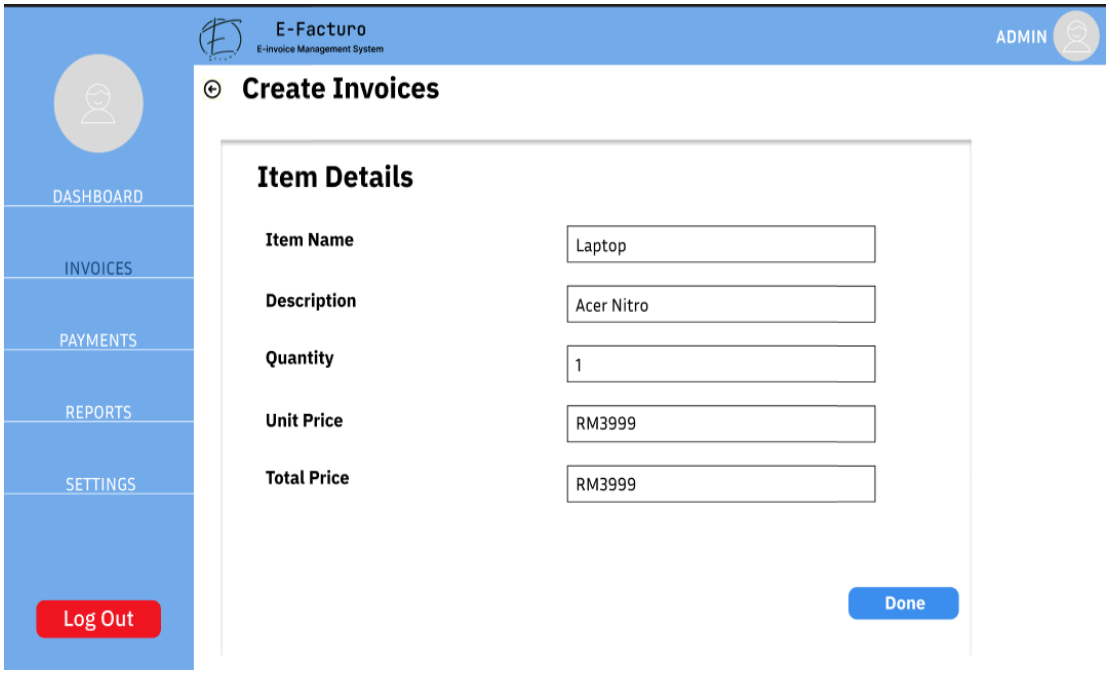

Figure 3.14: Invoice Page-Item Details

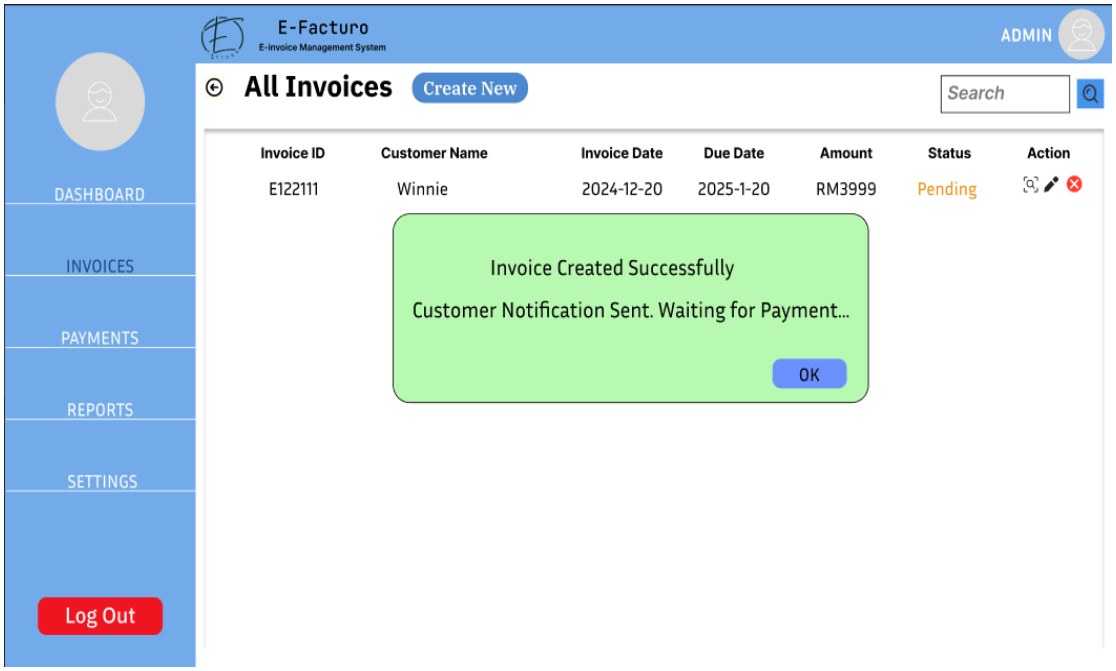

Figure 3.15: Invoice Page- Invoice created successfully

After selecting the " Create New " button, the user must enter the customer details, invoice details, and item details as indicated in figures 3.12, 3.13, and 3.14. Then, click “Done” to save the invoice. A pop-up notice will appear after the invoice is successfully created (*Figure 3.15*).

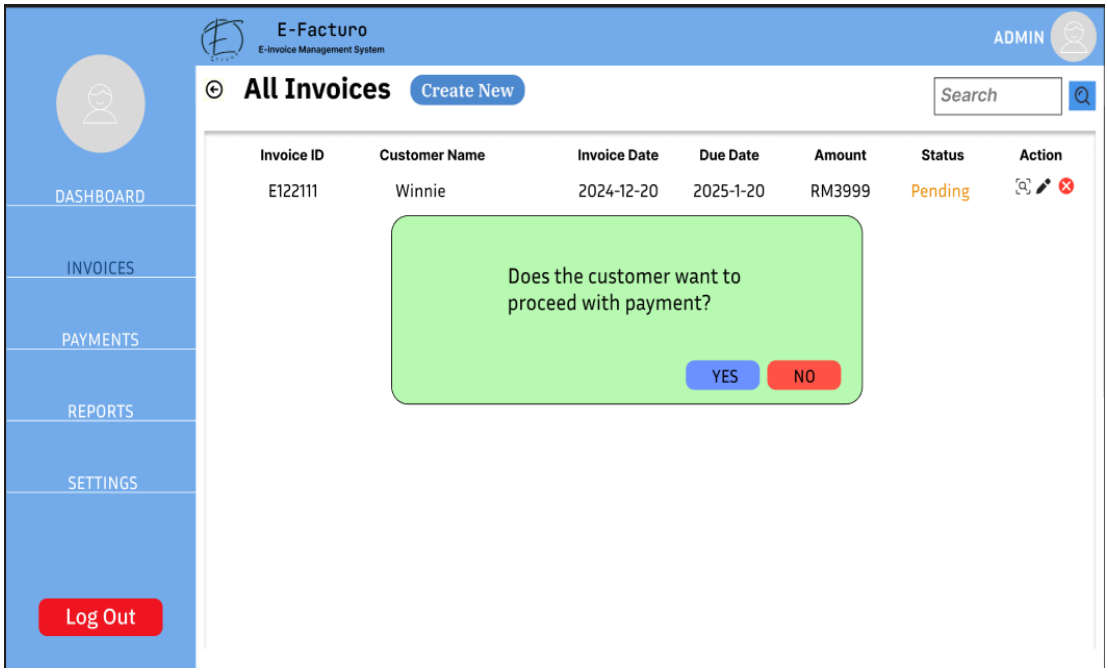

Figure 3.16: Invoice Page- Ask Customer about Proceed Payment

The invoice page asking the customer if the customer wishes to proceed with the payment is displayed in *Figure 3.16*. The customer will receive an email containing a bank account detail that allows them to continue with the payment process.

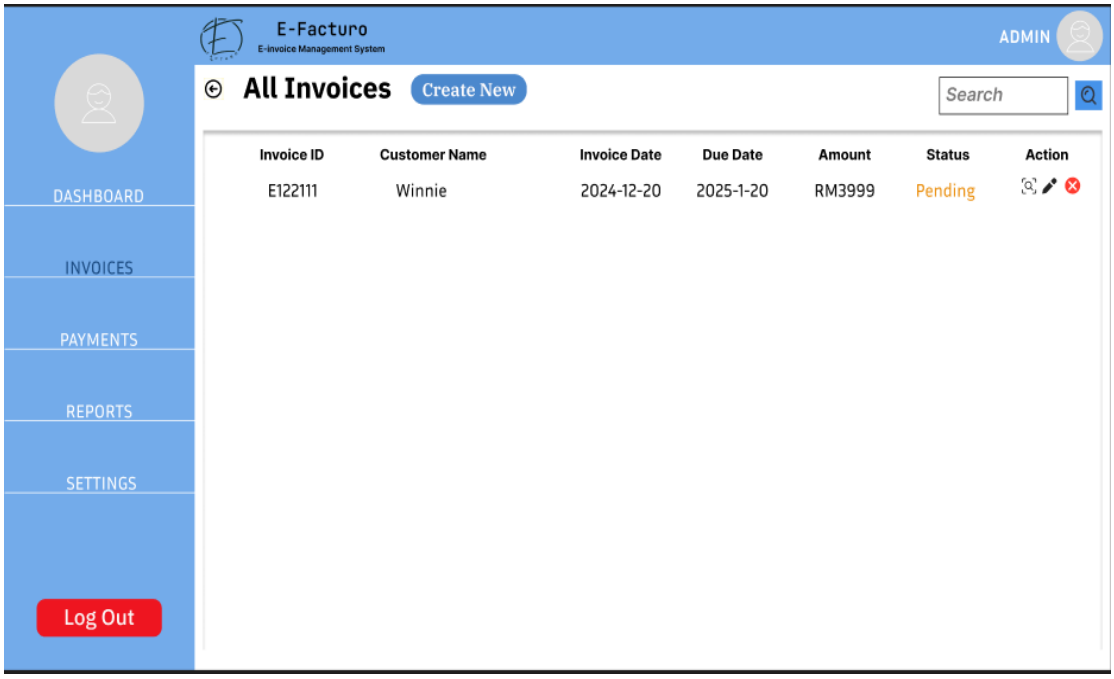

Figure 3.17: Invoice Page

Figure 3.17 shows the Invoice Page with invoice lists after the invoice was created successfully.

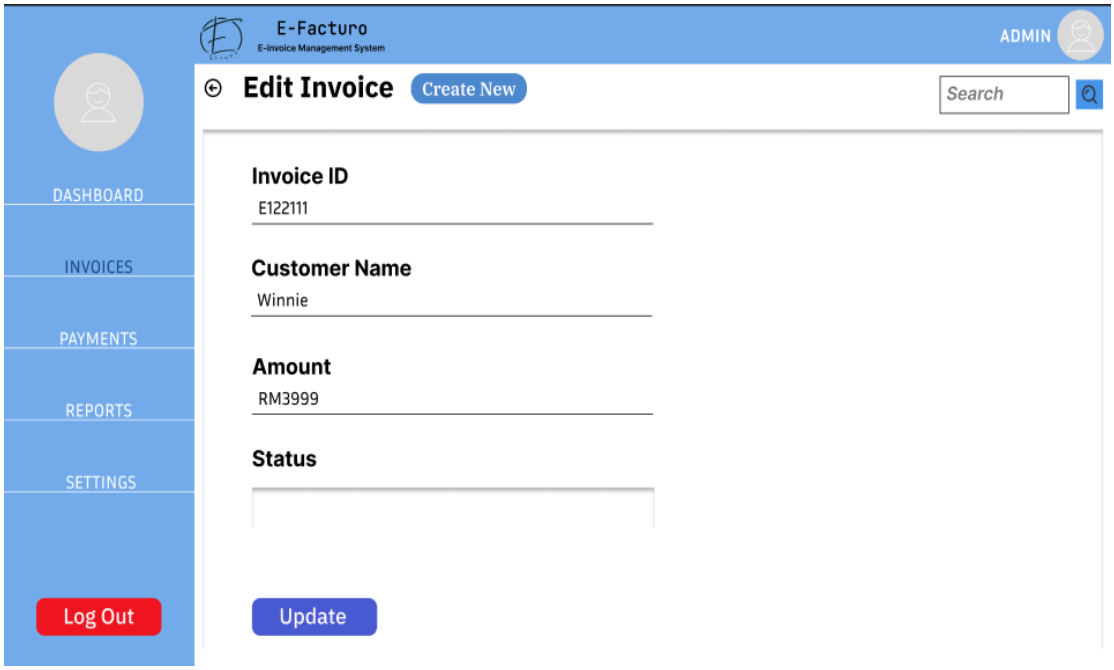

Figure 3.18: Edit Page

If the user wants to change the invoices' information, the edit page containing the "Update" option to alter the invoices' data is displayed in *Figure 3.18*. Since the invoice ID is automatically generated, it cannot be changed.

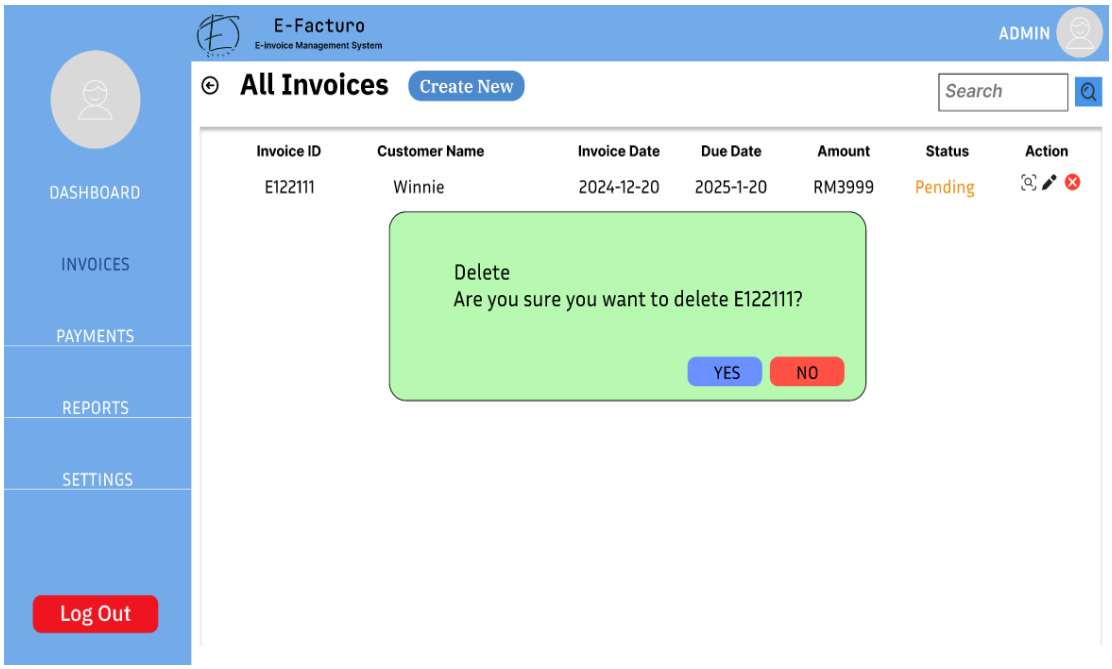

Figure 3.19: Delete page

If the user wants to remove the invoices, the delete page containing the "delete" option to remove the invoices' data is displayed in *Figure 3.19*. The invoice will be permanently erased if the user does not acknowledge the pop-up notice that asks, "Are you sure you want to delete?"

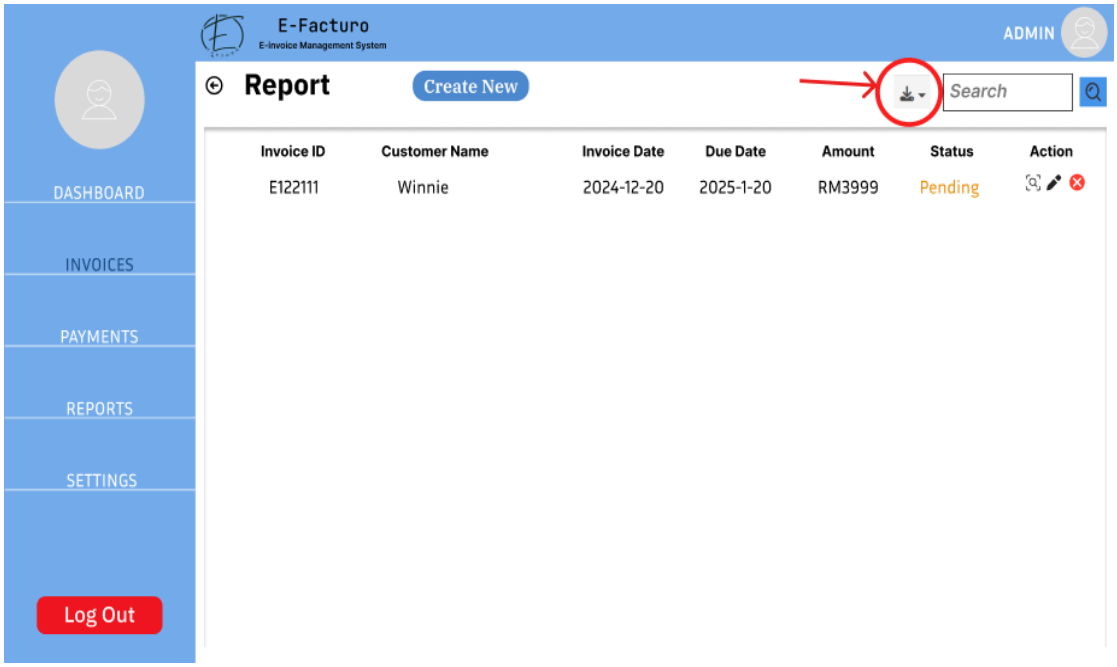

Figure 3.20: Report Page

To convert a report to PDF/CSV format, the user can click the “export” button in the red circle (*Figure 3.20*).

3.4.4 Database Design

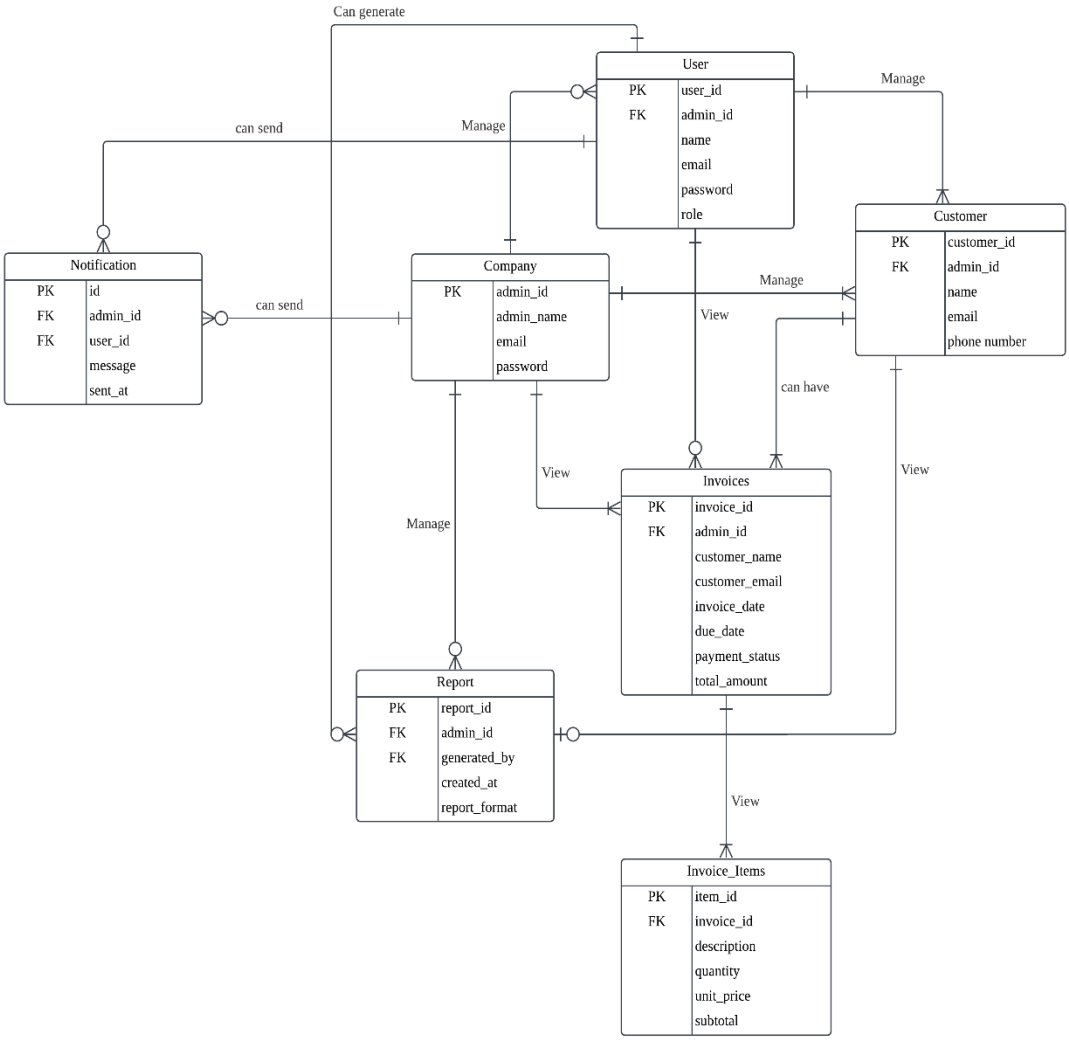

Figure 3.21: Entity Relationship Diagram

1. User Authentication:
    a. The Admin and Company staff can create and manage invoices.
2. Invoice Management:
    a. Each invoice belongs to one customer.
    b. An invoice has attributes such as invoice_id, due_date, total_amount, payment_status (Paid, Pending, Overdue).

3. Proof Submission:
    a. The admin/company staff reviews the payment and updates the invoice status.
4. Notification & Reports:
    a. The Notification table tracks system alerts for users.
    b. The Report table stores generated reports.

3.5 System Architecture

The presentation layer, business logic layer, and data layer are separated in the three-tier design of the e-invoice management system used by small and medium-sized businesses. The system's security, scalability, and maintainability are all enhanced by the modular architecture.

3.5.1 Presentation Layer

The system's user interface is the presentation layer. It is in charge of informing the user and recording their interactions, including form submission and page navigation.

- Technologies Used:
    - HTML, CSS, JavaScript
    - Bootstrap 5 for responsive design
    - Laravel Blade templating engine
    - Vite for frontend asset bundling and fast reloads.
- User Roles Served:
    - Administrator: Full access to all invoices
    - Staff: Access to invoice, payment, and report page.

With reliable navigation and user feedback tools (such as success/error messages, modals, and alarms), this layer guarantees that the end user has an easy-to-use and effective experience.

3.5.2 Business Logic Layer

The Model-View-Controller (MVC) architecture of Laravel is used to implement the business logic layer. All business rules, input validation, user role management, and database interaction are managed by this layer.

- Technologies Used:
    - Laravel 10 Framework (PHP 8.2)
    - Middleware for route protection and multi-tenant filtering.
- Function Implemented:
    - User authentication and role-based redirection.
    - Company verification and setup logic.
    - Invoice ID auto-generation.
    - Report generation logic with filter application and export handling.

This layer serves as the system's main decision-maker and workflow generator.

3.5.3 Data Storage Layer

All application data must be stored in a secure, organized fashion by the data storage layer. The paradigm used for its implementation is a relational database.

- Database Used:
    - MySQL
- Key Tables:
    - companies: Stores company registration info.
    - company_users: Stores user credentials and roles.
    - invoices: Contains invoice headers (invoice ID, dates, customer info, total)
    - invoice_items: Linked to invoices, stores item details.
    - payments: Stores uploaded proof of payment and status.
    - permissions: Supports role-based access control.

3.6 Summary

An e-invoice management system for SMEs called E-Facturo was designed and analyzed using an organized approach described in this chapter. The requirements were gathered, verified, and organized into manageable parts using the modified waterfall methodology. The data flow diagrams (DFDs) provided a comprehensive perspective of the system's processes, while the design artifacts assured a robust and user-friendly solution. These combined efforts are essential for E-Facturo's deployment and success.

CHAPTER 4 IMPLEMENTATION AND TESTING

4.1 Introduction

XAMPP was used as a local development server, and the Laravel PHP framework was used to create the e-invoice management system on a Windows 10 system. Session-based authentication was implemented using Laravel, and the database used MySQL. Git for version management and Visual Studio Code were all part of the development environment.

This chapter overviews the e-invoice management system's implementation environment, tools, and procedures. It also covers the system architecture, module implementation, hardware and software requirements, installation and setup, and interface design.

The following environment and tools are used in the development of the e-invoice management system:

- **Operating System:** Windows 10
- **Programming Language:** PHP 8.2
- **Framework:** Laravel 10 with Laravel Breeze (for authentication)
- **Database:** MySQL (via phpMyAdmin in XAMPP)
- **Frontend Design:** HTML, CSS, Bootstrap
- **Special Logic Implemented:**
    - Auto-generation of invoice ID
    - Role-based access control system (Administrator, Staff)

Table 4.1: Implementation Environment

Tool	Description
Windows 10	Operating system for development and testing
XAMPP	Bundled Apache server, PHP interpreter, and MySQL database server
Laravel	PHP framework for building web applications
Composer	PHP package manager to install Laravel dependencies
Visual Studio Code	Source code editor with Laravel-friendly extensions
Git (GitHub)	Version control tool for code management and collaboration
Laravel Breeze	Lightweight Laravel package for session-based authentication
Node.js and npm	Required for compiling frontend assets using Laravel Mix
DomPDF	Used to generate invoices and reports as PDF documents

4.2 Steps to Run and Execute the E-Invoice Management System

The e-invoice management system must be correctly installed, configured, and operational to access the welcome page. Two methods of running the system are described in this section: (1) locally, with XAMPP and Composer for development/testing; and (2) live deployment in a production environment with Hostinger.

4.2.1 Local Development Setup Using XAMPP and Composer

The Windows 10 operating system, which supports all required development tools, was used to create and test the suggested e-invoice management system. The system utilizes XAMPP, a local development environment that provides PHP, MySQL, and Apache, the web server and database required to run Laravel applications. Composer is also used to manage PHP packages and dependencies that Laravel needs.

The system is hosted on Hostinger, a reputable web hosting service that supports Laravel. It is configured with the correct database and environment settings to ensure smooth operation, and it can be accessed through a custom domain name.

Users, developers, or reviewers can download, test, or expand the application using the system's whole source code, which is accessible on GitHub.

Step 1: Install Required Software

To begin, ensure the following software is installed:

1. XAMPP (to provide Apache and MySQL)
    - Download: https://www.apachefriends.org/
2. Composer (for PHP dependency management)
    - Download: https://getcomposer.org/
3. Node.js and NPM (Required for Laravel Mix frontend assets)
    - Download: https://nodejs.org/
4. Visual Studio Code (VSC) -Code editor
    - Download: https://code.visualstudio.com/

Step 2: Download the Project Source Code

1. Clone the project repository (access permissions must be granted) or download the ZIP file after being added as a collaborator.
2. Place the project folder (e.g., e-invoicemanagementsystem_fyp2) into C:\xampp\htdocs.
3. **Note:** If access to the GitHub repository is not available, users can download the source code and the database SQL file from the Google Drive link: https://drive.google.com/file/d/1hb-2hwGO4oGeS39rd6vSKL5VrlPFBnFW/view?usp=sharing

    After downloading:

    1. Extract the project folder into C:\xampp\htdocs.
    2. Import the database file using phpMyAdmin by the standard database import steps.

Step 3: Install Composer Dependencies

1. Open Command Prompt, navigate to the project directory: `cd C:\xampp\htdocs\e-invoicemanagementsystem_fyp2`
2. Run command: `composer install`

Step 4: Configure the .env File

1. Copy .env.example and rename it to .env .
2. Update the database credentials:

```
DB_CONNECTION=mysql
DB_HOST=127.0.0.1
DB_PORT=3306
DB_DATABASE=e-invoicemanagementsystem_fyp2
DB_USERNAME=root
DB_PASSWORD=
```

Figure 4.1: .env laravel file database credentials

Step 5: Create and Import the Local Database

1. Access http://localhost/phpmyadmin/
2. Create a new database named `e-invoicemanagementsystem_fyp2`.
3. Click the Import tab
4. Upload `e-invoicemanagementsystem_fyp2.sql`.
5. Click Go to complete the import.

Step 6: Run Laravel Migrations

Run command: `php artisan migrate`

Step 7: Generate Application Key

Run command: `php artisan key:generate`

Step 8: Compile Frontend Assets Using NPM

1. Open the project in Visual Studio Code (VSC), then run: `npm install`
2. After install, then run: `npm run dev`

Step 9: Start the Laravel Development Server

1. Run command: `php artisan serve`
2. Navigate to http://127.0.0.1:8000 to view the system.

Step 10: Access the Welcome Page

The **Welcome Page (Figure 4.2)** will be displayed as the entry point for all users.

4.2.2 Production Deployment on Hostinger

The e-invoice management system is made publicly accessible by deploying it on Hostinger with a custom domain.

Step 1: Upload Project Files

1. Log in to Hostinger File Manager.
2. Upload .zip files to the public_html directory.

Step 2: Configure the public Directory

1. Move all files in the public folder into public_html.
2. Update index.php code.

Step 3: Set up the .env file

- Create a .env file in the root folder.
    - APP_URL=https://yourdomain.com
    - DB_CONNECTION=mysql
    - DB_HOST=localhost
    - DB_DATABASE=production_db
    - DB_USERNAME=production_user
    - DB_PASSWORD=secure_password

Step 4: Create a MySQL Database

1. Go to Hostinger, and redirect to Database>phpMyAdmin.
2. Create a database.

Step 5: Run Migrations (via SSH)

Use SSH terminal to run: php artisan migrate

Step 6: Access the Live Site

Visit: https://salmon-woodcock-261585.hostingersite.com/

The **Welcome Page (Figure 4.2)** will be displayed as the entry point for all users.

4.3 User Guide

4.3.1 Welcome Page

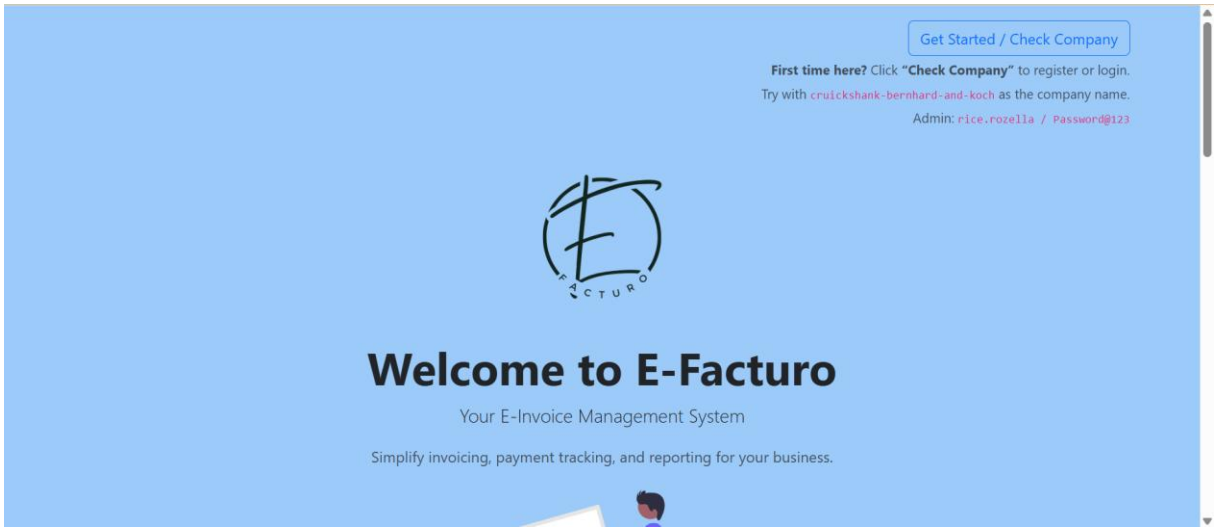

Figure 4.2: Welcome Page

The e-invoice management system's Welcome page (*Figure 4.2*) serves as the first point of access. Depending on the user's needs and level of access, this page is designed to greet users and provide straightforward navigation options. Since several roles (such as staff or administrators) may utilize the system, the Welcome page serves as a single point of entry for all users (staff or administrators).

First-time user guide:

If a first-time user:

- Click the "Check Company" button (top-right) to verify if the company exists in the system.
- If the company exists in the system, the system will proceed to the login page.
    - If the company does not exist, the system will proceed to the company setup page and create the first administrator account.

If already have an account:

- Simply click the check company button (top-right), enter the company name, then will redirect to the login page, and enter valid credentials to access the system.

4.3.2 Check Company Page

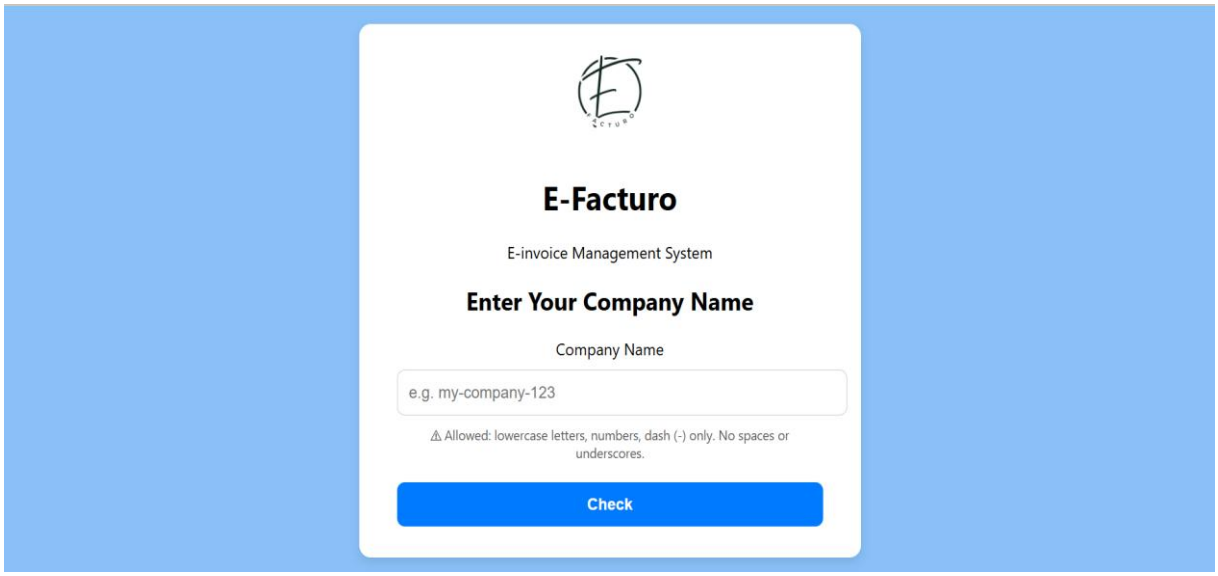

Figure 4.3: Check Company Page

Any user (staff or administrator) attempting to access the system must first navigate to the Check Company page (*Figure 4.3*). Since this e-invoice management system is designed for use by multiple businesses, it is essential to ensure that users are properly matched with their respective organizations and that corporate data is kept secure and distinct.

Purpose of this page:

- To verify whether the company that the user (staff or administrator) wants to access already exists in the database.
- To guide the user (staff or administrator) to the next step:

- If the company exists in the database, the user proceeds to the login page.
- If the company does not exist, the user will proceed to the company setup page.

How the Page Works:

When the user first accesses the system:

1. **Input Field:**

   The page will display a simple form where the user is required to enter their Company Name to check its existence.

2. **Validation and Search:**

   Once the user submits the company name:

   - The system performs a search in the backend database to check if the company name entered exists.
   - The search is case-insensitive but requires accurate company spelling to avoid confusion.

3. **Results & Navigation:**

   - **If the Company Exists:**
     - The system confirms that the company exists and automatically redirects the user to the Login Page, where the user can enter their credentials.
   - **If the Company Does Not Exist:**
     - The system will be assumed as a new company.
     - The user will be redirected to the Company Setup Page, where the user can register the company and create the first administrator account.

4. **Automatic Company Isolation:**

   The system first determines the company to ensure that:

- Any following users will be associated with the appropriate company.
- The data of every company is safely segregated, even if it is kept in the same shared database (multi-tenant design).

Importance for First-Time Users

For new users (administrators) who are configuring the system for their company:

- **First Setup:**
  - The administrator will be provided with step-by-step instructions to complete their company details and create an administrator account if their company has not been previously registered in the system.
- **Returning Users:**
  - If the company is already registered, the user (administrator/staff) will be directed straight to the login page without any unnecessary steps.

Why is this page important?

- Prevents data overlap between companies.
- Since users (administrators/staff) are prevented from inadvertently registering multiple companies, this lessens the administrative load.
- Isolating company data helps to ensure data integrity and system security.
- Automate the process of user onboarding by identifying the appropriate flow.

4.3.3 Company Setup Page

Figure 4.4: Company Setup Page

The first required setup page, the Company Setup Page (Figure 4.4), is displayed by the system when it determines that there is no company record in the system database. During the initial system setup process, this page is crucial, particularly for newly registered or first-time companies. The user will be unable to utilize the system further if they do not complete this page.

Purpose of the Company Setup Page

The purpose of this page is to record and capture essential company data that will be used for identification, reporting, and invoicing across the system. Each business operates in a separate environment because this e-invoice management system is designed to accommodate multiple companies (multi-tenant structure). The data of each firm is therefore properly registered and separated from other company data in the system, thanks to these settings page.

When is This Page Displayed?

- When you initially visit the system after installation or when there isn't a company record in the database, this page is automatically displayed.
- This page will only be visible to users (administrators) who are configuring the system for the first time.
- Regular users (administrator/Staff) will be taken to the login page instead of seeing this page after the setup is completed.

How Users Should Use This Page (Step-by-Step Guide)

1. For the first time, the user (administrator) logs into the system.
2. The system checks if the company data exists:
    a. If no company data is found, the user (administrator) is automatically redirected to the Company Setup Page.
    b. If the company data is found, the user (administrator/staff) will be redirected to the login page.
3. The user (administrator) fills in all the required fields with correct company information.
4. After filling all fields, the user clicks Save Company.
5. Upon successful submission:
    a. The company information is stored in the system.
    b. The user(administrator) is redirected to create the primary administrator account (the first administrator) user who will manage the system.

After administrator creation, the normal login flow will apply for the user who belongs to the registered company.

4.3.4 Login Page

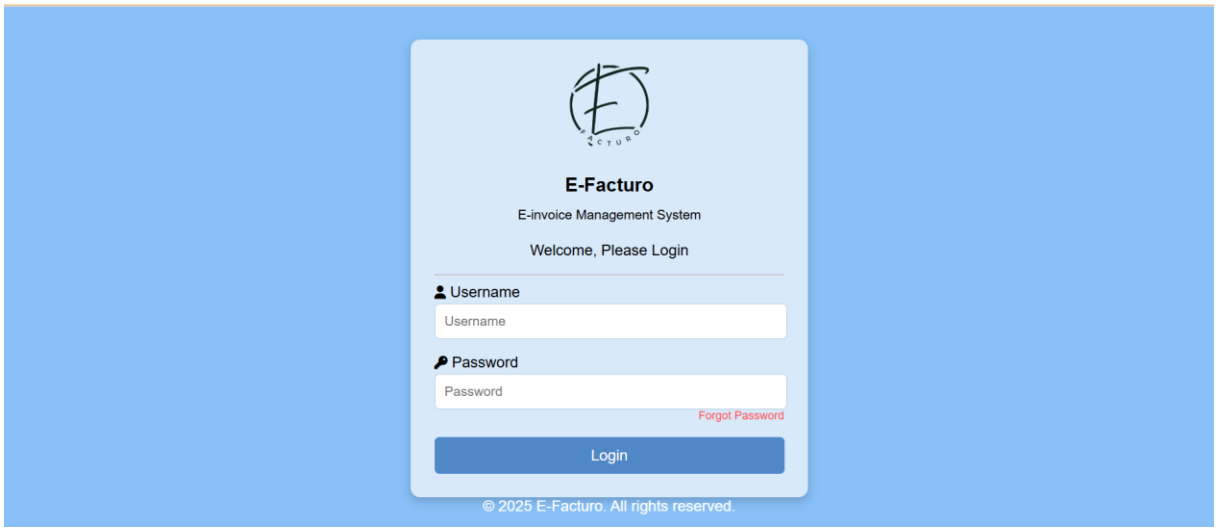

Figure 4.5: Login Page

All users can access the e-invoice management system primarily through the login page (Figure 4.5). This page ensures that only authorized users with valid login credentials can access company data and enter the system. Since the system employs role-based access control, after a successful login, different users (administrators, staff) will have access to varying functionalities.

User Guidance for First-time Users (administrators/staff)

- Ensure your system administrator has created your account and that you are registered.
- Use the "Forgot Password" option or seek assistance from your system administrator if you continue to experience issues logging in.

Importance of Login Page in the System

One essential component of the e-invoice management system is the login page. Without proper authentication, the system may be vulnerable to unauthorized access or data breaches. This page ensures:

- Company data privacy
- Accurate role separation
- Secure access to the system

4.3.5 Dashboard Page

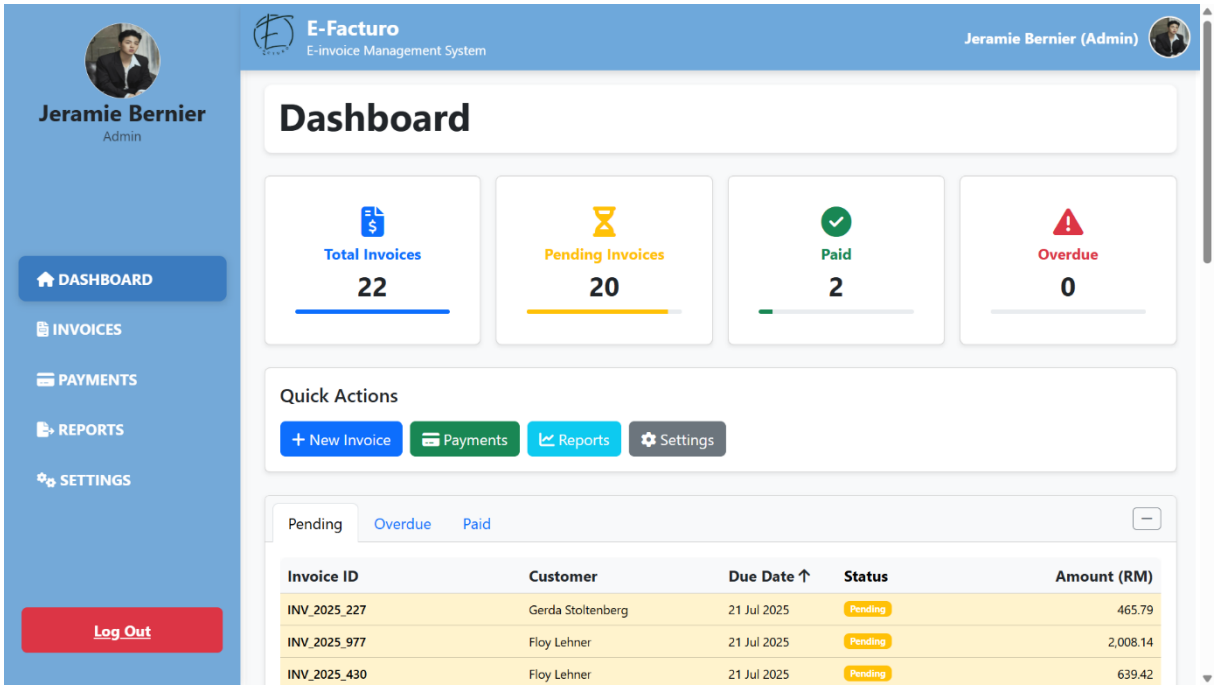

Figure 4.6: Dashboard Page

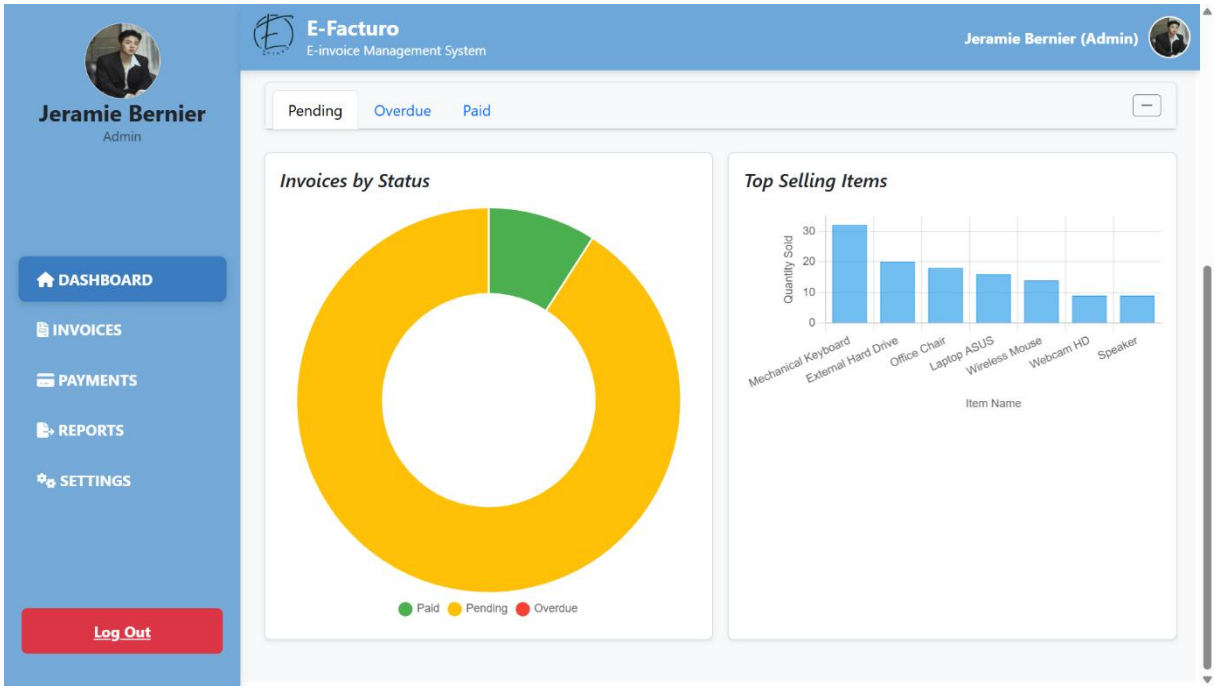

Figure 4.7: Dashboard Page (Chart)

Once the user has successfully logged into the e-invoice management system, they are directed to the dashboard page (*Figure 4.6*). Its primary purpose is to give a thorough and instantaneous summary of the company's invoice and payment operations. For first-time users or company administrators who need to swiftly access the primary features of the system and the current financial situation, the page is straightforward, easy to use, and packed with useful information.

1. Summary Cards

The dashboard's top contains summary cards that display the invoicing system's current state. These cards provide users with a summary of the system's main performance indicators:

- **Total Invoices:**

  Shows the overall quantity of invoices produced by the system. This enables users to keep an eye on all invoice activity.

- **Pending Invoices:**

  Shows the quantity of bills that have not yet been paid. This makes it easier for users (administrators/staff) to keep track of how many customers still owe money.

- **Paid:**

  Shows the total number of bills that the system has confirmed have been fully paid. This guarantees the crediting of revenue.

- **Overdue:**

  Shows the total number of bills that need to be paid in full. This enables businesses to identify past-due customers and take the appropriate action promptly.

Users (administrators/staff) can quickly assess their company's financial health, as each card is automatically updated with the current status of every invoice in the system.

2. Quick Action Buttons

A row of quick action buttons beneath the summary card allows users to bypass many menus and go straight to the system's primary functional modules:

- **New Invoice:**

  To rapidly create fresh invoices for customers, direct the user(administrator/staff) to the invoice creation form.

- **Payments:**

  Takes the user (administrator/staff) to the payment management page, where they may monitor their payment history, upload proof of payment, and check the status of their payment.

- **Reports:**

  Users can create comprehensive financial reports, apply filters, and export reports to PDF or Excel format for additional analysis by opening the Reporting module.

- **Settings:**

  Enables authorized users (often administrators) to modify system settings, tax rates, user access limits, and corporate information by opening the System Settings page.

The conspicuous placement of these fast actions reduces navigation time and boosts user productivity.

3. Graphical Data Visualization

The dashboard (*Figure 4.7*) has interactive charts to further assist customers in quickly understanding system activity:

- **Invoices by Status (Donut Chart):**

  The distribution of invoices by their current status—paid, pending, or past due—is visually represented in this chart. It helps users identify problem areas that require attention and understand trends.

- **Top Selling Items (Bar Chart):**

  The most popular items sold to all customers are displayed in the bar chart above. It helps business owners determine which products are in high demand by offering insights into top-performing items. Planning successful sales campaigns, enhancing product offerings, and optimizing inventories all benefit from this knowledge.

4. Sorting Function

The dashboard page now includes a new sorting tool to improve usability and data engagement. Users can utilize this feature to organize invoice records by criteria like amount, status, and due date. Accessibility to data and decision-making efficiency are boosted by allowing users to view invoice data in either descending or ascending order. When managing a large number of invoices, the sorting feature proves to be very helpful.

5. Purpose of Dashboard

The dashboard page's primary function is to serve as the command center for the e-invoice management system. It benefits users:

- Monitor key invoicing and payment metrics in real-time.
- Quickly access essential modules for invoicing, payment processing, reporting, and system settings.
- Visualize business performance through easy-to-understand charts.
- Based on the given summary and graphical data, make data-driven judgments.

For first-time users, the Dashboard Page is designed to be intuitive:

- Summary Cards give immediate system status.
- Quick Actions allow for fast navigation.
- Graphs provide company insights without requiring deep financial expertise.

In summary, the dashboard serves as a navigation and reporting tool, ensuring users always have complete visibility and control over their business's invoicing activities upon login.

4.3.6 Invoice Page

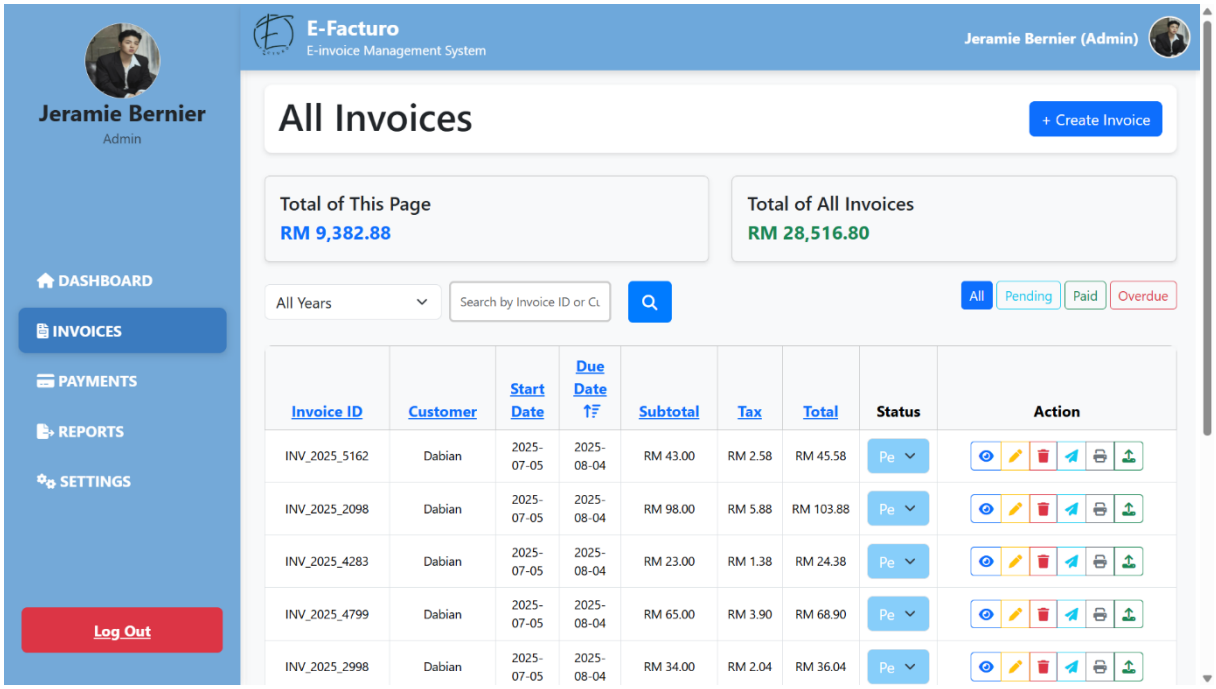

Figure 4.8: Invoice Page

Users can view, manage, and track all system invoices through the Invoice Index page (Figure 4.8). Only authorized individuals (such as administrators and staff members of the company) who have been given authority to manage invoices can access this page.

Purpose of the Page

This page's primary goal is to provide the user with an exhaustive and well-organized list of all invoices generated within the system. It acts as a focal point where users can:

- View the current status of the invoices
- Access detailed information for each invoice.
- Perform actions such as viewing, editing, or deleting invoices.
- Filter and search for specific invoices quickly.

User Workflow Explanation

- A user is taken to the Invoices index page after logging in and choosing the Invoices module from the menu or sidebar.
- All current invoices and their statuses are instantly visible to users.
- Simply click the "Create Invoice" button if the user needs to create a new invoice.
- Users can utilize the search bar or the filtering options to find a certain invoice.
- The user can click on the action button that corresponds to the invoice to edit or review its details.
- To preserve data security and integrity, the system makes sure that only authorized users can alter or remove invoice data.

4.3.7 Create Invoice – Steps 1 to 4

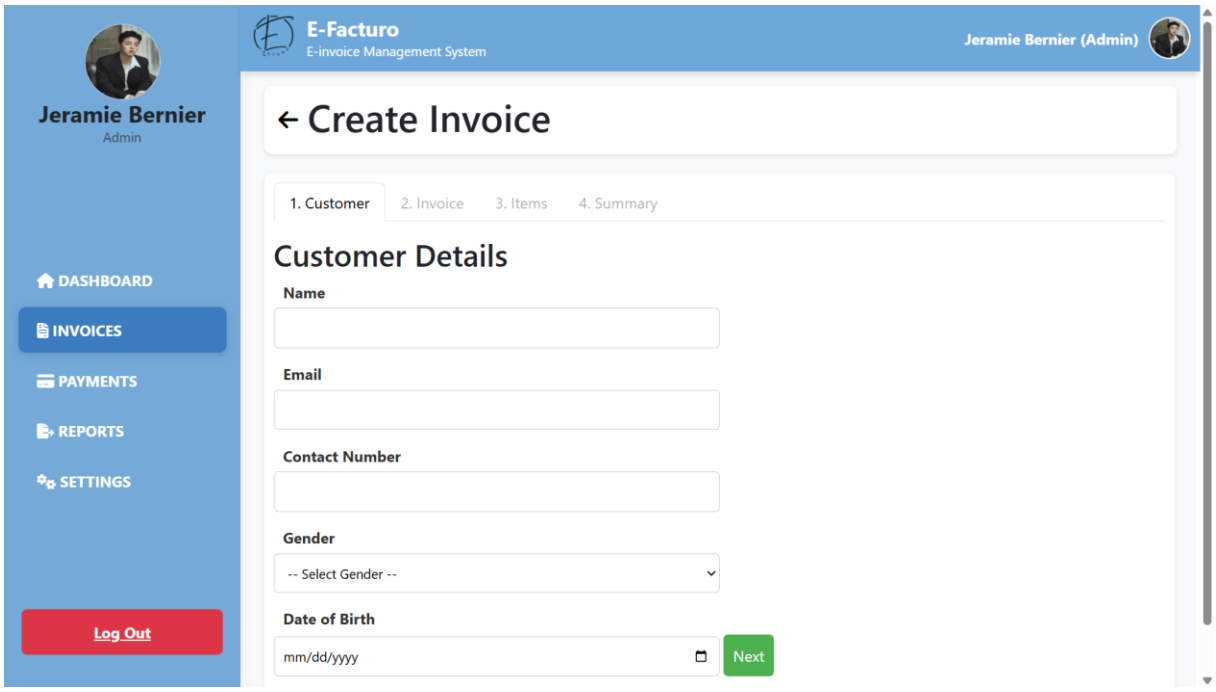

Figure 4.9: Invoice Create (Customer Details)

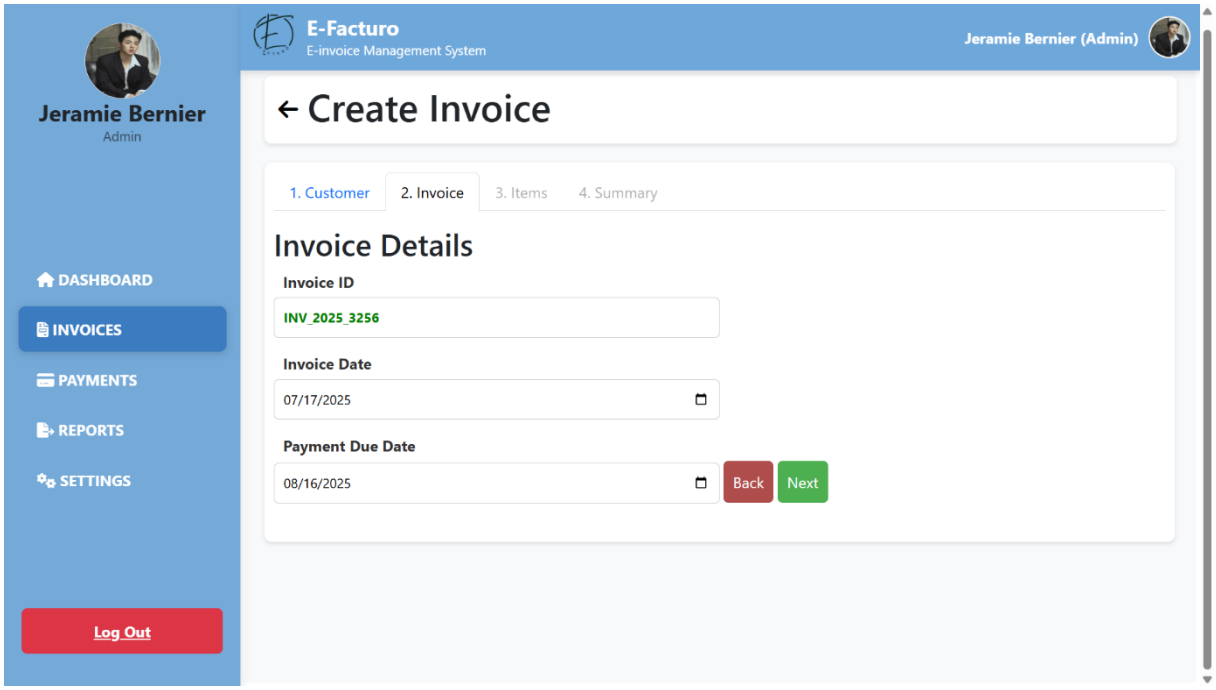

Figure 4.10: Invoice Create (Invoice Details)

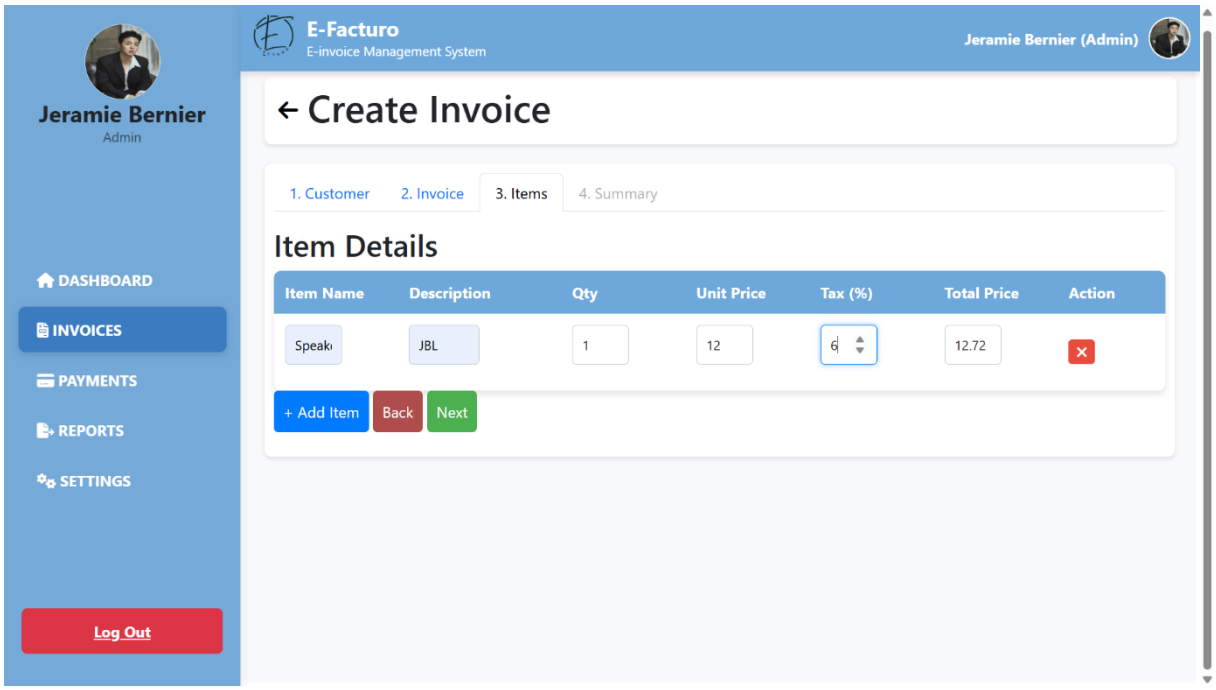

Figure 4.11: Invoice Create (Item Details)

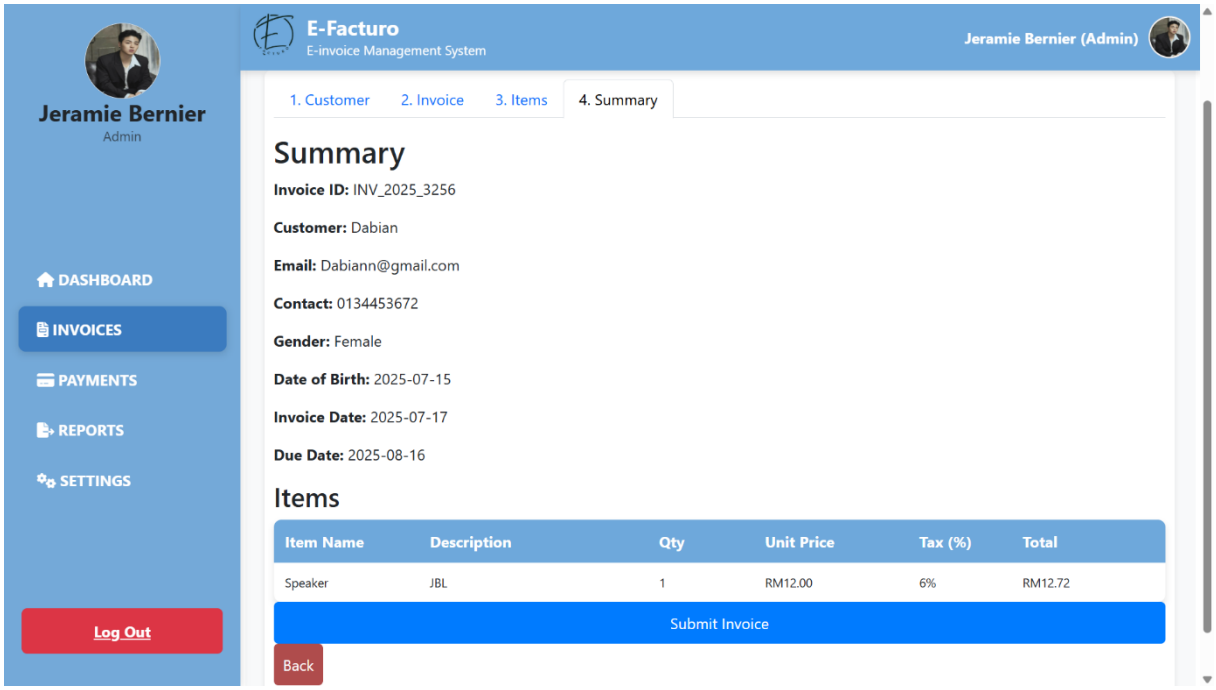

Figure 4.12: Invoice Details (Summary)

One of the primary functional components of the e-invoice management system is the Invoice Creation page. Authorized users, including staff and corporate administrators, can create new invoices for customers on this website in a methodical and supervised manner. The page is carefully designed to ensure that users can accurately input all necessary invoice data while minimizing the risk of missing important information. The functions of this page are explained in detail in the following instructions for new users:

Purpose of the Page:

The primary purpose of this page is to create a new invoice, which will be entered into the system database. The invoice can be linked to customer payments, tracked, changed, and viewed once it has been created. Every generated invoice is guaranteed to be full, uniform, and traceable thanks to this website.

Step-by-Step Functional Description

To ensure a seamless and organized data entry procedure, the invoice-generating page is broken up into several sections or steps:

Step 1: Customer Details (*Figure 4.9*)

- **Customer Name:**

  The customer's entire name must be entered by the user (administrators/staff). This person is the invoice's recipient.

- **Customer Email:**

  The email address of the customer. You can use this email for correspondence or to send electronic copies of invoices.

- **Customer Contact Number:**

  The phone number of the customer for invoice follow-up or clarification.

- **Customer Gender:**

  Additional demographic information might be needed by some companies for reporting or analysis.

- **Customer Date of Birth:**

  This might be applied to internal customer records, loyalty programs, or customized offers.

Step 2: Invoice Details (*Figure 4.10*)

- **Invoice Date:**

  The creation date of the invoice. The date may be set to today by default; however, alteration is possible if needed.

- **Payment Due Date:**

  Date of estimated payout. This aids in the system's computation of past-due invoices.

Step 3: Item Details (*Figure 4.11*)

- **Item Name:**

  The name of the service or product that is subject to billing.

- **Description:**

  To ensure that the customer understands the product or service, provide a quick explanation or description.

- **Quantity:**

  The quantity of billing units.

- **Unit Price:**

  The price of the product or service per unit.

- **Total Price:**

  Reduce human calculation errors by having "quantity × unit price" calculated automatically.

Final Actions (*Figure 4.12*)

- **Submit Button:**

  The user saves the invoice into the database by clicking the Save button after filling out and checking all the information. If the creation process is successful, the system might show a success message.

- **Cancel Button:**

  Permits the user to exit the active form and go back to the previous page without storing any information.

System Validation

Throughout the form, multiple validation rules are applied:

- Required fields must be filled.
- Numeric fields (e.g., quantity, unit price) only accept valid numbers.
- Email field requires a valid email format.
- Tax fields are automatically calculated to reduce manual errors.

Who Can Access This Page

- The only roles with the ability to create new invoices are those designated by the company administrator, such as Administrator and Staff Users.
- This page won't appear in the menus or navigation of unauthorized users.

4.3.8 Payment Page (Payment Verification Page)

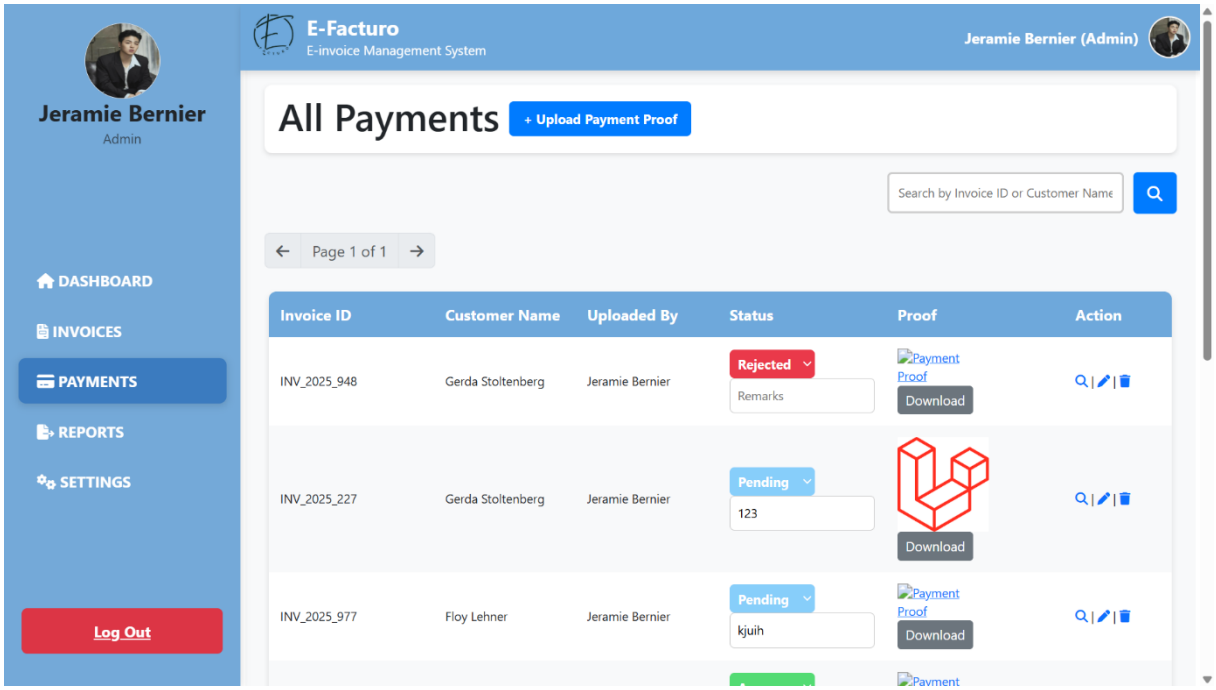

Figure 4.13: Payment Page

One of the main elements of the SME e-invoice management system is the payment page (Figure 4.13). Administrators can check, accept, or reject submitted payments on this page, while users—particularly staff members—can manage payment submissions. This feature is intended to support company procedures that require proof of payment to be presented for documentation and verification when external payments are made (either offline (cash) or by bank transfer).

Main Function of the Page:

- Allow users to upload proof of payment for their invoices.
- Display a list of all uploaded payments with corresponding information.
- Allow users to review, approve, or reject payments.
- Enables paging, filtering, and searching for improved data management.

Maintain invoice payment records for tracking and auditing purposes.

4.3.9 Payment Upload Page

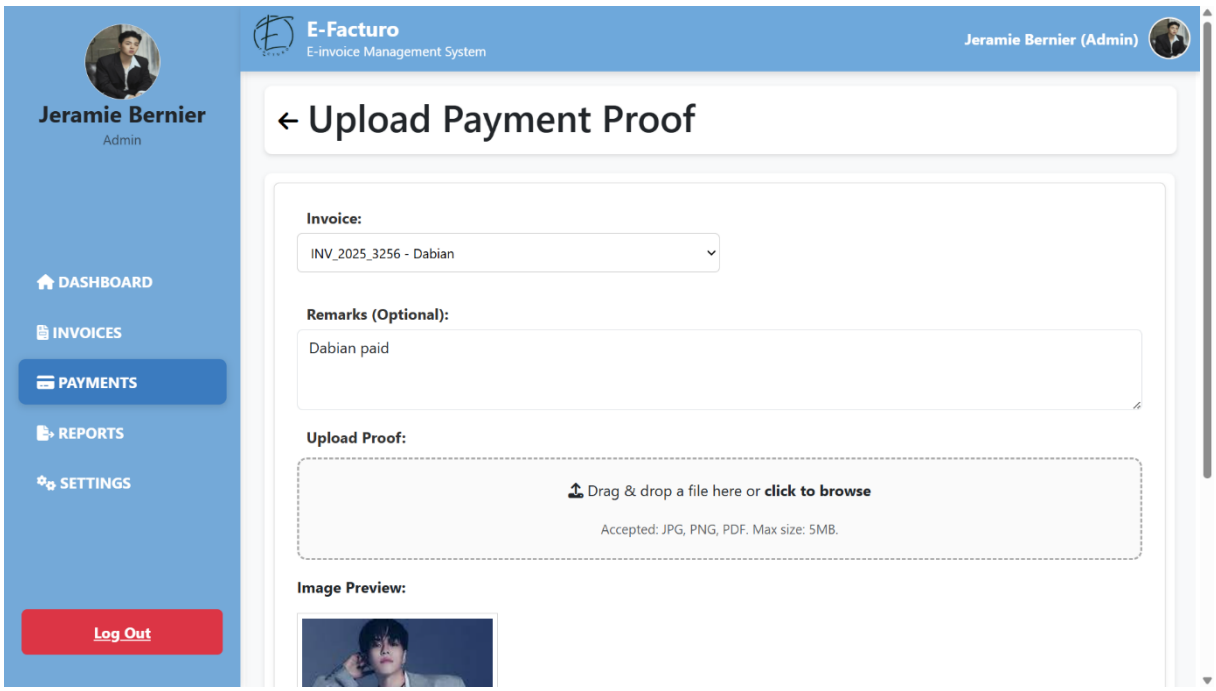

Figure 4.14: Payment Create (Upload Payment Page)

After purchasing outside of the system, users (administrators/staff) can upload proof of payment, like a transaction slip or receipt, to the payment page (Figure 4.14). The uploaded file may be in the form of a document (PDF) or an image (JPG, PNG). The administrators/staff are allowed to confirm the payment and adjust the invoice status appropriately.

4.3.10 Report Page

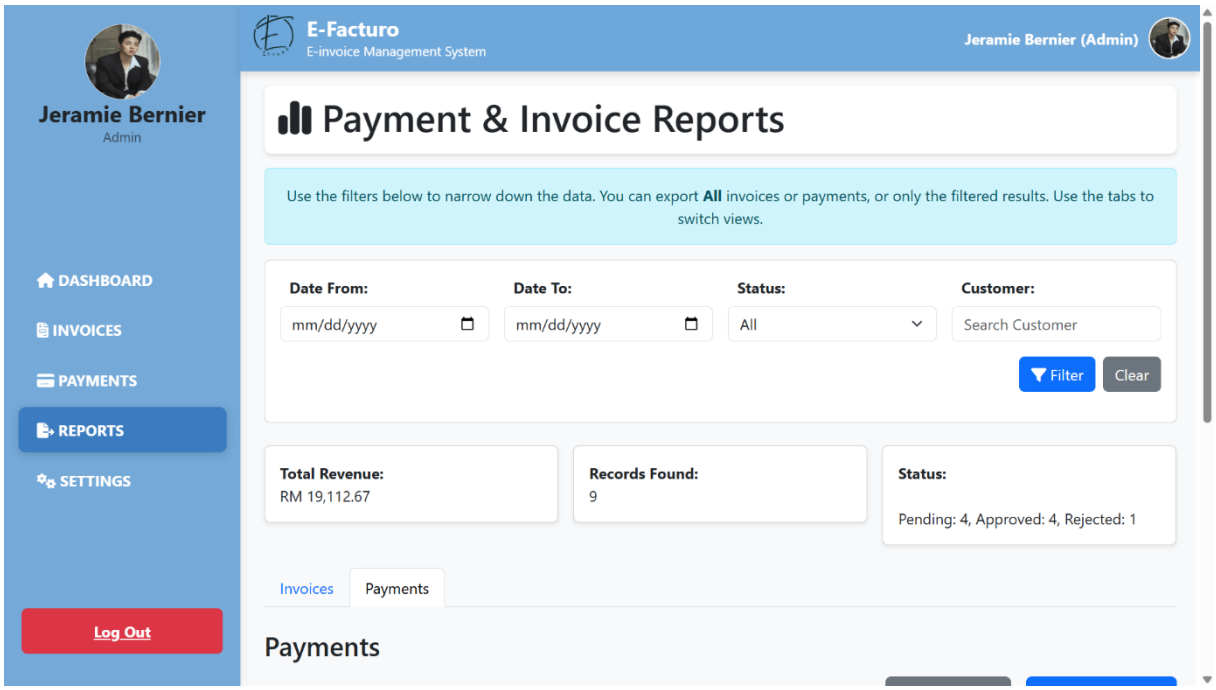

Figure 4.15: Reports Page

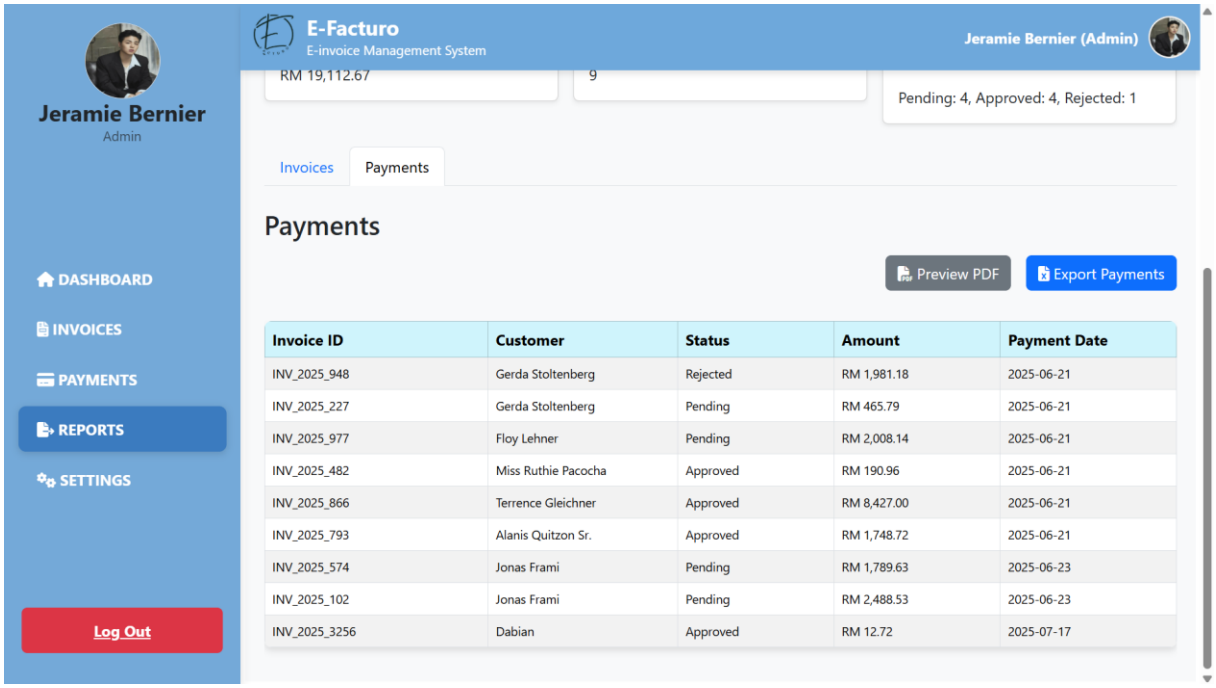

Figure 4.16: Reports Page (Payment summary)

One of the most crucial parts of an e-invoice management system is the Reports page (Figure 4.15 & Figure 4.16). This website is intended to assist users in tracking, analyzing, and assessing financial data pertaining to invoices and payments, particularly staff members and corporate administrators. More informed company decisions and financial tracking are made possible by the page's consolidated interface for viewing aggregated and filtered financial records.

Function of the Reports Page:

1. **Overview of Financial Performance**

   The system shows condensed data when the user visits the Reports Page, including:

   - Total number of invoices created
   - Total payments received
   - Total revenue

2. **Filtering and Searching**

The user can filter data on the report page according to some criteria:

- **Date Range Filter:**

  To display invoices and payments for a given period, select it. When creating monthly, quarterly, or annual reports, this functionality is useful.

- **Invoices / Payments Status Filter:**

  Enables users to sort records according to their payment status, such as Paid, Pending, or Rejected. This makes it easier to determine which invoices need to be verified or paid.

- **Customer Name Filter:**

  Enables users to concentrate on payments and invoices associated with a certain customer.

Users can concentrate on particular data that is pertinent to their current reporting requirements to filtering options.

3. **Dynamic Data Table**

The system shows the filtered invoice and payment records in the data table when the filter has been applied. Every row contains:

- Invoice ID
- Customer Name
- Status
- Amount
- Date

Users can examine financial records more quickly and clearly with this well-structured table format.

4. **Exporting Reports**

   The system enables the report to be exported in two forms after the user has examined the data and applied the required filters:

   - PDF Export

     Creates downloadable PDF reports that can be stored for future use or shared.

   - Excel Export

     Creates spreadsheet files that can be integrated with other accounting software or utilized for additional analysis.

   Companies can create formal reports for internal usage, audits, or financial assessments to export functionality.

5. **Real-Time Data Calculation**

   Any changes to invoices or payments are immediately reflected in the reports because the reporting page is directly linked to the live database. This removes the need for manual refreshes or report generation, ensuring that users always receive the most accurate, up-to-date information.

Who should use this page

- **Company Administrator**

  Analyze revenue, keep an eye on general company performance, and make sure payment collections are going as planned.

- **Staff**

Keep track of unpaid invoices, prepare monthly financial statements, and make sure all payments are accurately recorded and validated.

Purpose of the page

- Simplifies financial reporting for SMEs.
- Reduces manual calculation errors.
- Enables quick detection of payment delays.
- Assist in generating official company reports efficiently.

4.3.11 Settings Page

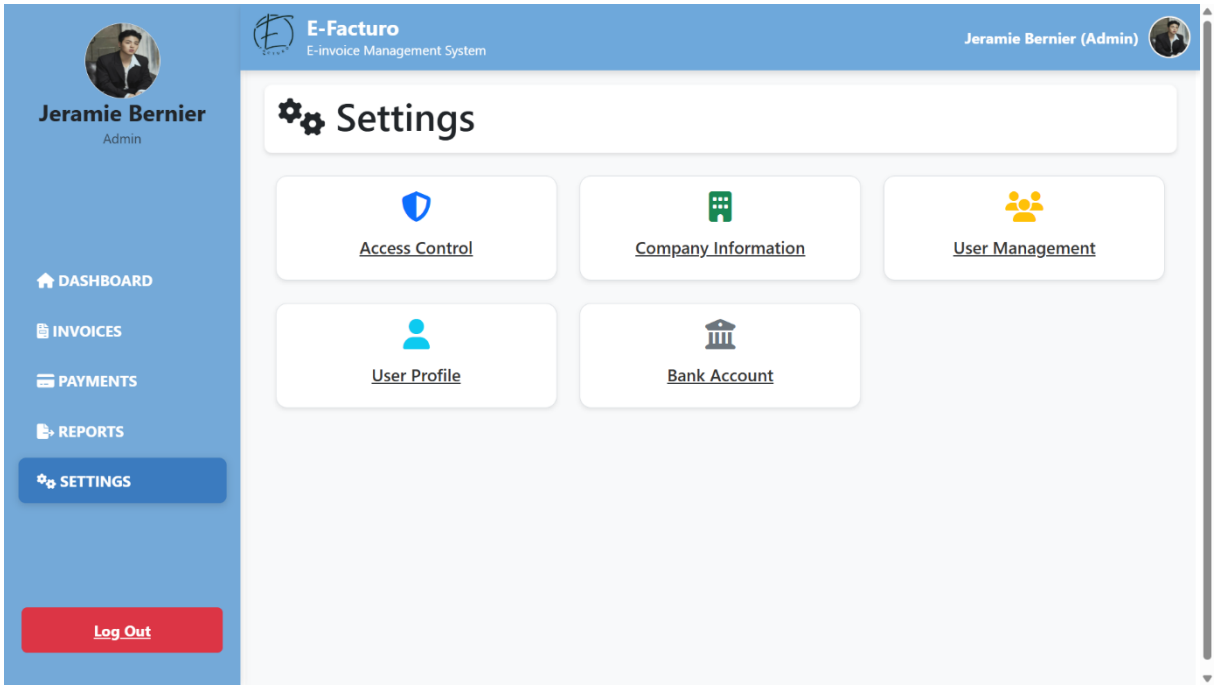

Figure 4.17: Settings Page

The e-invoice management system's Settings page (*Figure 4.17*) is designed to assist authorized users and system administrators in configuring essential system parameters and,

company's user management structure. A detailed explanation of each section's purpose is provided below:

Purpose of Page:

Administrators may manage every facet of the system setup from a single location on the settings page. This page's customization enables the system to adapt to the unique requirements of various companies that use different platforms. Any modifications data, and user access privileges. This page is vital for ensuring the system functions correctly in accordance with the company's internal policies, invoice regulations, and would need database modifications or developer intervention without this page, which is impractical for corporate users.

Main Sections of the Settings Page:

The Settings Page is divided into multiple modules, each accessible via buttons or navigation links:

1. **Access Control**
    - **Purpose:**

      For every module or page, adjust permissions and control role-based access.
    - **Function Available:**

      Access to pages such as payment pages, invoice management, reports, settings, and more can be granted or restricted.
    - **Usage:**
        - This security feature makes sure users can only see or do things that are relevant to their line of work.
        - Prevent unwanted access or unintentional data modification.

2. **Company Information**

- **Purpose:**
    - Allows the administrator to update and maintain the company's basic profile.
- **Field Available:**
    - Company Name
    - Company Email
    - Company Phone Number
    - Company Address
- **Usage:**
    - Aids in keeping paperwork professional and consistent.
    - Administrators can make updates here to reflect changes made to the company's information across the system, such as a change to the address.

3. **User Management**

- **Purpose**
    - Allows administrators to manage user accounts within their company.
- **Function Available:**
    - Add New User (administrators or Staff)
    - Edit User information
    - Delete user
- **Usage:**
    - Ensure that only individuals with permission can access particular parts of the system.

4. **User Profile**

- **Purpose:**

  Permit each user to control their data.

- **Field Available:**
  - Username
  - User email
  - New Password
  - Confirm Password

- **Usage:**
  - Give users the ability to control their own personal data.
  - Permitting users to change their passwords regularly will improve security.

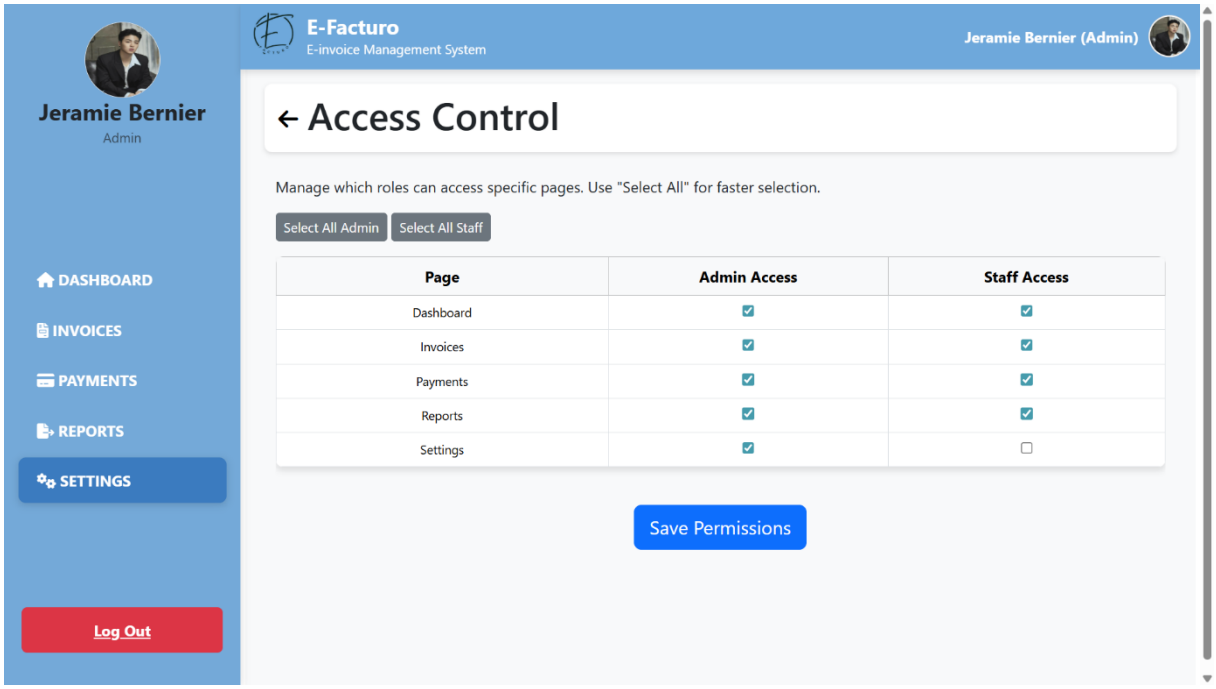

Figure 4.18: Settings Page (Access Control)

Administrators can change each role's page – level permissions using this page (Figure 4.17). Permission for CRUD are supported.

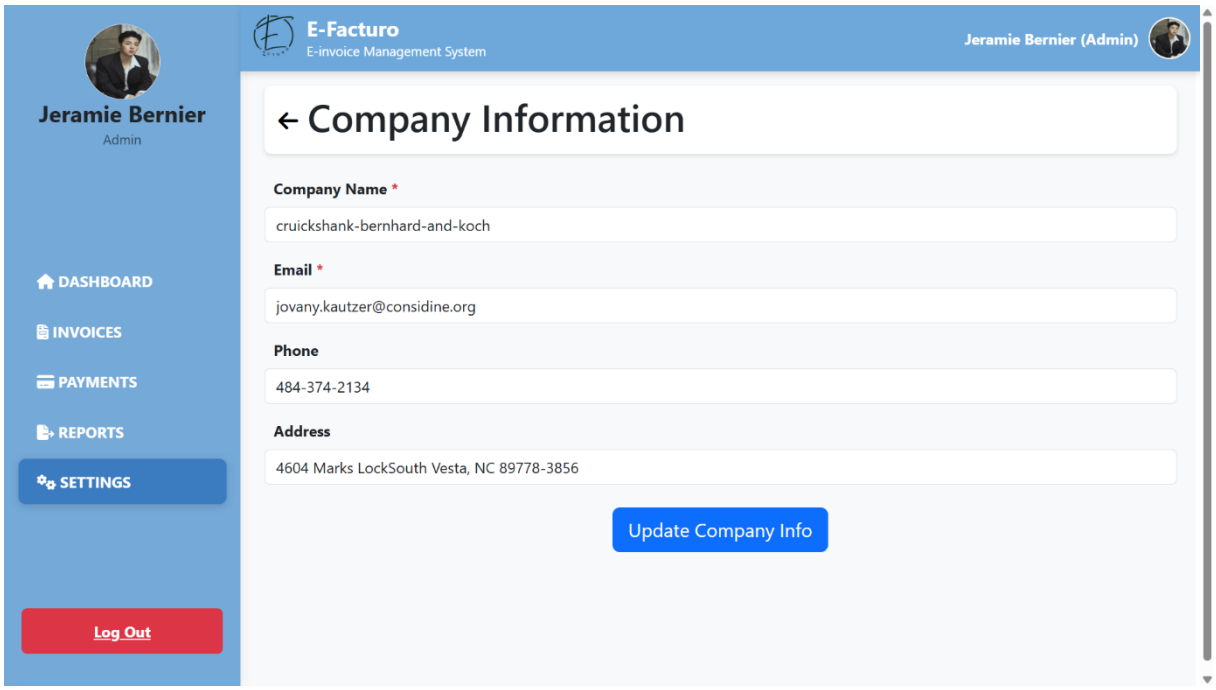

Figure 4.19: Settings Page (Company Information)

The company's name, email, phone, and address can all be updated by administrators (Figure 4.19).

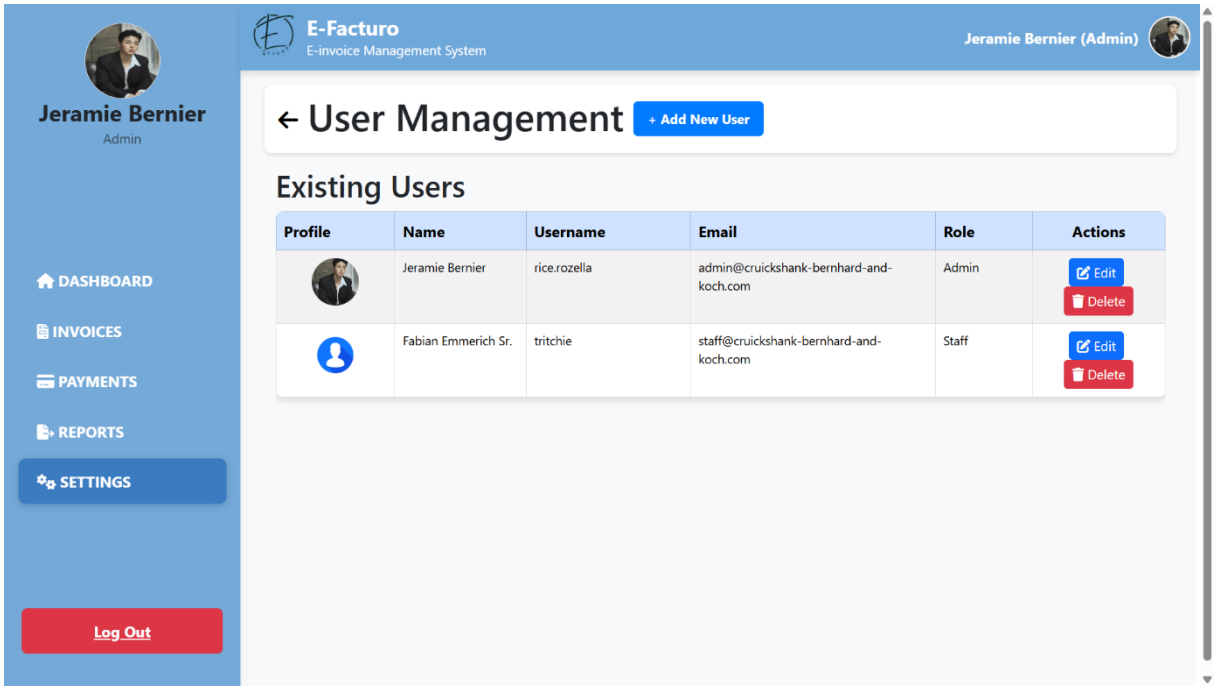

Figure 4.20: Settings Page (User Management)

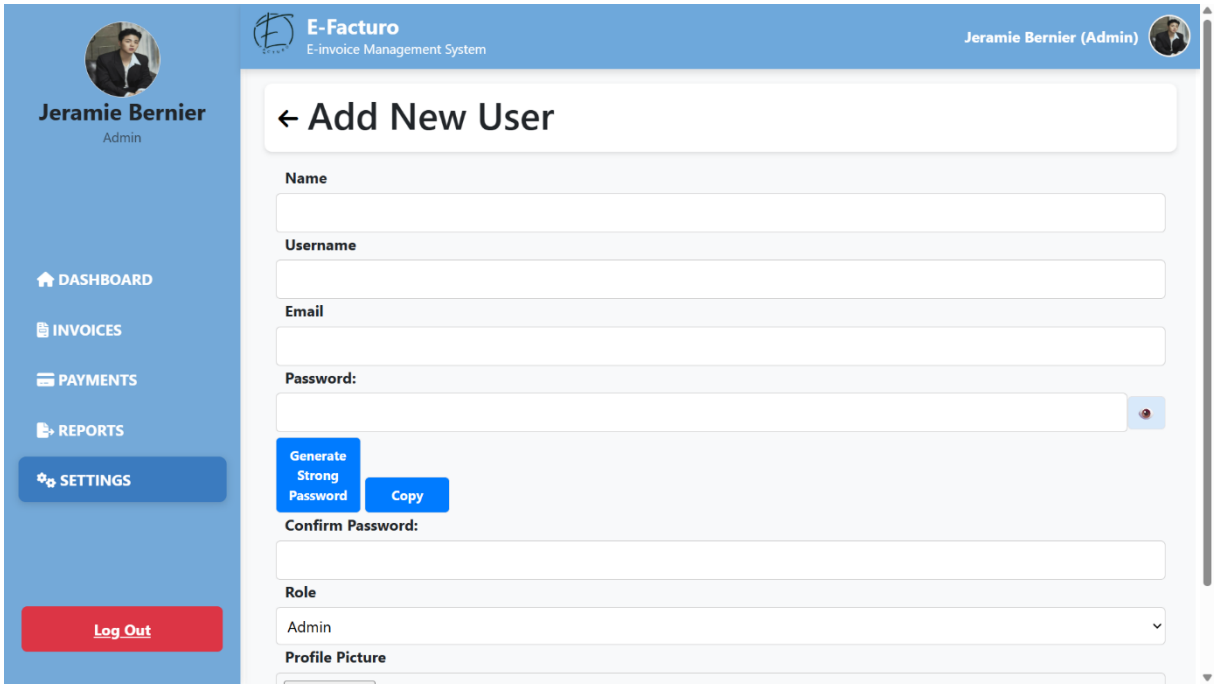

Figure 4.21: Settings Page (User Management_Add New User)

Administrators can register new users on this page (Figure 4.21) by choosing a role and entering their names, email address, username, and password.

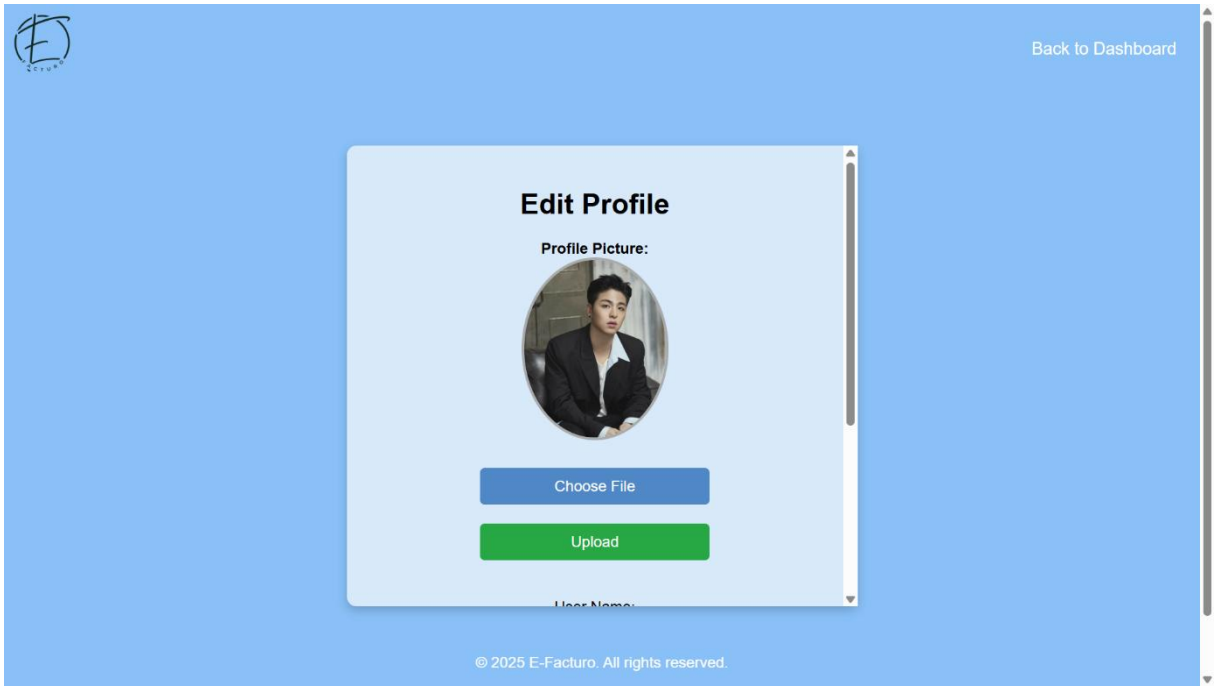

Figure 4.22: Edit Profile

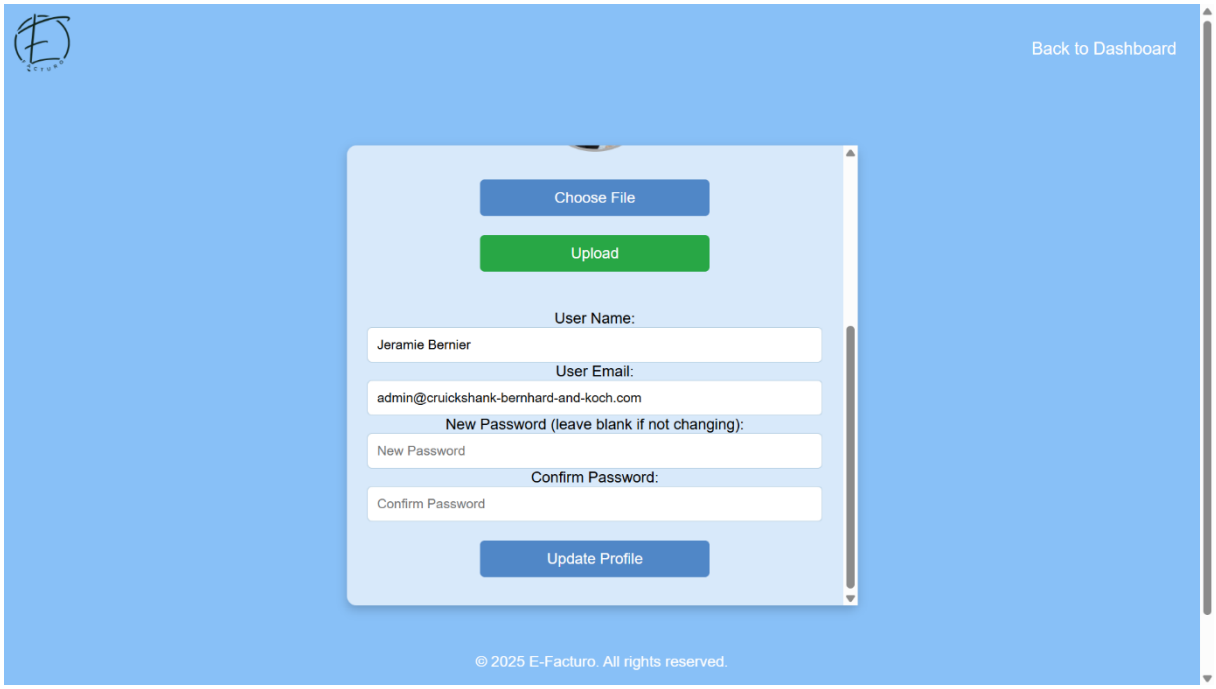

Figure 4.23: Edit Profile Page

The e-invoice management system's Edit Profile page (*Figure 4.22*) is a user-specific tool designed to help individual users securely view and update their profile data. This page

enables users to ensure that their account information remains current, accurate, and tailored, should their contact details or preferences change.

Purpose of the Page:

For the following uses, the Edit Profile page offers an intuitive user interface:

- Permit users to make changes to their data without an administrator's assistance.
- guarantees that each user's data is kept up to date and accurate by the system.
- Enable users to change their passwords frequently to improve account security.

When to Use:

- whenever any of their private data, like their email address or phone number, changes.
- To change their account password for security purposes.

Detailed Functionality:

A form containing the following fields will appear when a user visits the Edit Profile page:

1. **Profile Picture (optional)**
    - Users (administrators/staff) can upload or change their profile pictures.
2. **Username:**
    - Displays the current username of the user.
    - The user can edit this field to correct spelling mistakes or update legal name changes.
3. **User email:**
    - Shows the current email address linked to the user’s account.
4. **Password Update Section:**
    a. **New Password (Optional)**

The user inputs the new desired password.

b. Confirm Password

The user must re-enter the new password to avoid typing mistakes.

5. Save Button

After making updates, the user clicks this button to submit the changes.

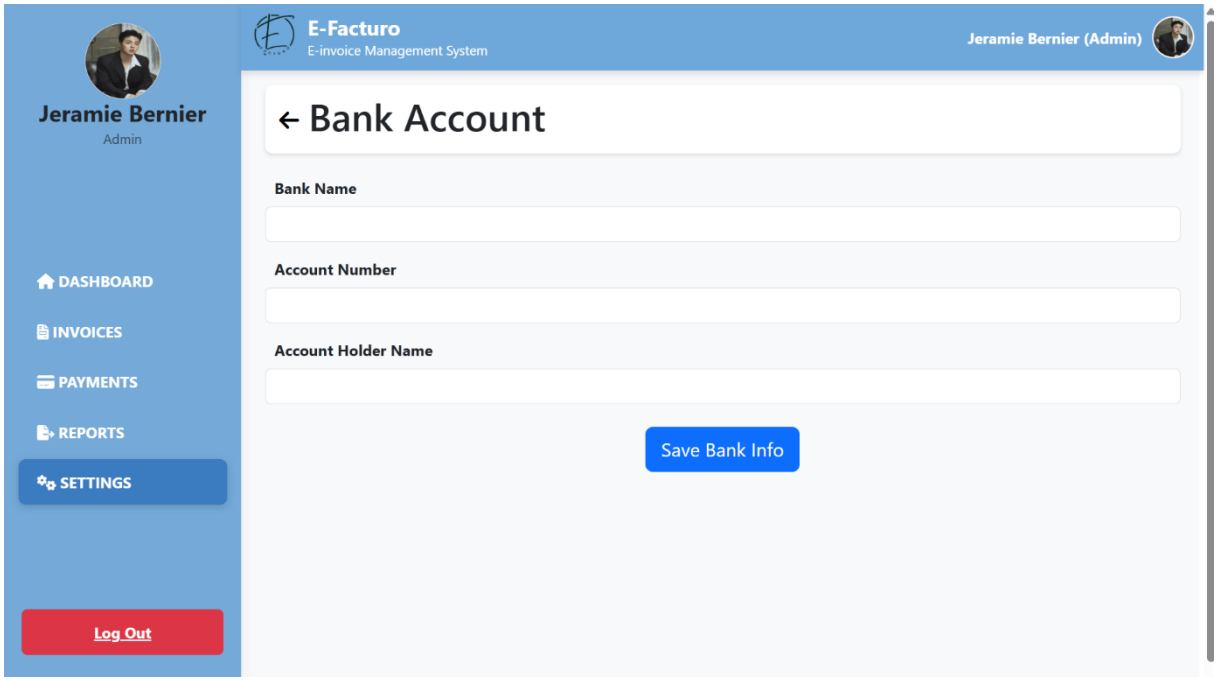

Figure 4.24: Bank Account setup page

The e-invoice management system's bank account setup page, which allows a company administrator to add and update official bank account details, is shown in *Figure 4.24*. "Bank Name," "Account Number," and "Account Holder Name" are among the fields on the form. The administrator can store the information by clicking the "Save Bank Info" button after completing the form.

When offline payment options are supported, this functionality is quite helpful. Customers have the option of paying with cash or a bank transfer. A smooth offline payment process is made possible by the system automatically including the company bank account

details in the email sent to the customer after a staff or administrator successfully creates an invoice.

4.4 Design Decision and Tools Selection

To ensure effectiveness, security, and scalability, creating an e-invoice management system relies on carefully selected tools and technologies. Due to its robust Model-View-Controller (MVC) design, advanced syntax, and integrated features like Eloquent ORM, routing, and authentication, Laravel was chosen as the primary backend framework. Using Laravel Breeze, secure session-based authentication can be implemented easily, simplifying registration and login processes. In a multi-tenant environment where data must be separated by company, MySQL, a relational database management system, provides reliable and scalable support for storing structured data. XAMPP is used for local development because of its compatibility with PHP, MySQL, and Apache, as well as its straightforward server configuration management. The Blade template engine is employed at the front end to streamline HTML rendering and maintain a clean, organized layout. To enforce secure and appropriate page access based on user roles, the system incorporates middleware and role-based access control techniques. Its modular design allows for easy customization and improves maintainability, especially for administrative tasks. Version control, which supports collaboration and change tracking throughout the development cycle, is implemented via GitHub. Document recording and sharing are simplified by integrating DomPDF, which makes exporting reports to PDF format straightforward. These technologies work together, offering features like data validation, role management, and error handling to facilitate efficient system development.

4.5 Constraints

During the system development process, several restrictions were identified that could affect availability or performance. One major issue was slow internet access, which periodically prevented third-party programs or system updates from installing. The lack of an integrated online payment option was another limitation. Currently, the system only allows evidence of payment to be uploaded manually, increasing the risk of human error and delaying payment verification. Additionally, the system was designed to require at least one administrator during the company's initial setup; without one, the system would not function, which could cause operational disruptions if not managed properly. Moreover, PHP's default settings limit file uploads to 5 MB, forcing customers to compress large proof of payment files before submitting them. Finally, older browsers may experience compatibility issues, especially with layout or styling, since the system is optimized for current browsers like Google Chrome. These limitations highlight areas for future improvement to enhance the system's overall robustness and user experience.

4.6 Testing

To ensure the application works as intended and meets user needs, testing is a crucial part of the system development lifecycle. Black box testing, which ignores internal code logic, is mainly used for the e-invoice management system to verify that each function operates correctly based on input and expected output.

Every essential component of the system, including user login, invoice administration, payment processing, reporting, user role management, access control, and company setup, was functionally tested. To test each feature, actual data input was used to mimic how administrator and staff users might behave in various scenarios.

An overview of the test cases run during system validation is given in the following table (Table 4.2 Test Cases). The functionality to be evaluated, the input values utilized, the anticipated system output, and further remarks on the outcomes are all included in each test case. A test account and demo data are used to test each test case in a local setting manually.

Table 4.2: Test Cases

Function	Input	Expected Output	Remarks
Check Company	Company name: cruickshank-bernhard-and-koch	If the company exists, redirect to the login page. If not, redirect to the setup page.	Ensures company validation before access.

Company Setup	Company name, email, phone, address	Saves the company details and redirects to the admin setup page.	First-time setup only.
Login (Valid credential)	Username: rice.rozella Password: Password@123	If the login is successful, then redirect to the dashboard page.	Test credential verification. The user redirect to the dashboard page.
Login (Invalid credentials with wrong password)	Username: rice.rozella Password: Password	If an invalid credential is entered, an error message will be shown.	Massage “Invalid username or password” will be shown.
Invoice (Index page)	None/ Invoice list of the company via auth	Shows list of the invoices for that company with the correct filter.	Role-based: staff / administrator
Create Invoice	Customer details (Name: Emi, Email: emi@gmail.com,	The invoice is saved to the database and appears in the invoice	The tax amount is calculated automatically.

	Contact number: 0134456789 Gender: Female, Date of Birth: 06/04/2005) Invoice Details (Invoice Date: 06/19/2025, Payment Due Date: 07/19/2025) Item Details (Item Name: Speaker, Description: JBL Qty: 1, Unit Price: 150.00, Tax(%): 6,	list. An invoice email is sent to the customer.	Invoice ID is auto-generated.

	Total Price: 159.00)		
Create Invoice – Empty Customer Name	Customer Name: *empty*	Validation error: "Please complete all required fields."	Required field check prevents empty submission.
Create Invoice - Price	Unit Price: abc (non-numeric string)	Validation error. The input field restricts non-numeric characters.	Input type is numeric. Invalid entries are blocked and rejected before submission.
Create Invoice – Customer email field	Email: emigmail.com (Invalid format, missing @ symbol)	Validation error: "Please fix the email and phone number format."	Ensures proper email formatting using Laravel validation.
Create Invoice – Contact Number	Contact number: 0123abc6475 (contains letters)	Validation error: "Please fix the email and phone number format."	The contact number must be numeric only.
Create Invoice – Item Quantity	Quantity: -10 (negative input)	Validation error: " Invalid Quantity. Quantity must be at least 1."	The system prevents invalid quantities.

Edit Invoice	Change due date, item quantity, etc.	Invoice updated and change reflected correctly.	The updated invoice is saved, changes are reflected in the invoice view, and the total updated.
Download Invoice	Click on “Print” on the specific invoice.	PDF invoice downloads with the correct format and content.	The PDF format invoice downloads successfully.
Payment (Index Page)	None/ Search filters such as Invoice ID or customer name.	Lists all the payments attached to the invoices.	Shows the filtered payment.
Create Payment	Select invoice, remarks, upload payment proof (PDF,PNG,JPG)	The file is stored, payment record is created with “Pending” status.	Administrators/staff can verify the payment status.
Upload payment	Upload a large or invalid file type (e.g. exe)	Validation error shown.	Shown accepts only allowed file types (PDF, JPG, PNG) < 5MB
	File type: pdf, size: 7.62MB	Validation error: “File too large. Max allowed size is 5MB.”	Prevents large size file upload.

Approve Payment	The administrator clicks “Approved” on the payment status.	Status updates to “Approved”, invoice status updates to “Paid”.	Payment status “Approved, the invoice status “Paid”.
Reject Payment	Administrator/staff clicks “Rejected”, and the payment status is stored.	The payment status updates to “Rejected”, and remarks are stored.	Proof is still stored for audit.
Generate Report	Filter by date, payment status, and customer name.	Returns correct payment data.	Administrators/staff allow export to PDF/Excel.
Search & Filter	Search by customer name “Emi”, filter status = “Pending”	Correct filtered results returned.	Important for large datasets.
Settings Page	Update the role permission.	Role-based restriction is enforced on views and actions to the page.	Administrators/staff can access the page based on the assigned permissions.
User Management	Add New User. (Name: Pharsa,	A new user is created and appears in the list.	Only the administrator can access the page.

	Username: Pharsa, Email: Pharsa@gmail.com, Password: Pharsa@123 Confirm Password: Pharsa@123, Role: Admin, Profile Picture (Optional)) Click “Create User”)		
Create User - Duplicate Email	Email: pharsa@gmail.com (already exists)	• Validation error: “The email has already been taken.”	Prevent duplicate email.
Access Control	Set role permissions (Staff cannot access to the settings page)	Role-based restriction is enforced on views and actions to the page.	Helps prevent unauthorized access.
Logout	Click “Logout.”	Session ends, user(administrator/staff)	Should work on all roles.

		redirected to the login page.	

4.7 Summary

This chapter covers system implementation, including tools, design choices, limitations, and the user manual. The main components of the development stack are Laravel and MySQL. Features like invoice management, tax calculations, payment tracking, and user role segregation have been designed and tested to meet requirements. Testing confirmed that all functions work as intended and that invalid input is handled properly. Limitations such as file size restrictions, reliance on manual inspection, and environmental constraints are also noted for potential future improvements.

CHAPTER 5 EVALUATION

This chapter examines the performance of the designed SME e-invoice management system under various conditions and evaluates the implementation outcomes covered in Chapter 4. The system output, reaction to legitimate and illegitimate inputs, and general dependability of the prototype in practical applications are the main points of interest.

5.1 Discussion and Result

The e-invoice management system, which includes functions such as invoice production, payment tracking, reporting, and access control, is designed to streamline the administrative workflow of SMEs. After successful deployment, several key modules were tested and yielded positive results.

First, the Check Company and Setup module ensures each company's unique registration within the system. When a user attempts to register a business, the system checks if it already exists. If not, it begins the process of establishing and configuring a new business. This creates the foundation for multi-tenancy, allowing each business to operate independently within the same system, and ensures that the initial user becomes the business administrator.

The system uses secure session-based login with Laravel Breeze for role management and user authentication. Role-based access control (RBAC) protects all functionality, ensuring that users can only access modules assigned to their roles. While workers have limited access, administrators have full permissions, including the ability to manage user roles and permissions through the settings panel.

There are four distinct processes in the invoice generation process. First, the customer's name, email address, phone number, gender, and birthdate are gathered. Second, details unique

to the invoice are included, like the due date and invoice date. Third, the item's name, description, quantity, unit price, and tax rate are entered by the user. The total sum is computed automatically. The invoice summary, which includes all computed values and relevant taxes, is then shown by the system.

Administrators and staff can upload proof of payment in supported formats (PDF, JPG, or PNG) using the payment management process. Every payment record has a specific invoice associated with it. The responsible user has the option to accept or refuse the payment after examining the uploaded file. The invoice status will automatically change to "Approved" after approval, expediting the process and eliminating the need for human revisions.

Users can filter, preview, and export invoice and payment data using the report generating module. Filtering criteria like date range, client name, and invoice status (paid, pending, or past due) are supported in invoice reports. The system also produces comprehensive breakdowns by status and summary totals. Payment reports offer a revenue summary based on accepted transactions and allow filtering by date, customer, and payment status (approved, pending, or rejected). Businesses can export reports to Excel or PDF formats to make analysis and documentation upkeep easier.

Key business data is displayed visually in the dashboard analytics function of the system. By visualizing trends and patterns, such as the distribution of invoice statuses and overall sales performance across all customers, graphs and charts assist businesses in making well-informed decisions.

This system's multi-tenant data security is one of its many advantages. To guarantee that each business may only access its own data, it makes advantage of Laravel middleware. The

technology preserves stringent data privacy throughout the platform and stops unwanted access between businesses by requiring a company_id check on each query.

As anticipated, the system continuously accepted legitimate input during testing. For instance, the system was able to accept properly formed email addresses and client information when issuing an invoice. File types that were supported, including PDF, JPG, and PNG, were successfully uploaded and connected to the relevant invoice. Following the completion of all fields, the invoice total was computed accurately, and the reporting section's filters produced the right export results. Additionally, role-based constraints functioned as intended, allowing access to only those users who had the appropriate authorization. These reliable outcomes attest to the proper operation of the system's validation mechanism for accurate input.

Furthermore, invalid input can be successfully rejected by the system. Forms without mandatory fields (such client email addresses) won't be sent in. Email fields that are not formatted appropriately (like "user@@mail") can result in validation problems. Uploads of unsupported files (like .exe or .zip files) are refused with the relevant warnings displayed. Additionally, the system uses automatic creation logic to avoid duplicate invoice IDs. Role-based access control also effectively prevents unauthorized users—like staff attempting to see administrator-only pages—from entering restricted areas. These examples demonstrate the system's robust client and server validation features, which successfully guard against data errors and unauthorized operations.

5.2 Summary

In conclusion, the assessment's findings demonstrate that the e-invoice management system satisfies the objectives set forth for SMEs. It effectively covers important business operations like dashboard visualization, report production, invoice and payment tracking, and secure user administration. The system can successfully reject illegal or invalid activities and handle valid inputs with reliability. All businesses utilizing the platform may be assured of data protection because to its multi-tenant architecture. All things considered, the system has proven to be useful, capable of processing data accurately, and functionally effective under a range of input and usage scenarios.

CHAPTER 6 CONCLUSION AND FUTURE WORK

6.1 Conclusion

The purpose of the SME e-invoice management system is to streamline the invoicing process, enhance transparency, and improve the efficiency of SME invoicing and payment management. Role-based access control and a modular design enable staff and administrators to perform activities safely and accurately.

Key features include company establishment, user authentication, invoice creation, tax computation, payment upload and verification, report generation, and dashboard analytics. Using a shared database approach with company-level filtering capabilities, the system also incorporates multi-tenant data isolation, guaranteeing that each company's data is safely isolated.

The technology significantly reduces manual tracking and management workload by automating payment verification and invoice status updates. Built-in reporting modules and visual dashboards enhance data-driven decision-making and financial oversight.

By providing SMEs with a unified, easy-to-use platform to automate invoice creation, payment tracking, and reporting, the project effectively met its objectives.

6.2 Contribution

This computerized invoicing management system offers a number of significant benefits. Multi-tenancy support is a crucial feature that protects each company's data privacy by filtering information according to company_id. When multiple businesses use the same system, this helps to safeguard data security. Additionally, the system offers automated invoicing workflows, which speed up and simplify the invoice preparation and management process while lowering human error. The application of role-based access control (RBAC) is another significant contribution.

6.3 Limitations

Despite its effectiveness, the technique nevertheless has many drawbacks. First, there is a manual payment confirmation step. It takes a lot of time and is prone to errors for staff to examine each proof of payment that users upload. Second, online payment gateways like PayPal, Stripe, and FPX are not supported by the system. As a result, the system does not allow customers to make payments in real time. Third, there isn't a mobile app for the system. Because it is only compatible with web browsers, users on mobile devices might not get the optimal experience.

6.4 Future Work

To make the system better in the future, a number of update recommendations were made. First, by including an online payment channel, customers would be able to pay invoices straight through the system, eliminating the need to upload proofs by hand. Second, incorporating push and email notifications would assist users in staying up to date on report availability, payment updates, and invoice due dates. Third, creating a mobile application could improve the user experience, particularly for those who would rather use their phones to access the system. Supporting numerous currencies and languages would further increase the system's flexibility and be helpful for users from other countries. Last but not least, incorporating an audit log to monitor user behavior and system modifications will improve accountability and facilitate the examination and troubleshooting of system usage.

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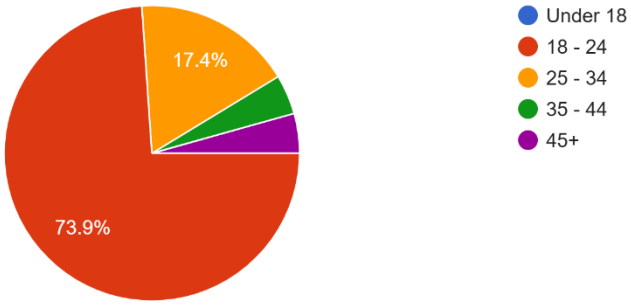
Appendix A

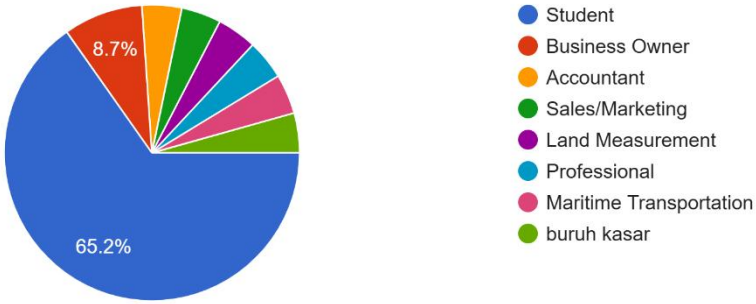
Age

23 responses



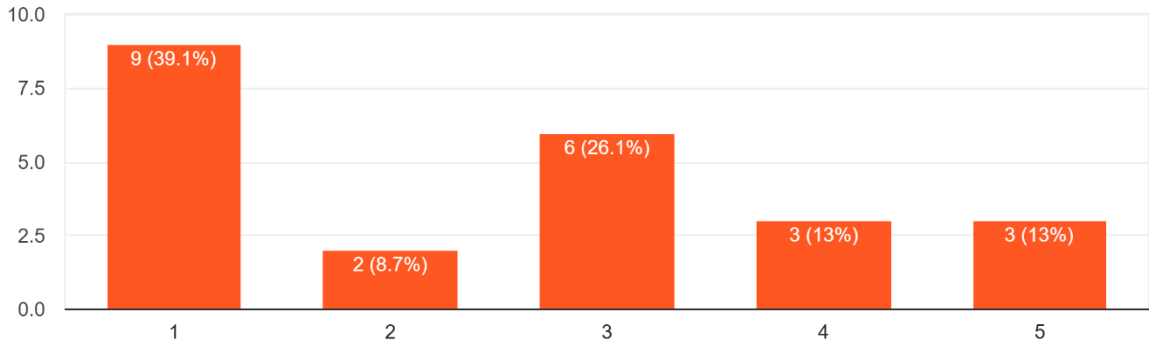
What is your current occupation?

23 responses



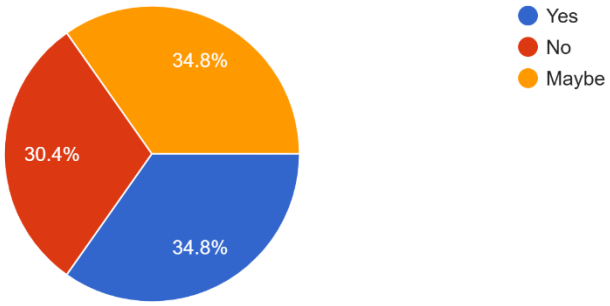
How familiar are you with e-invoice systems?

23 responses



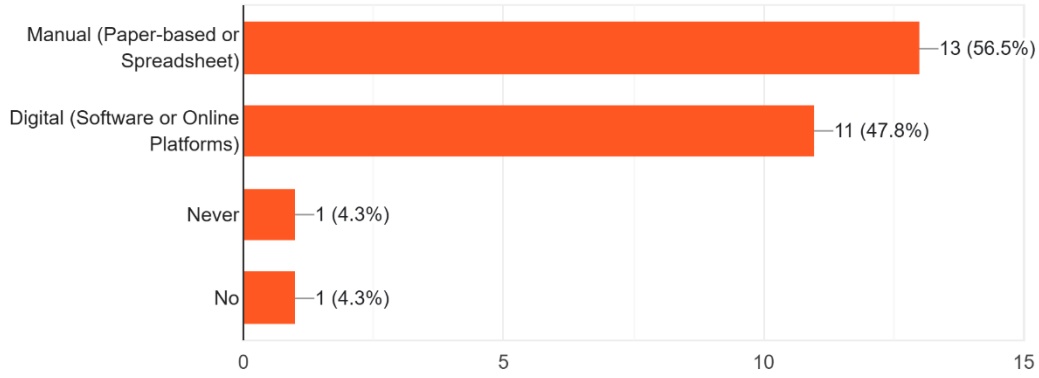
Have you used or managed invoicing systems before?

23 responses



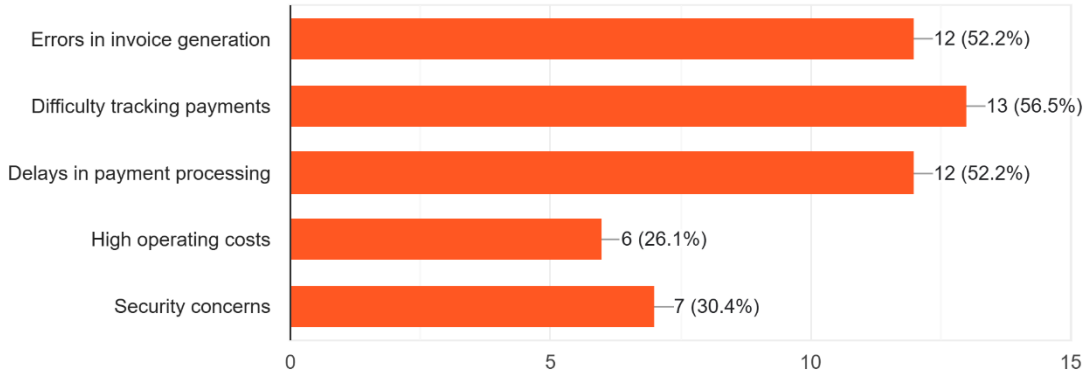
If yes, what type of invoicing system do you currently use?

23 responses



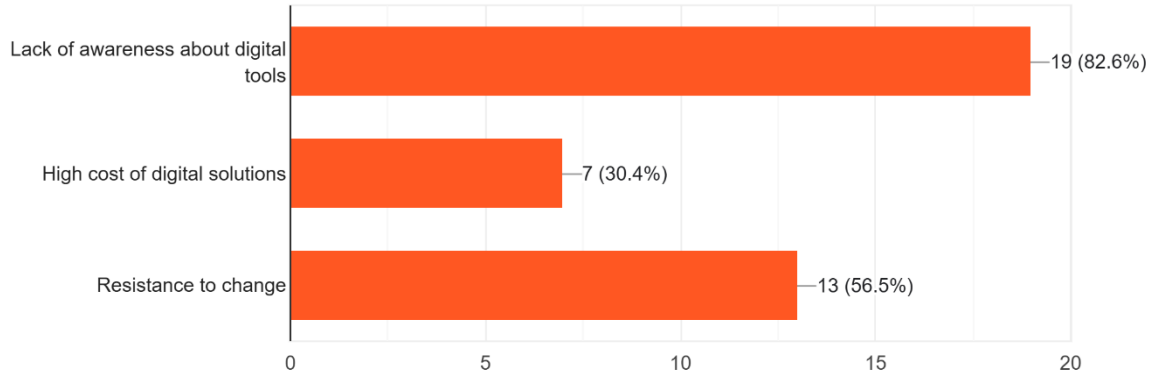
What are the key challenges you face in managing invoices?

23 responses



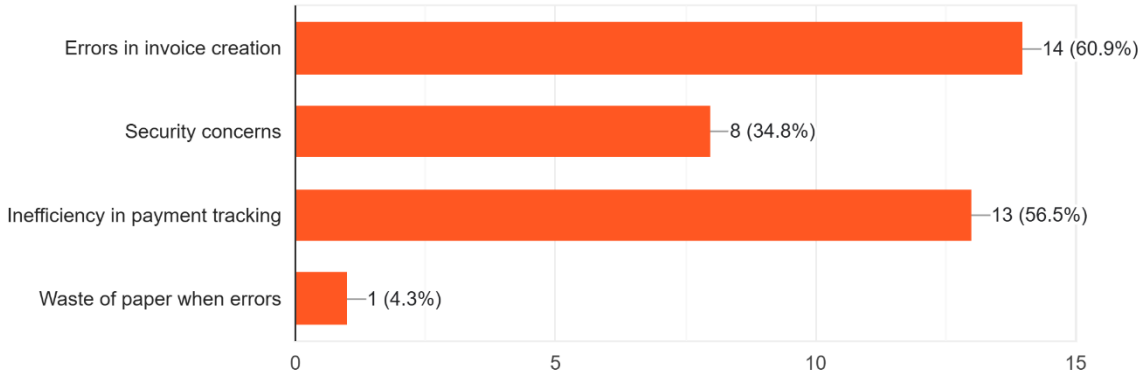
Why do you think traditional invoicing methods are still commonly used by SMEs?

23 responses



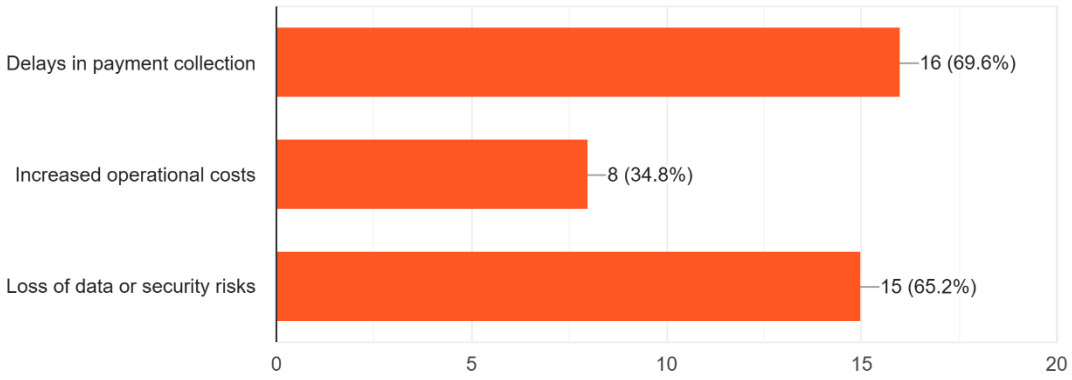
What are the main issues you face with traditional invoicing methods?

23 responses



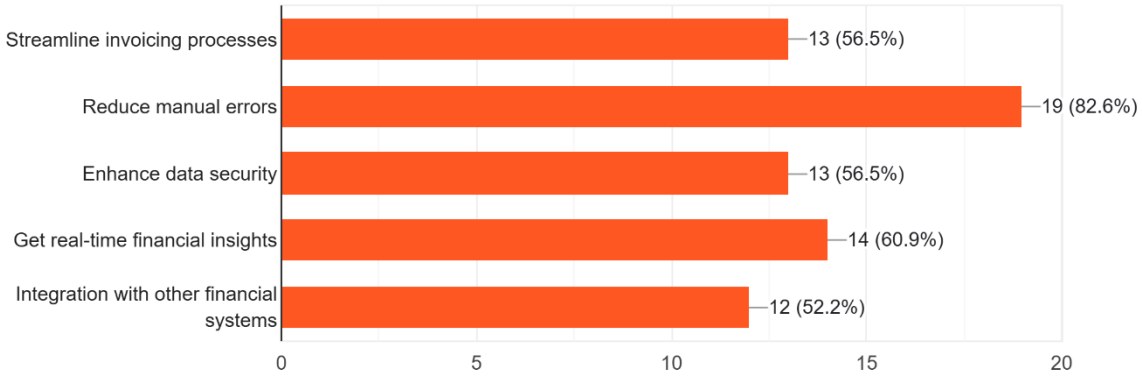
How do these challenges impact your business operations?

23 responses



What would you hope to accomplish with an e-invoice management system?

23 responses



Why do you think a system like this is necessary for SMEs?

23 responses

Efficiency to ensure automate repetitive tasks

E-invoicing reduces paper usage, postage costs, and administrative labor, saving money for SMEs. It also speeds up the invoicing process, which can lead to faster payments and improved cash flow

_-

it's better than the manual one and also can minimize errors

dont know reason but really important

Tidak tahu

Easy to record

To give simplify human's life.

proper financial tracking

Easy to track sales

To track payment history

Yes

For more security

Improve efficiency

reduce wastes on papers

reduce wastes on papers

..

helps track finance of business

Driving productivity value while significantly reducing call costs

To make it easy to track budget

Nadai

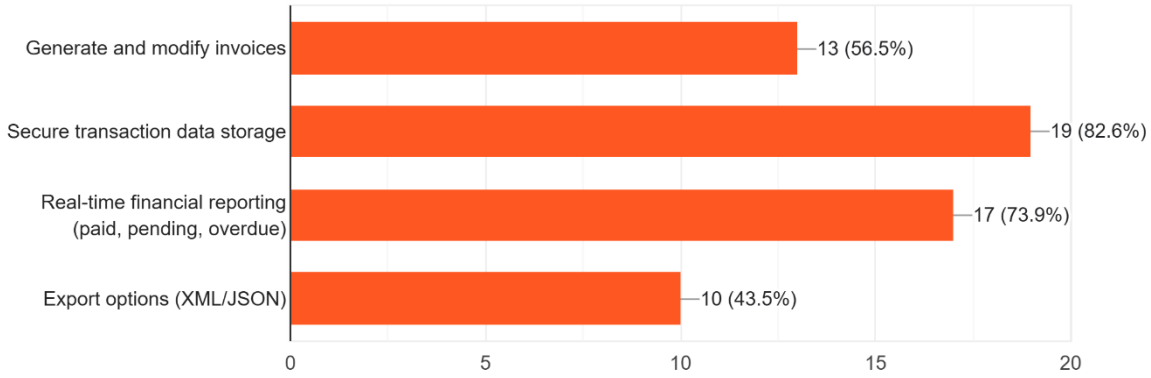
Improve tracking in business

make things easier

Easy to use

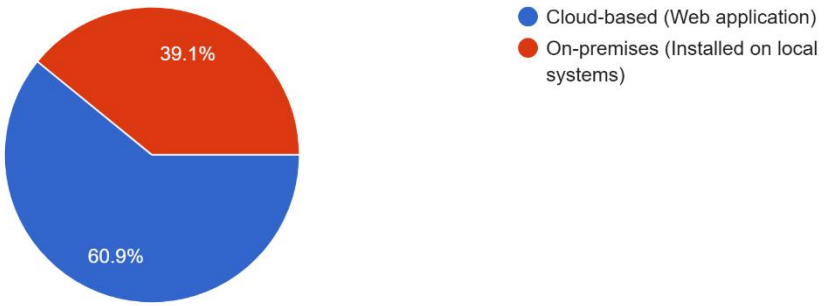
What specific features would you consider essential in an e-invoice management system?

23 responses



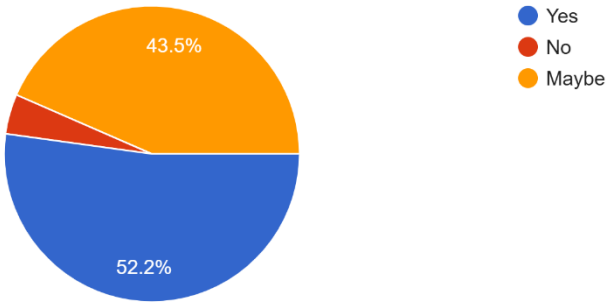
How would you prefer the system to be implemented in your business?

23 responses



Would you consider investing in an automated e-invoice system?

23 responses



Do you have any additional suggestions or feedback on how the system should be developed or implemented?

23 responses