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Abstract

DroPilot aims to revolutionize the dropshipping industry by harnessing the power of artificial intelligence (AI) to automate and optimize every key aspect of the dropshipping workflow. This platform is designed to help businesses focus on growth by managing the time-intensive processes involved in product sourcing, inventory management, order fulfillment, and customer support.

DroPilot provides an intuitive system for setting up personalized e-commerce stores using customizable templates and user-friendly design tools. It automates the identification of trending and high-performing products through AI-driven web scraping, natural language processing (NLP), and sentiment analysis. The platform imports product data, including descriptions, images, pricing, and inventory status, directly from reliable suppliers and keeps this information synchronized in real-time using webhooks and RESTful APIs. This ensures that stock levels and pricing are always accurate, minimizing the risk of overselling or underpricing.

To streamline order processing, DroPilot automates order forwarding, ensuring that customer details and shipping information are transmitted accurately to suppliers. The platform also supports automatic invoice generation, improving operational efficiency and reducing human error. By integrating advanced analytics and reporting tools, DroPilot offers insights into sales performance, profit margins, and customer trends, enabling data-driven decision-making.

The platform also features an AI-powered chatbot to provide 24/7 customer support. Using NLP, the chatbot can handle common inquiries, such as product details, and basic troubleshooting, ensuring quick and accurate responses to customer queries and enhancing overall customer satisfaction.

Additional features like photo verification using computer vision help maintain the quality of product listings by ensuring that images match descriptions. SEO optimization tools generate AI-driven product descriptions, metadata and keywords to improve search engine rankings and increase store visibility.

By combining AI and automation across these processes, DroPilot reduces manual effort, minimizes errors, and boosts the efficiency of dropshipping businesses, ultimately helping entrepreneurs scale their operations and maximize profitability.

1 Project Introduction

A project introduction is a document that provides an overview of a project and its purpose, objectives, and scope. It is typically used to introduce the project to stakeholders, such as project sponsors, team members, and customers, and to provide a common understanding of the project's goals and deliverables.

1.1 Introduction

In today's highly competitive e-commerce industry, efficiently managing and scaling a dropshipping business requires advanced technological solutions to overcome many challenges. Dropshippers are tasked with identifying high-demand products, dynamically adjusting pricing, ensuring real-time inventory updates, and providing excellent customer experiences to remain competitive in a saturated market. Traditional manual methods are no longer sufficient to handle these complexities, emphasizing the need for a robust and automated solution.

DroPilot is an AI-driven automation system, designed to address the challenges of modern dropshipping. By using advanced technologies, DroPilot enhances operational efficiency and decision-making processes through its feature set.

Key functionalities include:

1. **Product Hunting**:
   Utilizing advanced web scraping techniques, DroPilot automates the identification of trending and high-performing products across multiple platforms. By employing machine learning algorithms and natural language processing (NLP), the system extracts and analyzes product data such as descriptions, ratings, and reviews to pinpoint potential best-sellers. This feature helps dropshippers quickly find the best products to add to their stores.

2. **Real-Time Stock and Pricing Synchronization**:
   DroPilot integrates seamlessly with supplier systems through webhooks, ensuring real-time synchronization of stock levels and pricing data. This dynamic linkage minimizes the risk of overselling or underpricing, as updates are pushed instantly from suppliers to the platform. DroPilot uses industry-standard RESTful APIs to ensure secure, fast, and scalable communication channels.

3. **Review Aggregation and Product Comparison**:
   Through advanced data aggregation, DroPilot collects customer reviews and ratings from multiple sources to provide a comprehensive analysis of product performance. Sentiment analysis powered by AI categorizes reviews, allowing users to evaluate the quality, popularity, and customer satisfaction of products. Comparative analytics tools present these findings in a structured format, assisting in selecting the best products for listing.

4. **Photo Verification Using Computer Vision**:
DroPilot employs computer vision technology to analyze and verify the photos of listed products. This feature ensures that uploaded images match the corresponding product descriptions and specifications. By detecting discrepancies or irrelevant images, this tool maintains the quality and trustworthiness of product listings, reducing the likelihood of customer dissatisfaction.

5. **Store Creation**:
DroPilot provides an intuitive platform for creating and managing online stores. With customizable templates and design features, users can deploy professional storefronts quickly.

6. **Order Automation**:
DroPilot automates the order fulfillment process by securely transmitting order details to suppliers. The system ensures that customer details, shipping preferences, and product information are accurately sent and monitored in real-time, reducing manual intervention and errors.

7. **SEO Optimization & AI Copy-writing**:
DroPilot includes an SEO optimization module that analyzes product listings and generates recommendations for improved visibility. Using AI, the system generates SEO-friendly product descriptions, metadata and suggests keyword strategies to target markets. By improving search engine rankings, this feature drives organic traffic and enhances discoverability.

8. **AI-Powered Customer Support Chatbot**:
DroPilot includes an AI chatbot to handle customer questions and issues. The chatbot uses natural language processing (NLP) to understand queries and provide instant, accurate responses. It can manage tasks like answering order-related questions and solving basic problems.

9. **Analytics and Reporting**:
DroPilot provides advanced analytics and reporting tools, delivering actionable insights into key business metrics such as sales performance, profit margins, and customer trends. Visual dashboards with interactive charts and graphs enable users to monitor and assess their businesses in real time. The reporting module supports data export in formats like PDF and Excel for further analysis and decision-making.

1.2 Objectives

The primary goal of **DroPilot** is to provide a comprehensive, user-friendly automation platform that addresses the core challenges of running a dropshipping business. By leveraging the power of AI, we aim to:

1. **Streamline Product Sourcing and Selection**
   Automate the process of identifying, sourcing, and importing trending products from reliable suppliers.

2. **Monitor Real-Time Inventory and Pricing Management:**
   Ensure accurate and up-to-date stock levels and pricing through real-time synchronization with suppliers.

3. **Automate Order Fulfillment and Processing:**
   Simplify and speed up the order processing by automating the transmission of order details to suppliers.

4. **Improve Customer Service with AI-Powered Support:**
   Enhance customer experience by providing instant and accurate responses through an AI-powered chatbot.

5. **Provide Actionable Business Insights through Analytics:**
   Offer detailed sales and performance reports to help dropshippers make data-driven decisions.

6. **Optimize Product Listings with SEO Enhancements:**
   Improve product visibility and ranking on search engines by generating SEO-friendly descriptions and keywords.

7. **Reduce Operational Risks and Maximize Profit Margins:**
   Use AI to analyze supplier reliability, profit margins, and other factors to minimize risks and optimize returns.

8. **Simplify and Accelerate Decision-Making for Dropshippers:**
   Provide intelligent, data-driven insights to streamline decision-making and enhance business efficiency.

9. **Verify Product Photos Using Computer Vision:**
   Ensure the accuracy and relevance of product images by leveraging computer vision to detect discrepancies and maintain high-quality listings.

10. **Provide Users with Functional Online Stores:**
    Deliver a platform that enables users to easily create fully functional online stores, complete with customizable templates and design features.

1.3 Problem statement

Managing a dropshipping business involves multiple complex tasks, including identifying trending products, maintaining real-time stock and price updates, ensuring seamless order fulfillment, and providing exceptional customer support. Traditional manual methods are inefficient, error-prone, and time-consuming, leading to delays, poor customer experiences, and missed business opportunities. Furthermore, dropshippers struggle with sourcing reliable suppliers, managing large volumes of data, and optimizing their business operations for maximum profitability. These challenges delays the growth and scalability of dropshipping businesses, making it necessary to adopt an automated and AI-powered solution to streamline processes, reduce operational risks, and enhance overall business performance.

DroPilot resolves these challenges by offering a one-stop solution that automates critical operations and provides data-driven insights to support growth

1.4 Assumptions & constraints

1.4.1 Assumptions

1. **Stable Internet Connection**: A reliable internet connection is assumed for seamless data exchange with suppliers.
2. **User Access to Platforms**: It is assumed that users have access to the necessary platforms, such as supplier dashboards, payment gateways, and other third-party services.
3. **Proper Data Formatting**: It is assumed that data provided by users and suppliers will follow consistent and compatible formats for easy integration and processing.
4. **AI Module Training**: The AI components, such as product selection and customer support chatbots, will be trained with sufficient historical data to make accurate recommendations and responses.

1.4.2 Constraints

1. **External Dependency**: The effectiveness of the platform is dependent on the reliability and performance of third-party services, such as payment providers etc.
2. **Data Privacy and Security**: Compliance with data privacy regulations, such as GDPR, is a constraint when handling sensitive user information, particularly payment data.
3. **Scalability Limitations**: As the user base grows, there may be challenges in maintaining system performance, requiring continuous infrastructure scaling.
4. **Supplier Integration Compatibility**: The integration process may be constrained by variations in the format, structure, or availability of data provided by different suppliers.
5. **AI Accuracy**: The accuracy of AI models, such as sentiment analysis and product recommendations, depends on the quality and diversity of training data, which may affect performance if the data is insufficient or unbalanced.
6. **Cost of Integration**: Implementing and maintaining third-party API integrations, such as payment gateways etc, may incur additional costs that could impact the overall budget.

7. **Website Structure Changes:** Frequent changes in the structure of target websites may break scraping scripts, requiring constant updates and maintenance of web scraping systems to ensure continuous data collection.

8. **Rate Limiting and IP Blocking:** Websites may implement rate limiting or IP blocking mechanisms to prevent scraping, which could lead to disruptions in data collection if appropriate measures (such as rotating proxies or delay strategies) are not in place.

9. **Data Quality and Completeness:** Web scraping may result in incomplete, inaccurate, or outdated data, as scraped information depends on the consistency and accuracy of the publicly available content on external websites.

1.5 Project scope:

The project aims to develop and implement **DroPilot**, an AI-powered automation platform for dropshipping businesses. DroPilot will streamline key business processes such as product sourcing, order fulfillment, customer support, and inventory management, providing dropshippers with an intelligent, data-driven solution for optimizing their operations. Scope Includes**:**

- **Online Store Creation and Customization:**
  Provide users with a fully functional online store that includes design features and customizable themes, allowing them to easily set up and personalize their storefront to match their brand identity.

- **Real-Time Stock and Pricing Synchronization**:
  Integration with supplier stores to ensure real-time synchronization of stock levels and pricing, preventing overselling or underpricing.

- **Product Sourcing and Selection**:
  Automated product identification through web scraping and AI-based analysis to source trending and profitable products from reliable suppliers.

- **Order Automation**:
  Automation of the order fulfillment process, including the secure transmission of order details to suppliers and shipping carriers for seamless processing.

- **AI-Powered Customer Support**:
  Development of a chatbot powered by natural language processing (NLP) to handle customer inquiries, and resolve common issues autonomously.

- **Analytics and Reporting**:
  Provide advanced analytics dashboards for tracking business metrics such as sales performance, profit margins, and customer trends, allowing for informed decision-making.

- **SEO Optimization**:
  Integration of an SEO module that generates SEO-friendly product descriptions, optimizes keyword strategies, and enhances product visibility on search engines.

- **Supplier Integration**:
  Establishing secure, scalable connections with supplier stores to facilitate smooth product importation and continuous synchronization with the platform.

- **Profit Margin Optimization**:
  AI-driven analysis of supplier reliability and profit margins to suggest optimal product selections, reducing risks and maximizing returns.

- **Comprehensive Documentation**:
  Deliver detailed user documentation covering system setup, use cases, and scalability options.

- **Extensive Testing and Feedback**:
  Conduct thorough testing of the platform's features and usability, refining the system based on user feedback.

2   Requirements Analysis

Requirement analysis is the process of gathering and documenting the requirements for a system or product. It involves identifying the needs and goals of the stakeholders, such as users, customers, and project sponsors, and determining how the system or product will meet those needs.

The goal of requirement analysis is to ensure that the system or product is designed and developed to meet the needs of the stakeholders. It is a crucial step in the software development process as it helps to define the scope of the project and establish a common understanding of the requirements among all team members.

2.1   Literature review / Existing system study:

2.1.1   Dropy.ai [1]:

Dropy.AI aims to simplify dropshipping by automating core tasks with AI. It helps users find products, keeps stores updated with new items, and offers an AI-driven customer support system. While the brand spy tool is useful for checking competitors' strategies, it's not revolutionary and might not always provide a clear advantage.

2.1.2   AutoDS [2]:

AutoDS is known for being easy to use, especially for beginners, but it's fairly basic. It automates routine tasks like processing orders and adjusting prices when suppliers change them. You can quickly import products from platforms like AliExpress, though it can feel limited if you're looking for more advanced customization or control.

2.1.3   Glitching AI [3]:

Glitching AI offers tools to discover trending products and manage orders, but its standout feature is access to a network of suppliers. However, the platform's analytics are decent but not as in-depth as some users might want, and while the automated marketing tools are convenient, they can feel generic without much personalization.

2.1.4   Sell The Trend [4]:

Sell The Trend gives access to over 7 million products and lets you fulfill orders with one click. Its NEXUS tool helps track competitors' trends, but some may find it overwhelming due to the sheer volume of data. The built-in marketing tools are functional but won't blow you away if you're expecting cutting-edge features.

2.1.5   Inventory Source [5]:

Inventory Source is a dropshipping platform that features an integrated dropship supplier directory available for free. It automates inventory management, product data updates, and order processing, making it easy to streamline the dropshipping process and recover time to grow the business. The platform also provides integration with other e-commerce platforms.

2.1.6 Shine Commerce [6]:

Shine Commerce is an e-commerce solution that offers dropshipping automation tools, including product sourcing and order fulfillment services. The platform also provides integration with other e-commerce platforms.Shine Commerce also features analytics tools to track sales performance and optimize inventory management.

2.2 Stakeholder's list (Actors):

A stakeholders list is a document that identifies the individuals, groups, or organizations that are stakeholders in a project or business. Stakeholders are individuals or groups that have a vested interest in the success or failure of the project or business.

2.2.1 Store Owner

Store owners use DroPilot to manage dropshipping operations, including product listings, inventory, orders, and analytics, while automating routine tasks.

2.2.2 Customer

Customers shop on e-commerce stores powered by DroPilot, using responsive websites and AI chatbots for inquiries, and provide feedback on products and shopping experiences.

2.2.3 Suppliers

Suppliers provide products for DroPilot-powered stores, ensuring accurate information, timely order fulfillment, and quality shipping.

2.2.4 Admin

Admins oversee DroPilot's operations, ensuring platform performance, user satisfaction, and compliance with regulations.

2.3 Requirement's elicitation

Requirement elicitation is the process of gathering the requirements for a system or product. It involves identifying the needs and goals of the stakeholders and determining how the system or product will meet those needs.

2.3.1 Functional requirements

FR01: Authentication & Onboarding

- **FR01-01: User Registration (Sign Up)**

Table 1FR01-01: User Registration (Sign Up)

FR01-01-01	The system shall allow users to register by providing their email, password, and basic account information.

i	The system shall validate the user information before creating an account to ensure a valid email format and a strong password policy.
ii	The system shall send an email verification link to the user after successful registration to confirm the email address
iii	The registration process shall ensure secure data handling by encrypting passwords using industry-standard encryption methods.

- **FR01-02: User Login (Sign In)**

Table 2 FR01-02: User Login (Sign In)

FR01-02-01	The system shall allow registered users to log in using their email and password.
i	The system shall validate user credentials to ensure that only registered users can access their accounts.
ii	The system shall provide options for password recovery through email, which includes sending a reset link to the registered email address.
iii	The login system shall protect against brute force attacks by implementing a lockout mechanism after multiple failed attempts.

- **FR01-03: User Onboarding**

Table 3 FR01-03: User Onboarding

FR01-03-02	The system shall guide the user through the onboarding experience to create their first store.
i	The onboarding process shall include interactive tutorials and prompts to assist users in setting up their store.
ii	The system shall offer templates and quick-start configurations to streamline the onboarding experience.

FR02: Payment Integration

Table 4 FR02: Payment Integration

FR02-01	The system shall integrate with popular payment systems to facilitate transactions.
i	The system shall support integrations with Stripe
ii	The payment integration shall ensure secure processing by complying with PCI DSS (Payment Card Industry Data Security Standard).

FR03: Stock Management

- **FR03-01: Real-time Stock Updates**

Table 5 FR03-01: Real-time Stock Updates

FR03-01-01	The system shall automatically update product stock levels from drop-shipping suppliers.
i	The system shall connect with supplier's store to receive real-time inventory data.
ii	Stock updates shall reflect in the store's inventory dashboard within seconds of a change from the supplier.
iii	The system shall handle stock discrepancies and notify the user of any synchronization issues.

- **FR03-02: Low Stock Alerts**

Table 6 FR03-02: Low Stock Alerts

FR03-02-01	The system shall notify store owners when stock for certain products is running low.
i	The system shall set a threshold for low stock alerts
ii	Notifications shall be sent via email and displayed in the store dashboard.

iii	The system shall prioritize low stock alerts for high-demand products.

FR04: Order Management

- **FR04-01: Order Processing**

Table 7 FR04-01: Order Processing

FR04-01-01	The system shall automatically forward order details to the drop-shipping supplier for fulfillment.
I	The system shall send order details to the supplier
Ii	Order processing shall include customer details, shipping preferences, and product information.
Iii	The system shall confirm successful transmission of order data to the supplier.

- **FR04-02:** Automatic Invoice Generation

Table 8 FR04-02: Automatic Invoice Generation

FR04-02-01	The system shall generate and email invoices to customers automatically after order confirmation.
i	Invoices shall include product details, pricing, and customer information.
ii	The system shall format invoices to comply with standard accounting practices.

FR05: Product Management

- **FR05-01: Product Sourcing**

Table 9 FR05-01: Product Sourcing

FR05-01-01	The system shall automatically fetch product data from drop-shipping suppliers.
I	The system shall support integration with trusted suppliers.

Ii	Product data shall include descriptions, images, and pricing.
iii	Users shall have the option to review and modify fetched product data before listing it in their store.

- **FR05-02: AI-Enhanced Product Descriptions**

Table 10 FR05-02: AI-Enhanced Product Descriptions

FR05-02-01	The system shall use AI to generate SEO-optimized product titles, descriptions, and tags.
i	AI-generated content shall be customizable to fit different marketing strategies.
ii	The system shall evaluate product keywords and trends to improve search engine visibility.
iii	Users shall have the option to edit AI-suggested descriptions before publishing.

FR06: Store Creation & Setup

- **FR06-01: Store Setup**

Table 11 FR06-01: Store Setup

FR06-01-01	The system shall assist users in creating a fully functional e-commerce store.
i	The setup wizard shall include prompts for branding elements, such as logos and themes.
ii	Users shall receive recommendations for optimizing their store layout and content.

- **FR06-02: Template Selection**

Table 12 FR06-02: Template Selection

FR06-02-01	The system shall provide users with a range of pre-designed store templates.
I	Templates shall be categorized by industry and design style.
Ii	Users shall preview templates before selecting them for their store.
Iii	Templates shall be customizable after selection.

- **FR06-03:** Customization Options

Table 13 FR06-03: Customization Options

FR06-03-01	The system shall allow users to modify the layout, colors, fonts, and overall design.
i	Customization tools shall include a user-friendly interface for real-time changes
ii	Users shall save changes and revert to previous versions if needed.

- **FR06-04:** Domain Integration

Table 14 FR06-04: Domain Integration

FR06-04-01	The system shall offer an option for users to use a custom domain or a subdomain provided by DroPilot.
i	Domain setup shall include step-by-step instructions for connecting external domains.
ii	The system shall provide SSL certificates for secure browsing.
iii	Users shall receive domain management support.

FR07: Analytics & Reporting

- **FR07-01: Sales Report**

Table 15 FR07-01: Sales Report

FR06-01-01	The system shall generate reports on daily, weekly, or monthly sales performance.
I	Sales data shall include metrics such as total revenue, best-selling products, and average order value.
Ii	Users shall have the option to export reports in standard file formats.
Iii	Reports shall include visual representations like charts and graphs for better comprehension.

- **FR07-02: Product Profitability Analysis**

Table 16 FR07-02: Product Profitability Analysis

FR06-02-01	The system shall offer detailed insights into product profitability, including costs and margins to help users understand financial performance.
I	Profit analysis shall include metrics such as gross and net profit calculations.
ii	The system shall automatically highlight the most profitable products and suggest potential areas for reducing costs or optimizing product margins.
iii	Users shall be able to access a detailed cost breakdown that includes product prices, shipping fees, supplier fees, and overall revenue to help them make informed decisions.

2.3.2 Non-functional requirements

- **NFR01: Performance**

Table 17 NFR01: Performance

NFR01-01	Home page must load within 10 seconds.
NFR01-02	System must respond within 10 seconds on user request.

- **NFR02: User Friendly**

Table 18 NFR02: User Friendly

NFR02-01	Display of our application will be very user friendly.

- **NFR03: Portability**

Table 19 NFR03: Portability

NFR03-01	Our web application can be operating on any platform. (Mac, Windows, Linux)
NFR03-02	Our mobile application can be operating on Android platform.

- **NFR04: Accuracy**

Table 20 NFR04: Accuracy

NFR04-01	Our application will generate results that will be reasonably accurate.

- **NFR05: Disaster Recovery**

Table 21 NFR05: Disaster Recovery

NFR05-01	If system crashes, all data should be recoverable within 30 minutes of the crash.

- **NFR06: Defect Maintenance**

Table 22 NFR06: Defect Maintenance

NFR06-01	Post release bug fixing should not take more than 4 hours.

- **NFR07: Security**

Table 23 NFR07: Security

NFR07-01	No user can access database except the Admin.
NFR07-02	System must provide access only through login module to authorized users.

2.3.3 Requirement's Traceability Matrix

Table 24 Requirement's traceability matric

Requirement's Traceability Matrix					
Project Name	DroPilot **– AI Assisted Dropshipping Automation**				
Project Supervisor	**Dr. Atif Saeed**				
Requirement No.	**Requirement Description**	**Use Case**	**Test Case**	**Activity Diagram**	**Sequence Diagram**
FR01	User Registration (Sign Up)	UC-01	TC-01	AD-01	SD-01
FR02	User Login (Sign In)	UC-02	TC-02	AD-02	SD-02
FR03	User Onboarding	UC-03	TC-03	AD-01	SD-01
FR04	Payment Integration	UC-04	TC-04	AD-05	SD-05
FR05	Real-time Stock Updates	UC-05	TC-05	AD-04	SD-04
FR06	Low Stock Alerts	UC-06	TC-06	AD-04	SD-04
FR07	Order Processing	UC-07	TC-07	AD-09	SD-05
FR08	Automatic Invoice Generation	UC-08	TC-08	AD-08	SD-05
FR09	Product Sourcing	UC-09	TC-09	AD-07	SD-04

FR10	AI-Enhanced Product Descriptions	UC-10	TC-10	AD-07	SD-04
FR11	Store Setup	UC-11	TC-11	AD-06	SD-03
FR12	Template Selection	UC-12	TC-12	AD-01	SD-01
FR13	Customization Options	UC-13	TC-13	AD-01	SD-01
FR14	Domain Integration	UC-14	TC-14	AD-11	SD-03
FR15	Sales Report	UC-15	TC-15	AD-10	SD-06
FR16	Product Profitability Analysis	UC-16	TC-16	AD-10	SD-06

2.4 Use Case Descriptions

Use case descriptions are an important part of the software development process as they help to define the requirements for a system or product and ensure that it meets the needs of the end users. They are typically used to create user stories or acceptance criteria, which are used to guide the development and testing of the system or product.

2.4.1 UC-01: User Registration

Table 25 UC-01: User Registration

Use Case ID	1
Name	User Registration
Actors	User, System
Description	User registers an account by providing required information.
Pre-Condition	User is not registered on the system.
Post-Condition	User account is created successfully.

Normal flow of Events	• User provides required information for registration. • System validates the information • System sends an email verification
Alternative Flow	Invalid user input leads to an error message.
Exception	System failure prevents account creation.

2.4.2 UC-02: Login User

Table 26 UC-02: Login User

Use Case ID	2
Name	Login User
Actors	User, System
Description	User logs into their account using valid credentials.
Pre-Condition	User account must exist and be verified.
Post-Condition	User is logged into the system successfully.
Normal flow of Events	• User enters login credentials. • System validates credentials • If incorrect credentials are provided repeatedly, a lockout mechanism is implemented • If forgotten password, provide password recovery
Alternative Flow	Incorrect login credentials prompt an error.
Exception	System fails to authenticate due to server error.

2.4.3 UC-03: User Onboarding

Table 27 UC-03: User Onboarding

Use Case ID	3
Name	User Onboarding
Actors	User, System
Description	Guide the user through the onboarding process after successful registration or login.
Pre-Condition	User is logged in.
Post-Condition	User is onboarded successfully with helpful resources.
Normal flow of Events	• System provides an onboarding guide. • System shows interactive tutorials

	• System offers templates or quick-start configurations
Alternative Flow	
Exception	Tutorials or templates fail to load.

2.4.4 UC-04: Payment Integration

Table 28 UC-04: Payment Integration

Use Case ID	4
Name	Payment Integration
Actors	User, System, Payment Provider
Description	User integrates payment systems such as Stripe for their store.
Pre-Condition	User is logged in.
Post-Condition	Payment system is successfully integrated.
Normal flow of Events	• System ensures secure payment processing • System complies with PCI DSS standards
Alternative Flow	Payment provider rejects integration request.
Exception	Security compliance issues cause integration failure.

2.4.5 UC-05: Real-Time Stock Updates

Table 29 Real-Time Stock Updates

Use Case ID	5
Name	Real-Time Stock Updates
Actors	User, System, Supplier
Description	Automatically update product stock levels using supplier's store.
Pre-Condition	Supplier's store must be accessible.
Post-Condition	Stock levels are updated automatically in the system.
Normal flow of Events	• System connects with supplier's store • System updates product stock levels. • System handles stock discrepancies if any • System notifies user of synchronization issues
Alternative Flow	Supplier's store fails to respond.

Exception	Network issues prevent connection.

2.4.6 UC-06: Low Stock Alerts

Table 30 UC-06: Low Stock Alerts

Use Case ID	6
Name	Low Stock Alerts
Actors	User (Store Owner), System
Description	Notify the user when stock levels fall below a specified threshold.
Pre-Condition	Low stock threshold is set in the system.
Post-Condition	User is notified of low stock levels.
Normal flow of Events	• System monitors stock levels. • System sends notifications when stock levels fall below the threshold • System prioritizes alerts for high-demand products
Alternative Flow	
Exception	System fails to send notifications.

2.4.7 UC-07: Order Processing

Table 31 UC-07: Order Processing

Use Case ID	7
Name	Order Processing
Actors	User, System, Supplier
Description	Forward order details to the supplier for fulfilment.
Pre-Condition	Order must be created and confirmed.
Post-Condition	Order details are securely transmitted to the supplier.
Normal flow of Events	• System compiles customer and order details. • System securely sends order details • System includes customer details and product information • System confirms successful transmission of order data.
Alternative Flow	
Exception	Network issues or server errors prevent data transmission.

2.4.8 UC-08: Automatic Invoice Generation

Table 32 Automatic Invoice Generation

Use Case ID	8
Name	Automatic Invoice Generation
Actors	System, Customer
Description	Automatically generate invoices upon order confirmation.
Pre-Condition	Order must be confirmed.
Post-Condition	Invoice is generated and sent to the customer.
Normal flow of Events	• System generates an invoice after order confirmation. • System includes product details, pricing, and customer information • System formats invoice according to accounting standards • Invoice is sent to the customer's email.
Alternative Flow	
Exception	System fails to generate the invoice.

2.4.9 UC-09: Product Sourcing

Table 33 UC-09: Product Sourcing

Use Case ID	9
Name	Product Sourcing
Actors	System, Supplier
Description	Automatically fetch product data from supplier systems.
Pre-Condition	System must be connected to the supplier's store.
Post-Condition	Product data is fetched and available for review.
Normal flow of Events	• System connects to supplier's store. • System fetches product descriptions, images, and pricing • User reviews and modifies fetched product data
Alternative Flow	
Exception	Connection issues prevent data fetching.

2.4.10 UC-10: AI-Enhanced Product Descriptions

Table 34 UC-10: AI-Enhanced Product Descriptions

Use Case ID	10
Name	AI-Enhanced Product Descriptions
Actors	User, System
Description	AI generates SEO-friendly product descriptions for enhanced marketing.
Pre-Condition	Product details must be available in the system.
Post-Condition	SEO-optimized product descriptions are generated and editable by the user.
Normal flow of Events	• System generates SEO-optimized product descriptions using AI. • System analyzes keywords and trends for improved SEO • User edits AI-suggested descriptions
Alternative Flow	
Exception	AI module fails to generate descriptions.

2.4.11 UC-11: Store Creation

Table 35 UC-11: Store Creation

Use Case ID	11
Name	Store Creation
Actors	User, System
Description	System helps the user set up an e-commerce store.
Pre-Condition	User must be logged into the system.
Post-Condition	Store is created.
Normal flow of Events	• User initiates the store creation process. • System prompts the user to provide store preferences • System generates product listings
Alternative Flow	
Exception	

2.4.12 UC-12: Template Selection

Table 36 UC-12: Template Selection

Use Case ID	12
Name	Template Selection
Actors	User, System
Description	Provide users with pre-designed templates categorized by style, which they can preview and select.
Pre-Condition	System must have a repository of store templates.
Post-Condition	Selected template is applied to the user's store.
Normal flow of Events	• System displays available templates categorized by industry and design style. • User previews templates. • User selects a template, which is applied to the store. • User customizes the template post-selection.
Alternative Flow	
Exception	System fails to load or display template options.

2.4.13 UC-13: Customization Options

Table 37 UC-13: Customization Options

Use Case ID	13
Name	Customization Options
Actors	User, System
Description	Enable the user to customize the store's design through an intuitive interface.
Pre-Condition	User must have selected a store template.
Post-Condition	Customizations are saved and applied to the store.
Normal flow of Events	• User accesses customization options. • System provides a user-friendly interface for real-time changes • User modifies layout, colors, fonts, and other design elements. • User saves changes or reverts to the previous version
Alternative Flow	User keeps the default template without customization.
Exception	System fails to apply or save changes due to validation errors or technical issues.

2.4.14 UC-14: Domain Integration

Table 38 UC-14: Domain Integration

Use Case ID	14
Name	Domain Integration
Actors	User, System
Description	Allow the user to connect a custom domain or use a subdomain provided by the system.
Pre-Condition	Domain registration and SSL integration features must be active.
Post-Condition	Domain is integrated, and the store is accessible via the chosen domain.
Normal flow of Events	- User chooses between a custom domain or a DroPilot-provided subdomain. - System provides step-by-step instructions for connecting external domains - System integrates SSL certificates for secure browsing - System provides ongoing domain management support
Alternative Flow	User opts not to integrate a custom domain.
Exception	Domain setup fails due to incorrect configurations.

2.4.15 UC-15: Sales Report

Table 39 UC-15: Sales Report

Use Case ID	15
Name	Sales Report
Actors	User, System
Description	Provide detailed sales reports with metrics like revenue, best-selling products, and order value.
Pre-Condition	Sales data must be recorded in the system.
Post-Condition	User can view and export sales reports.
Normal flow of Events	- User selects a reporting period (daily, weekly, monthly). - System generates the sales report, including key metrics like total revenue, best-selling products, and average order value - System provides visual representations like charts and - User exports the report in standard file formats.
Alternative Flow	User customizes the reporting period or filters data.
Exception	Insufficient data prevents report generation.

2.4.16 UC-16: Product Profitability Analysis

Table 40 UC-16: Product Profitability Analysis

Use Case ID	16
Name	Product Profitability Analysis
Actors	User, System
Description	Analyze profitability metrics for products and suggest cost optimizations.
Pre-Condition	Product and sales data must be available in the system.
Post-Condition	Profitability insights are available for review.
Normal flow of Events	• System calculates gross and net profit for each product • System provides a detailed cost breakdown. • System highlights the most profitable products.
Alternative Flow	
Exception	Missing or incomplete data affects the accuracy of profitability analysis.

2.5 Use case design

2.5.1 User Registration
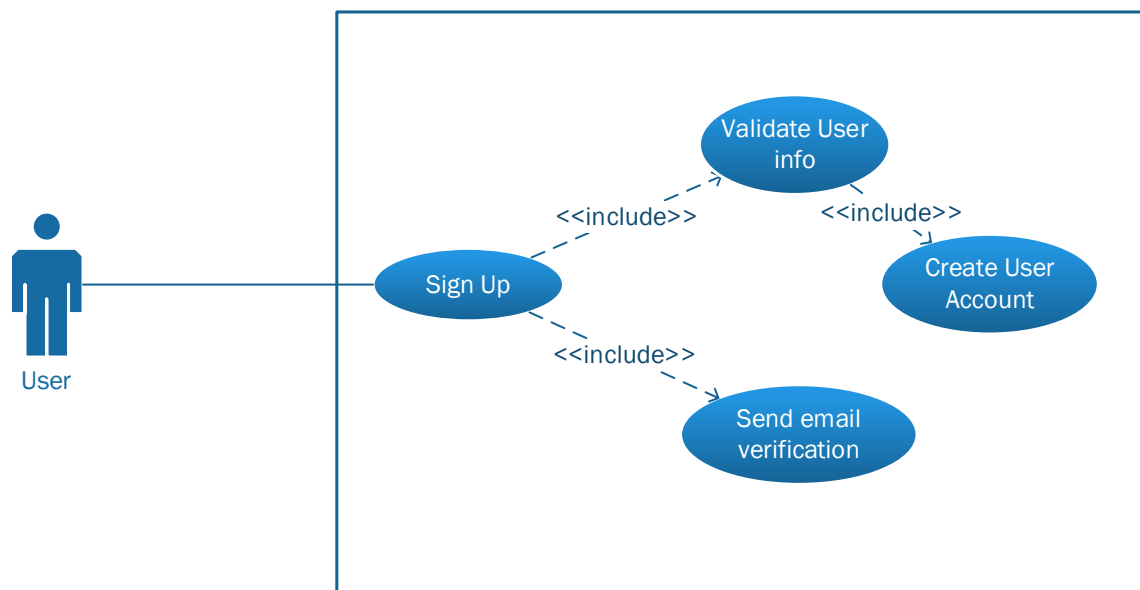
Figure 1 UD-User Registration

2.5.2 Sign In
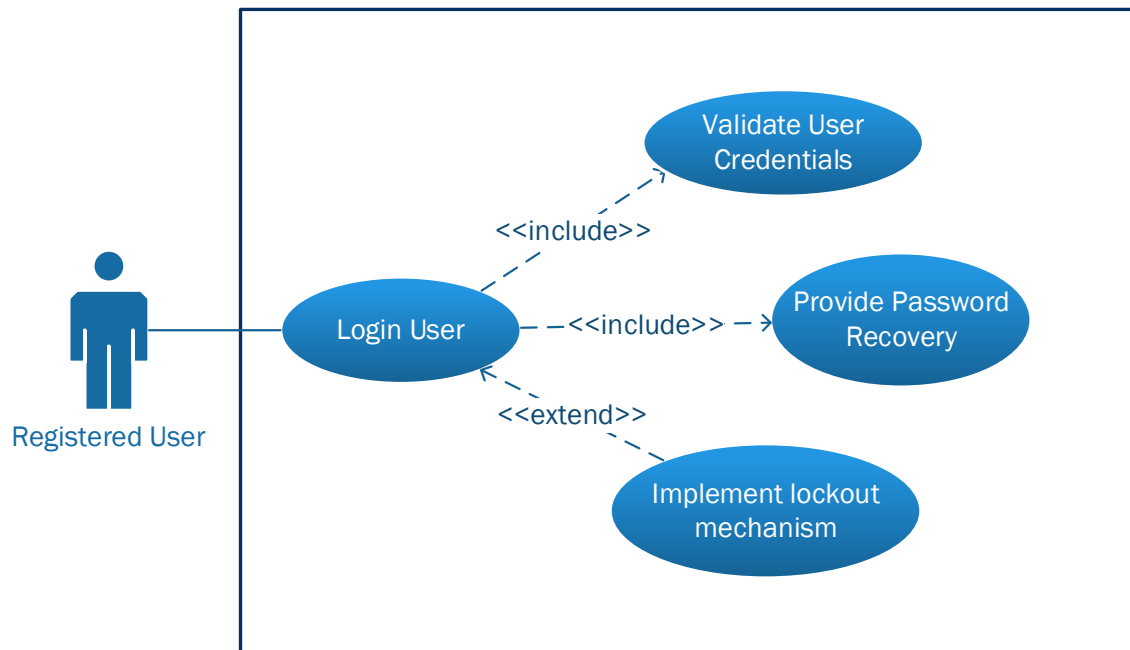
Figure 2 UD-Sign In

2.5.3 User On-boarding
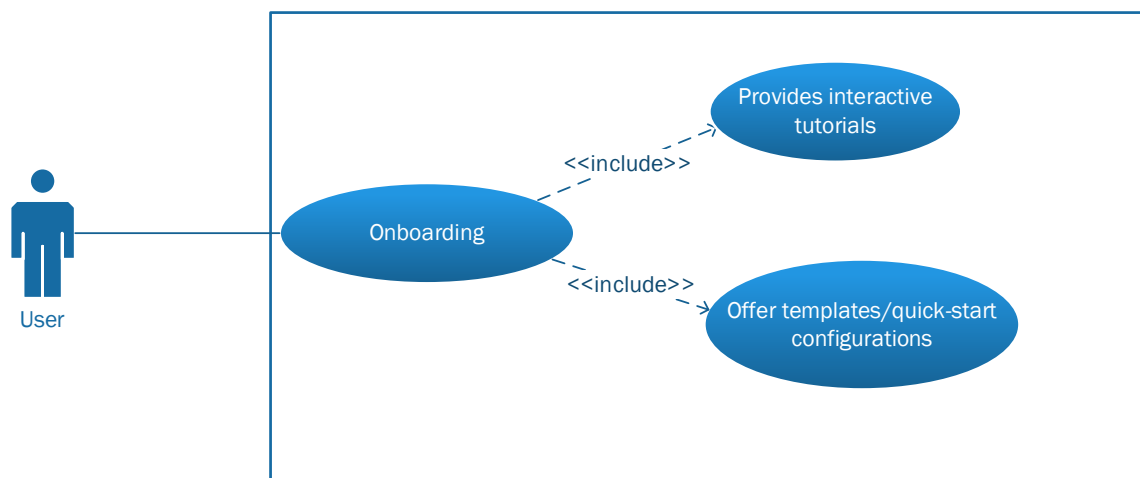
Figure 3 UD-User Onboarding
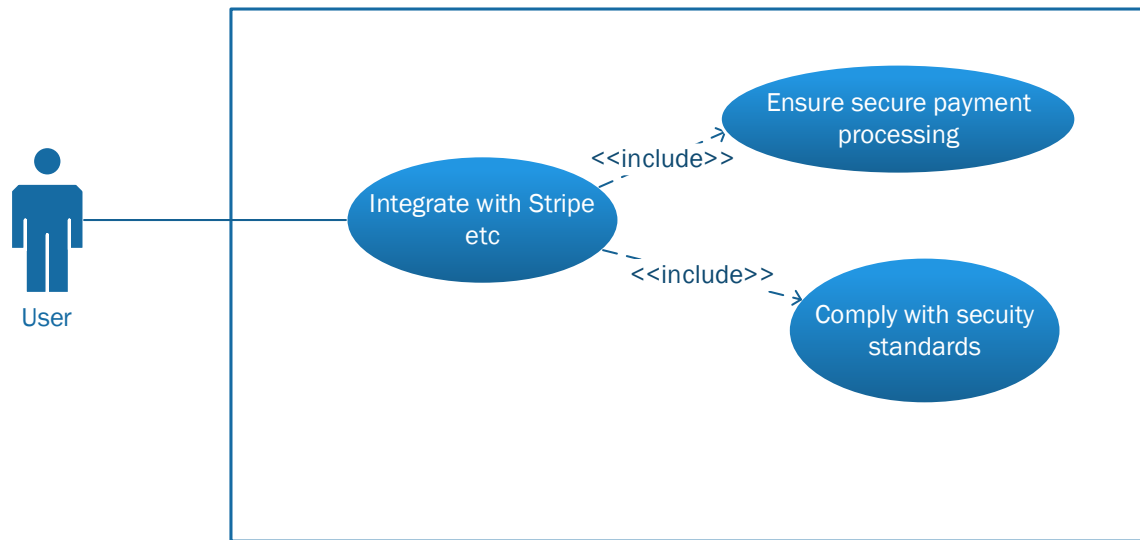
2.5.4 Payment Integration

Figure 4 UD-Payment Integration

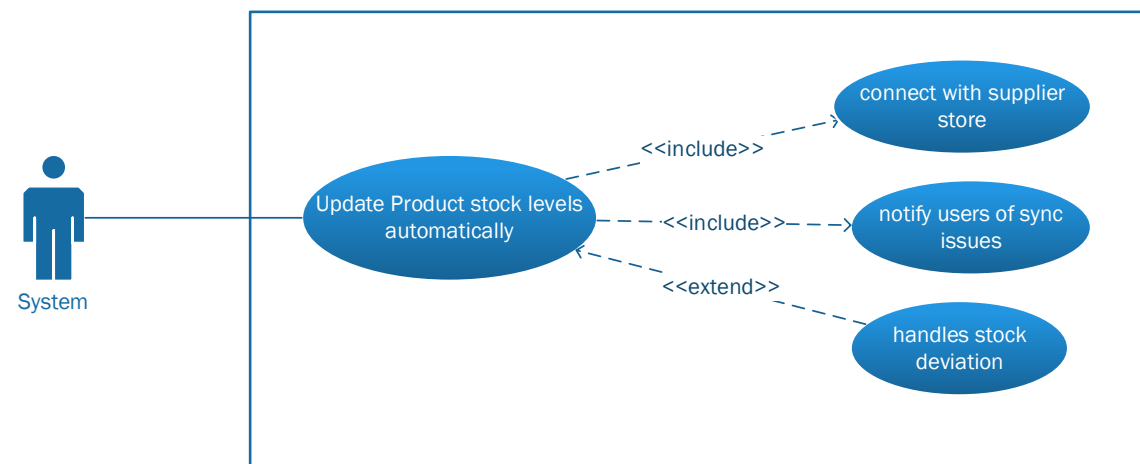### 2.5.5 Real-time Stock Updates

Figure 5 UD- Real-time Stock Updates
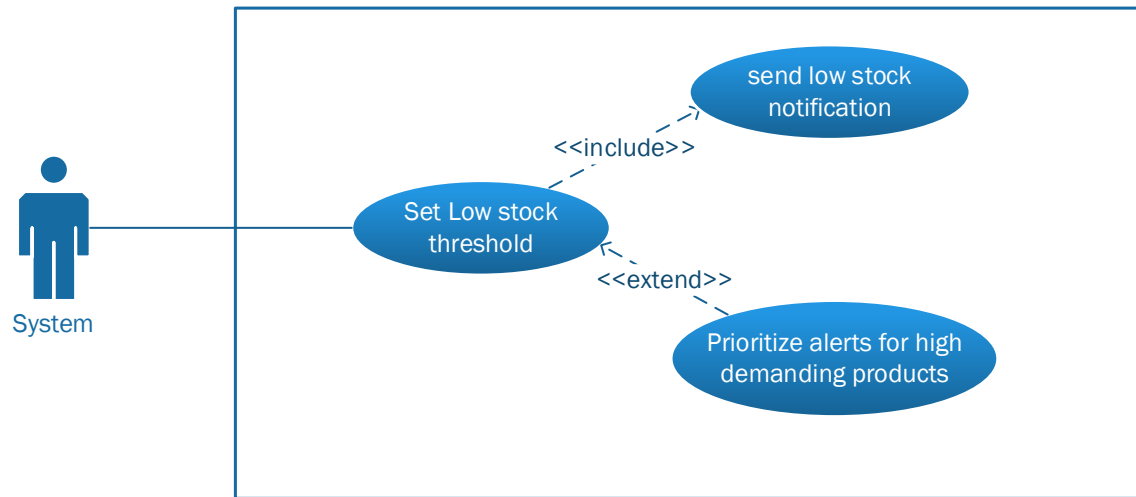
2.5.6 Low Stock Alerts

Figure 6 UD-Low Stock Alerts
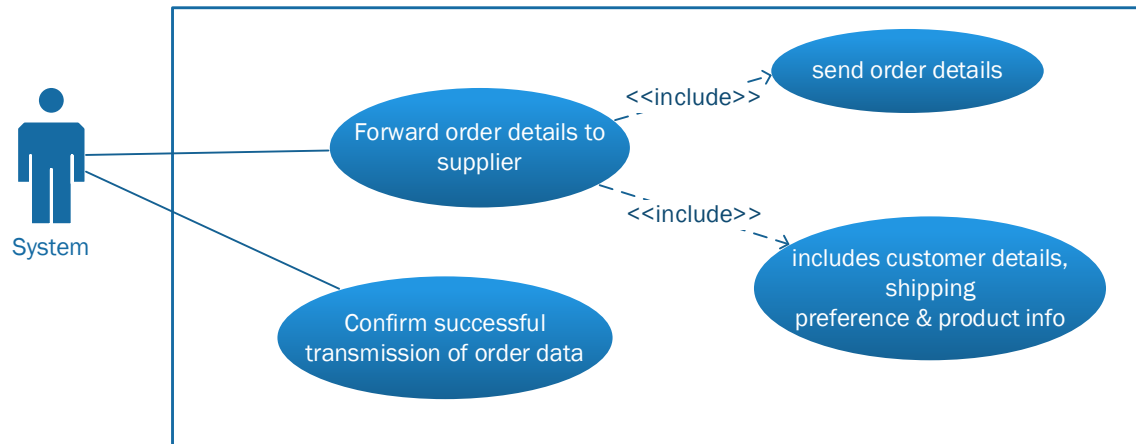
2.5.7 Order Processing

Figure 7 UD-Order Processing
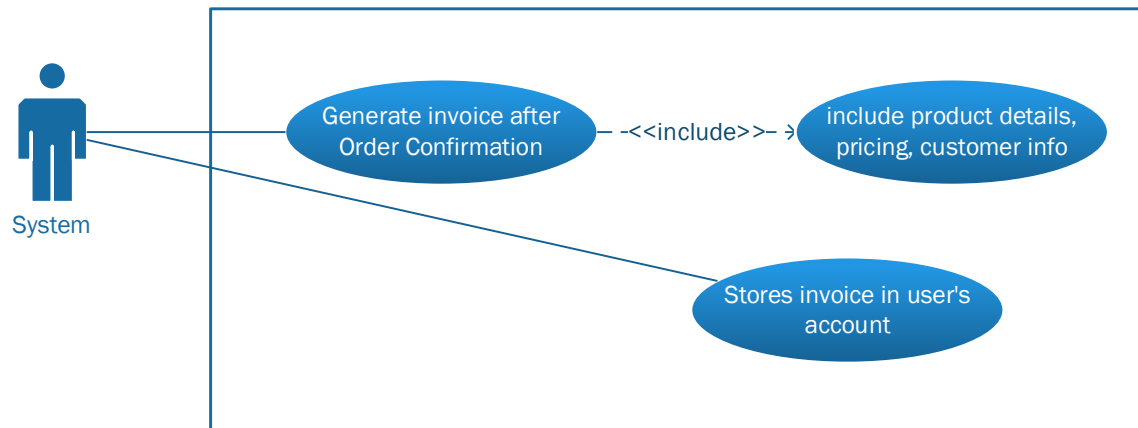
2.5.8 Automatic Invoice Generation

Figure 8 UD-Automatic Invoice Generation
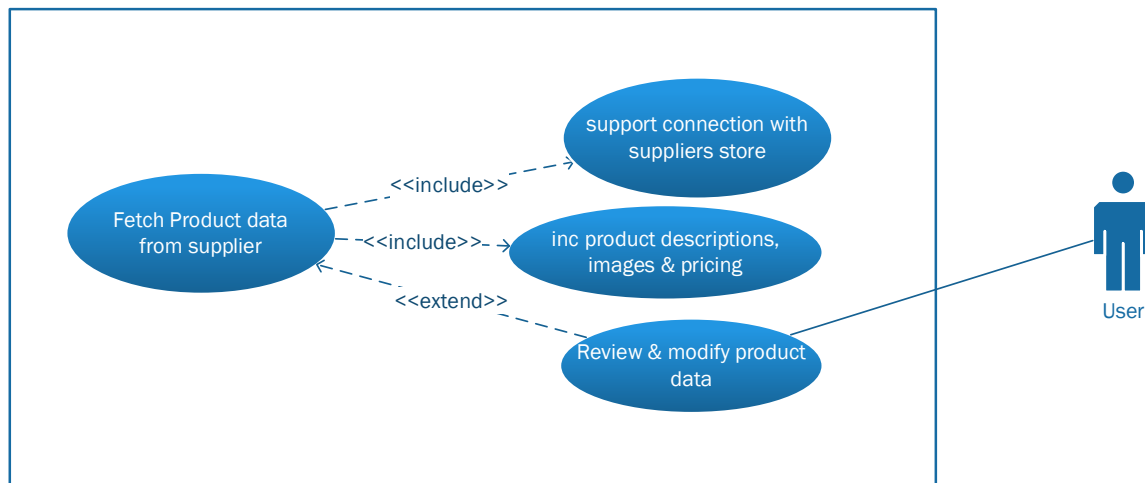
2.5.9 Product Sourcing

Figure 9 UD-Product Sourcing

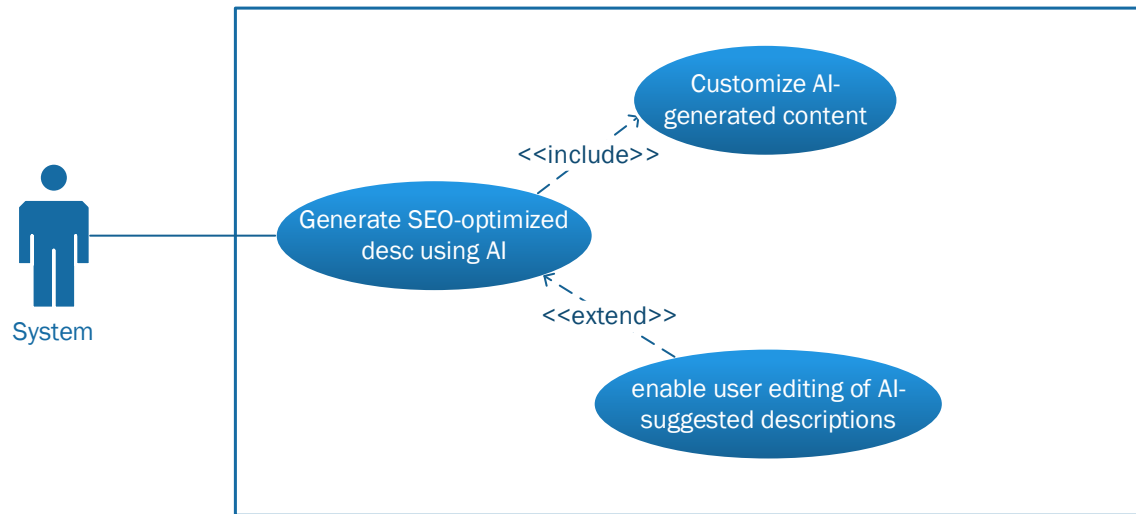## 2.5.10 AI-Enhanced Product Descriptions

Figure 10 AI-Enhanced Product Descriptions
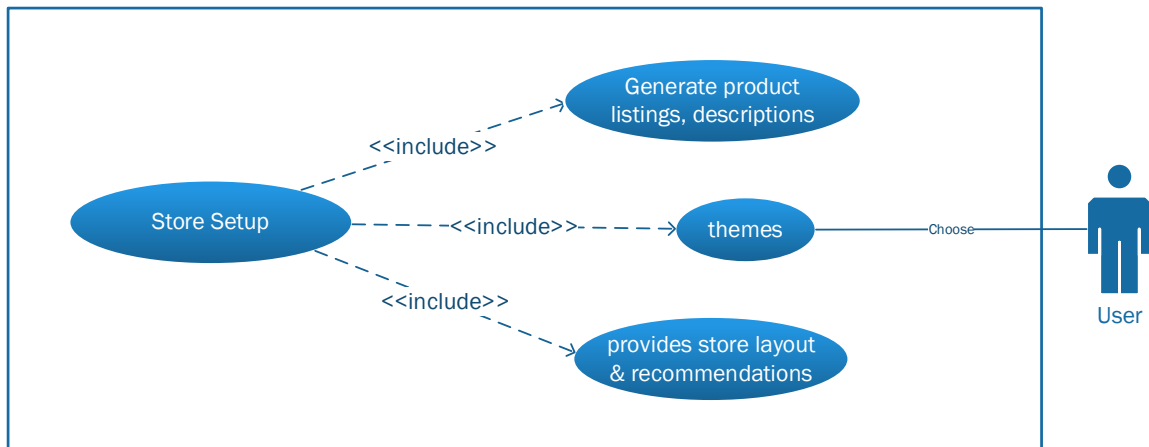
2.5.11 Store Setup

Figure 11 UD-Store Setup
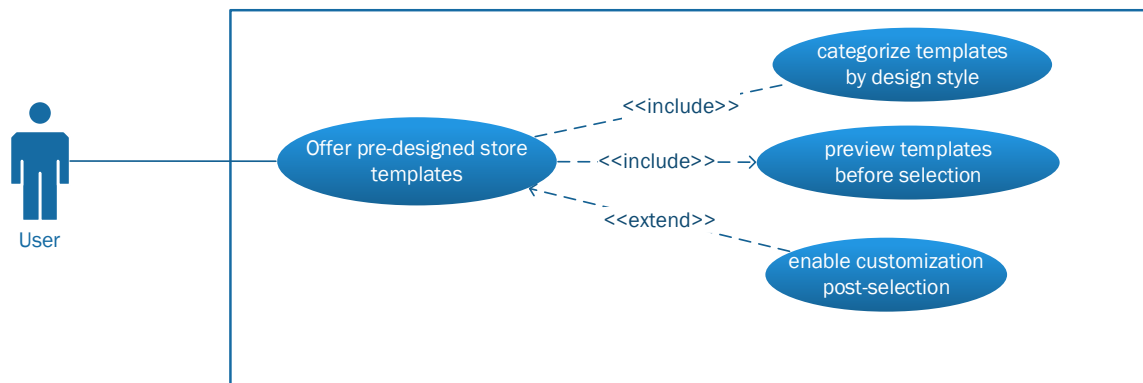
2.5.12 Template Selection

Figure 12 UD-Template Selection

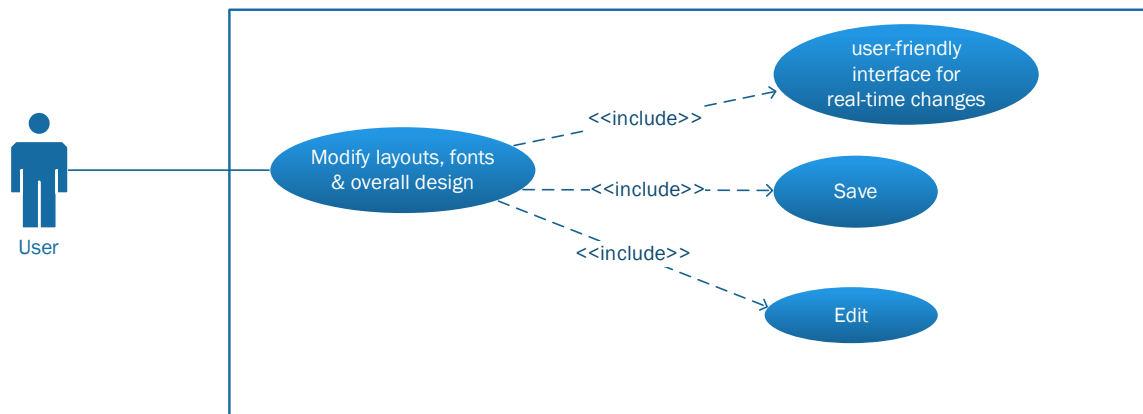### 2.5.13 Customization Options

Figure 13 UD-Customization Options

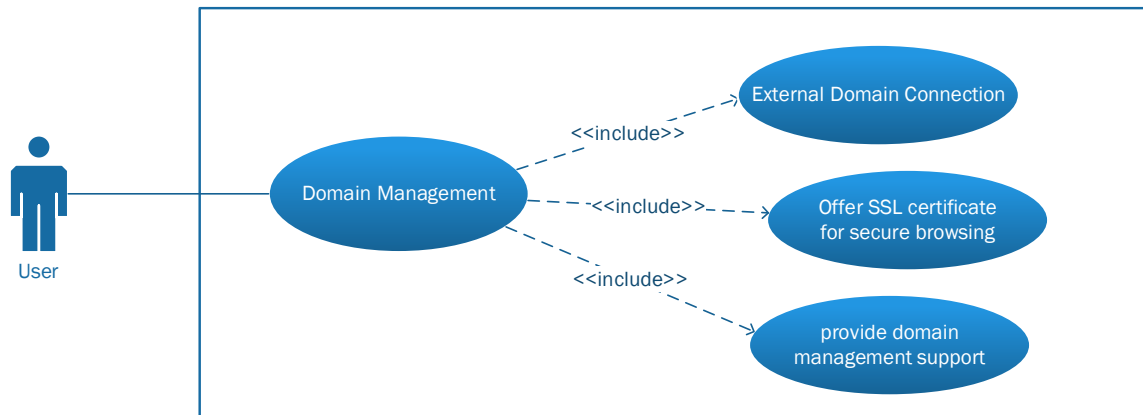### 2.5.14 Domain Integration

Figure 14 UD-Domain Integration

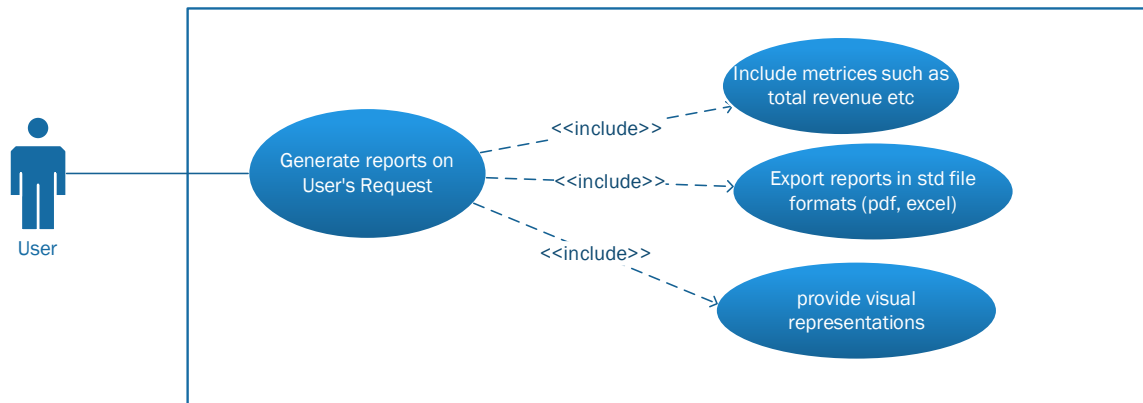### 2.5.15 Sales Report

Figure 15 UD-Sales Report

2.5.16 Profitability Analysis
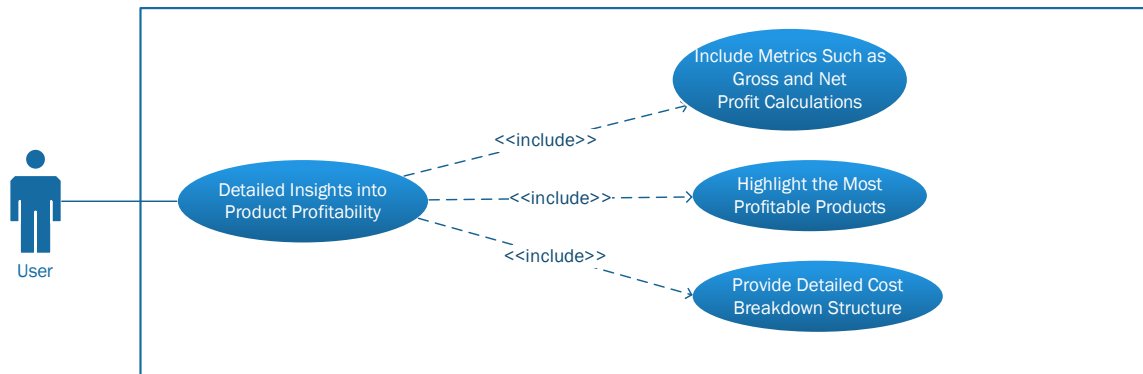

Figure 16 UD-Profitability Analysis

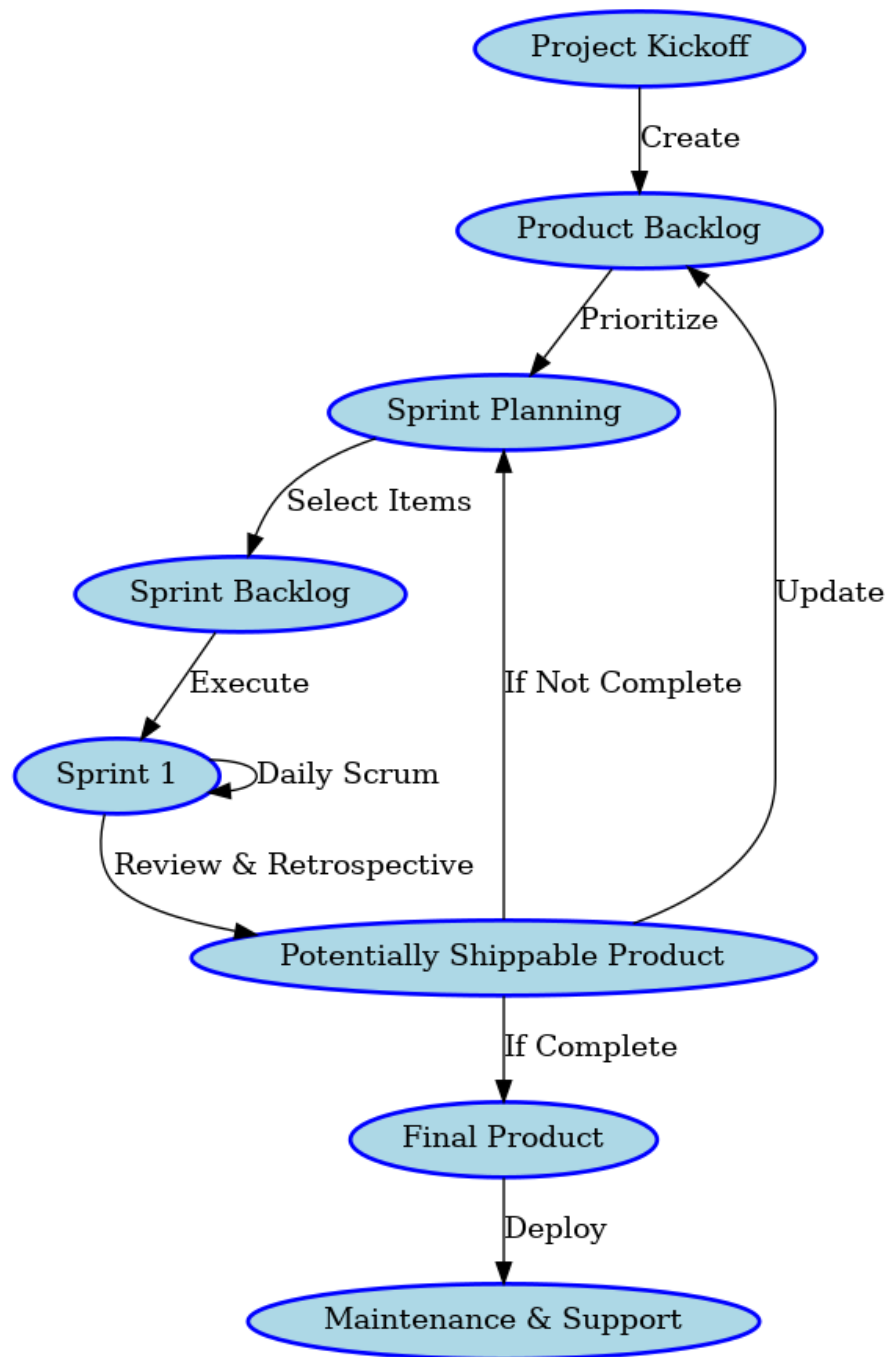## 2.6 Software development life cycle model

Figure 17 SDLCM

This diagram explains the Agile process. It starts with the Project Kickoff, where a list of tasks (Product Backlog) is created and organized. Then, important tasks are chosen during Sprint Planning and worked on in a sprint with daily meetings. After the sprint, the work is reviewed,

and either more tasks are done or the Final Product is completed. The finished product is then deployed and supported.

Reasons:

- **Iterative Development:** Allows for incremental development of features, which is crucial for a complex system with multiple functionalities.

- **Flexibility:** Can adapt to changing requirements or market needs, which is important for an e-commerce platform.

- **Continuous Feedback:** Regular sprints and reviews allow for continuous improvement and alignment with user needs.

- **Faster Time-to-Market:** Core features can be developed and released quickly, with additional features added in subsequent sprints.

- **Risk Mitigation:** Regular testing and reviews help identify and address issues early in the development process.

3 System Design

3.1 Work breakdown structure (WBS)
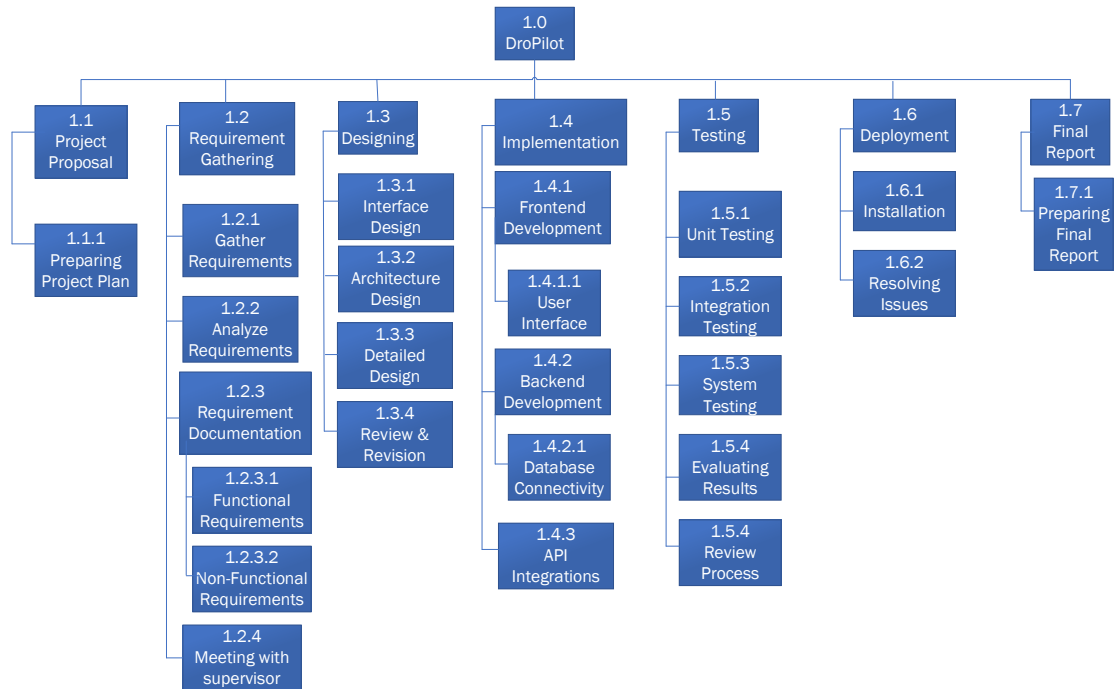
Figure 18 Work breakdown structure

3.2 Activity diagram

3.2.1 Sign Up
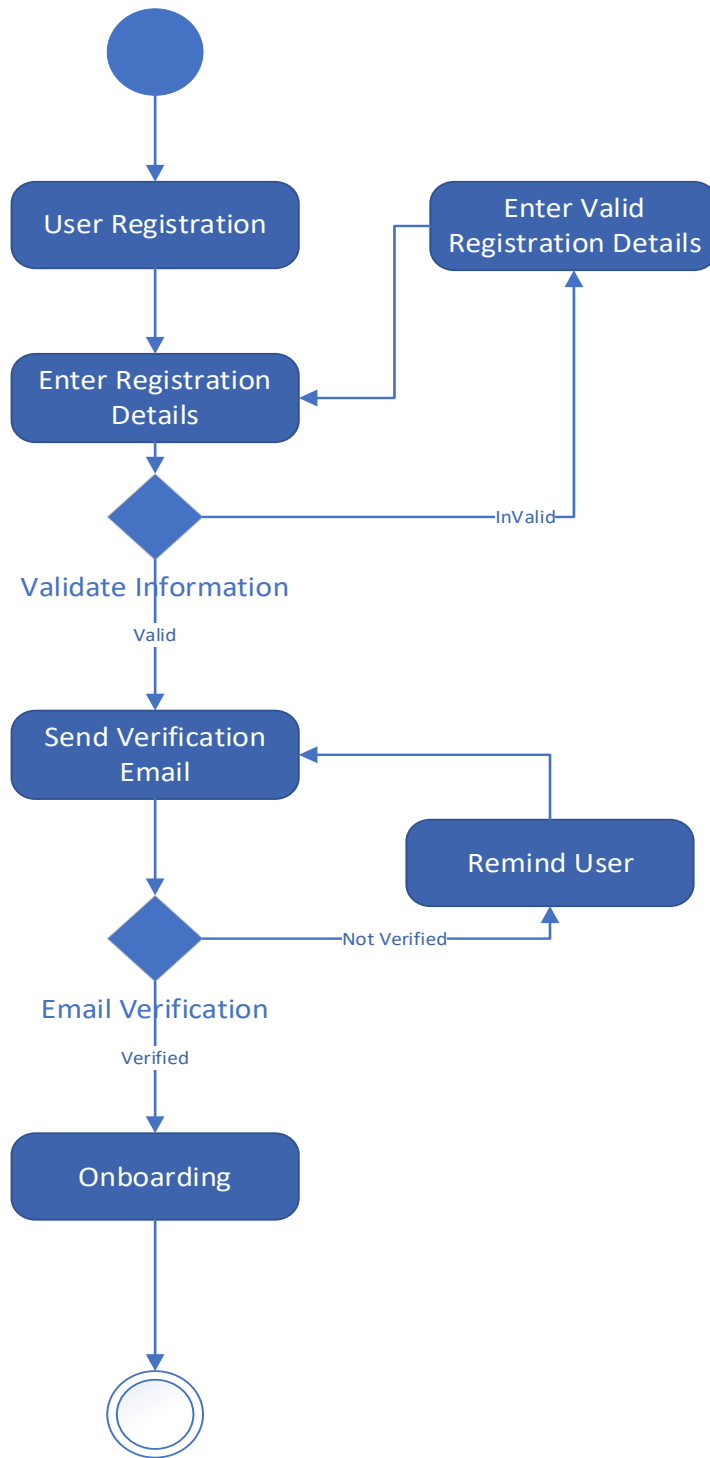
Figure 19 AD-Sign Up

3.2.2 Login
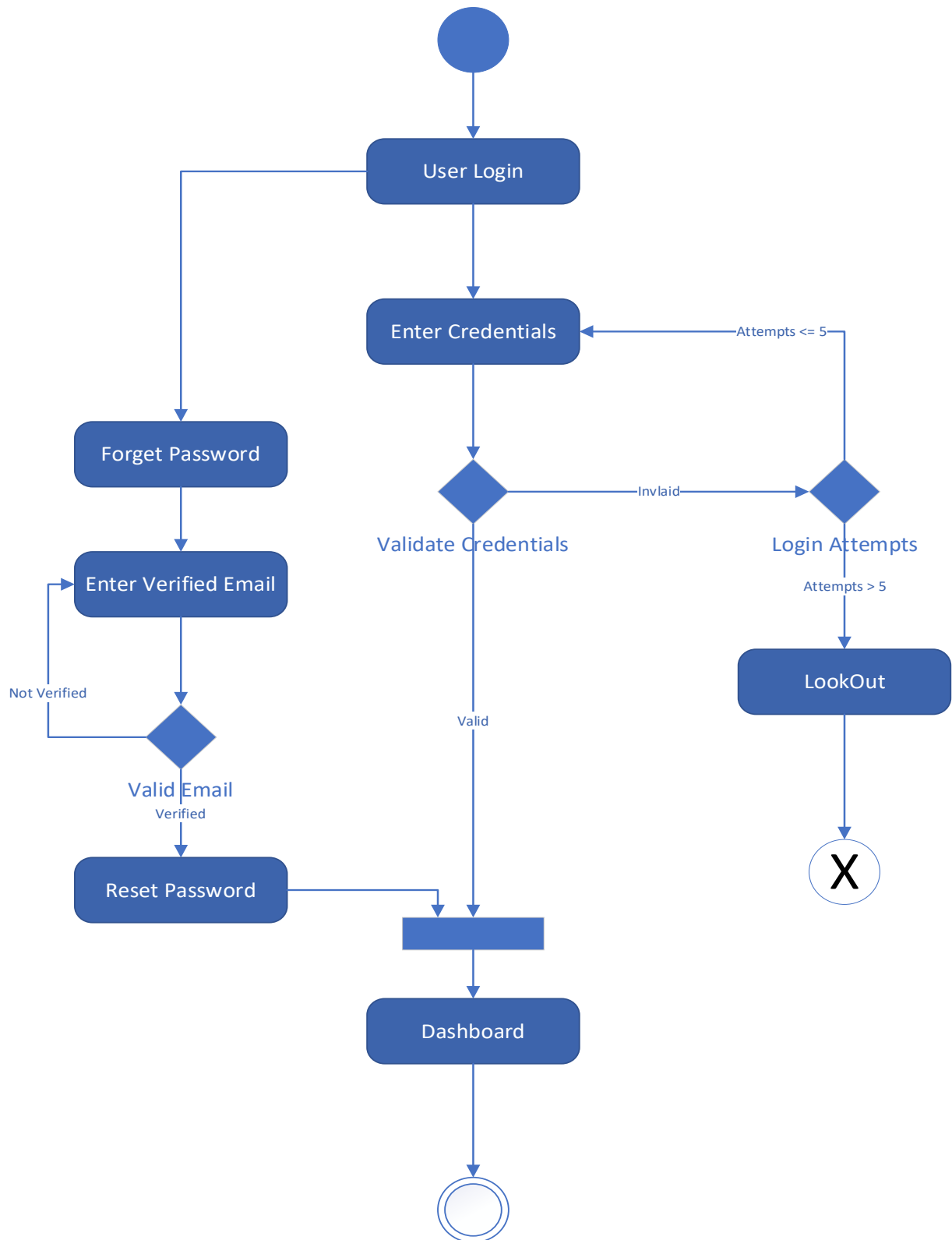
Figure 20 AD-Login

3.2.3 Update Stocks
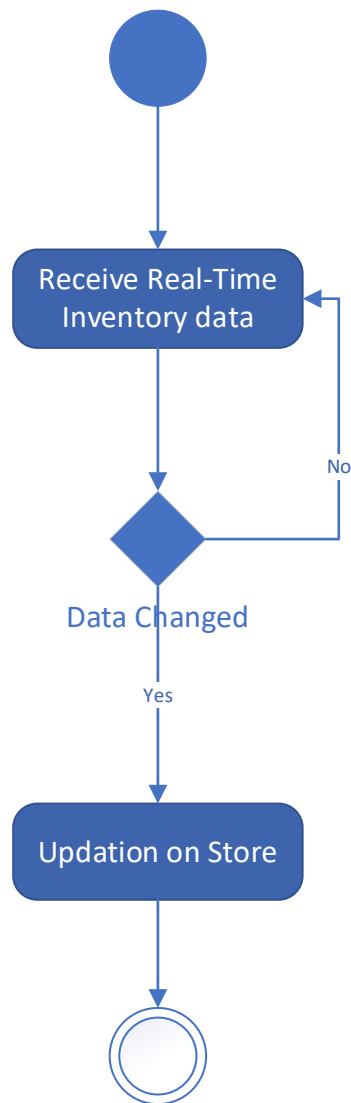
Figure 21 AD-Update Stocks

3.2.4 Real Time Stock Alert
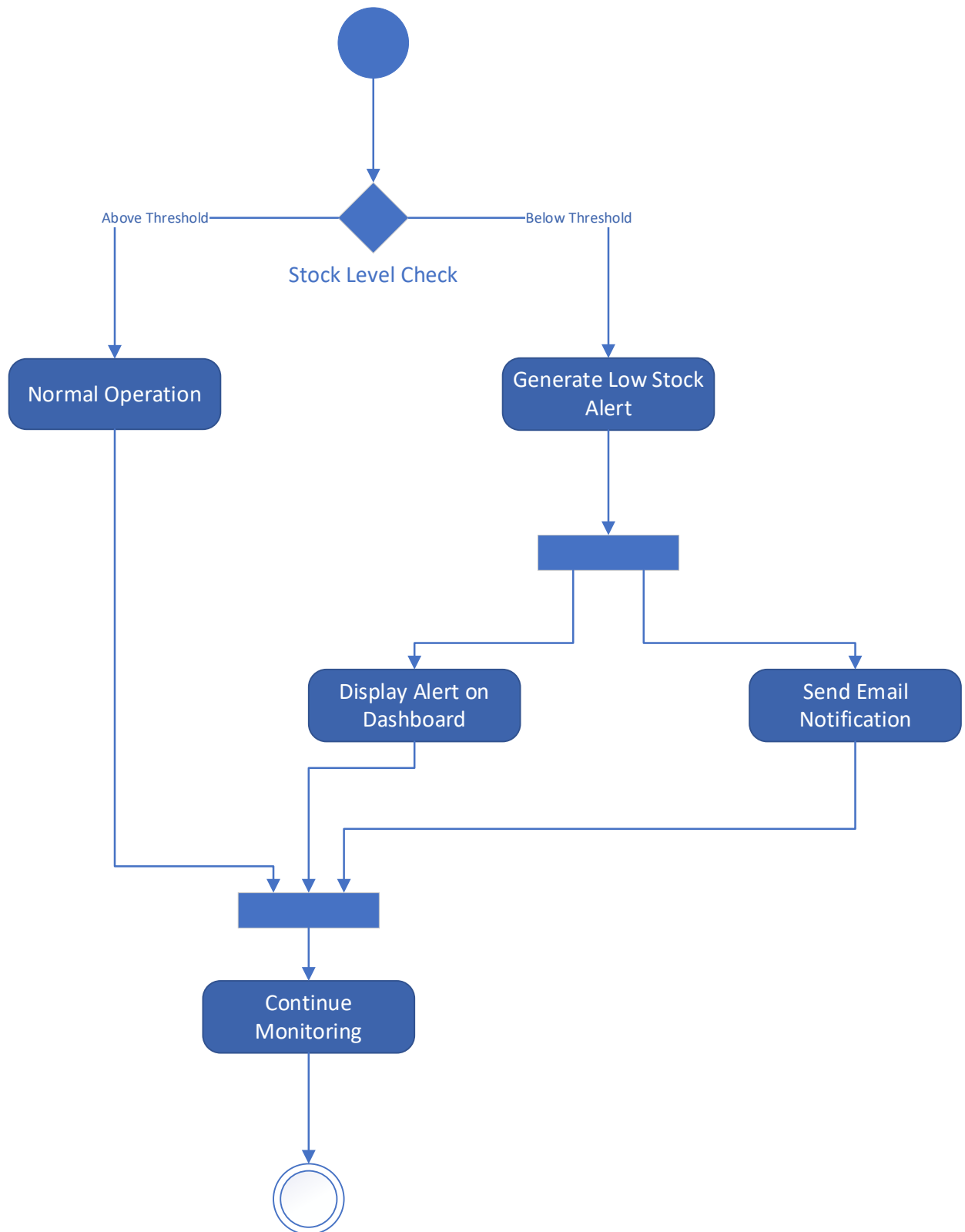
Figure 22 AD-Real Time Stock Alert

3.2.5 Payment Integration
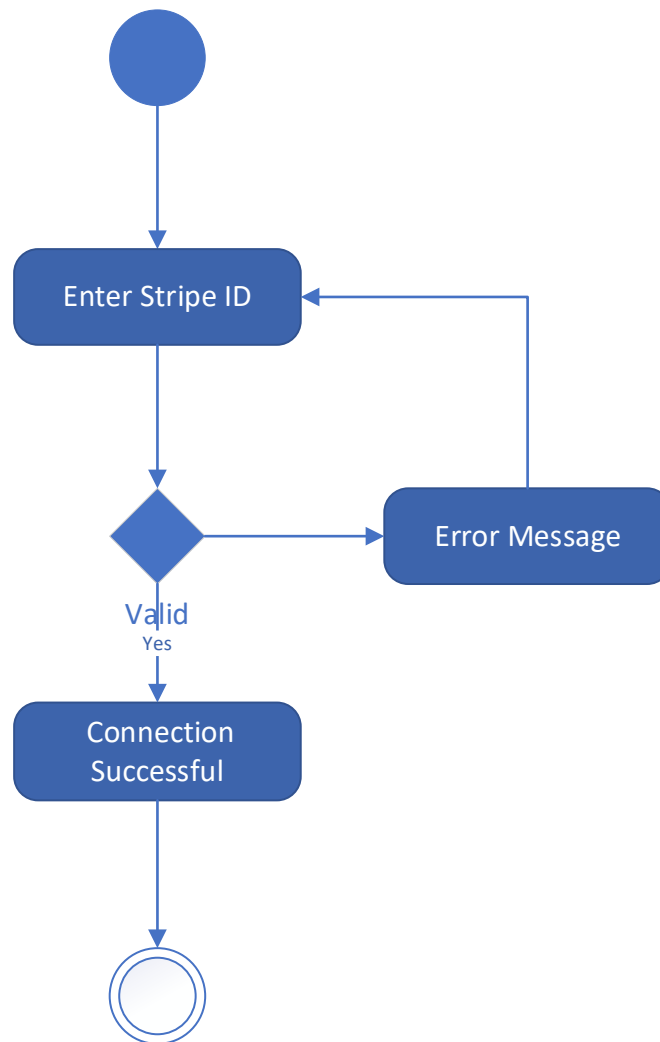
Figure 23 AD-Payment Integration

3.2.6 Store Creation & Setup
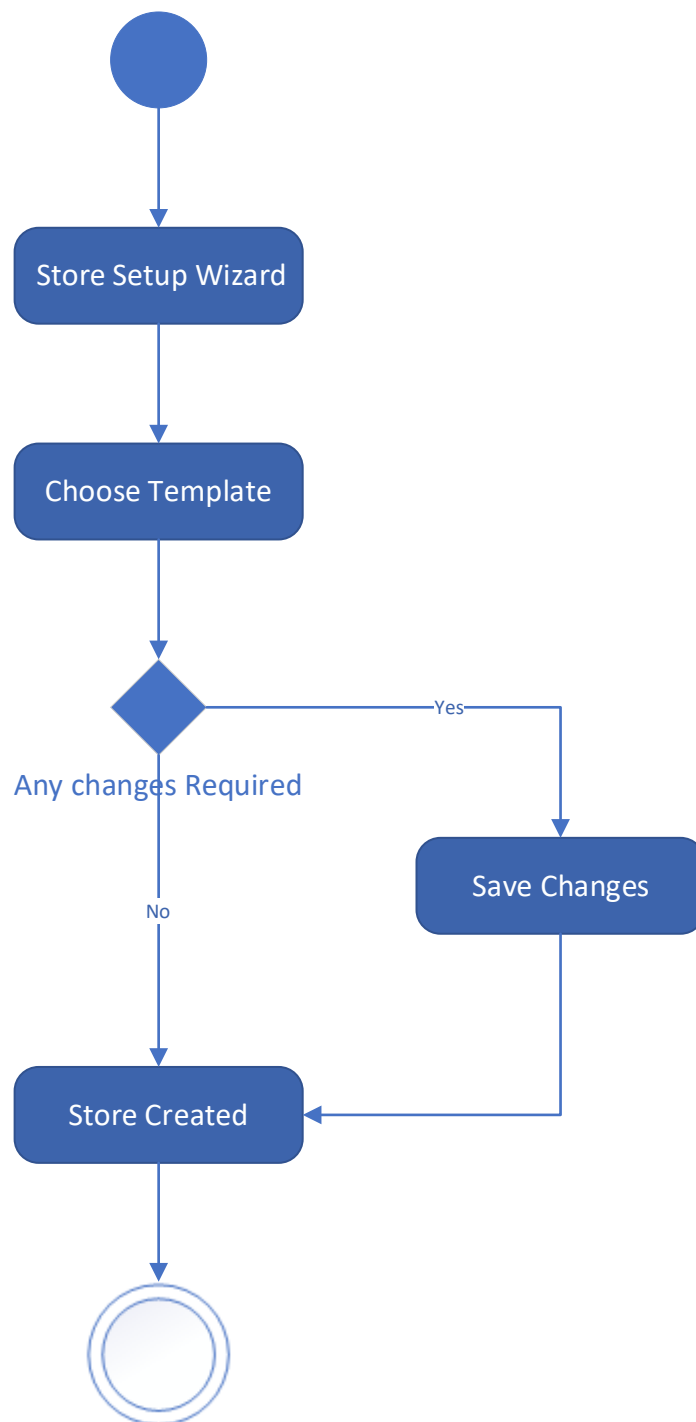
Figure 24 AD-Store Creation & Setup

3.2.7 Product Management
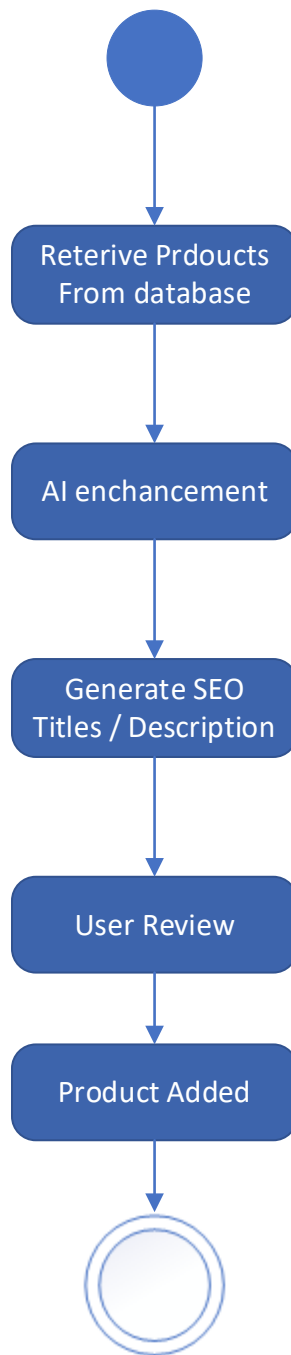
Figure 25 AD-Product Management

3.2.8 Generation of Invoice
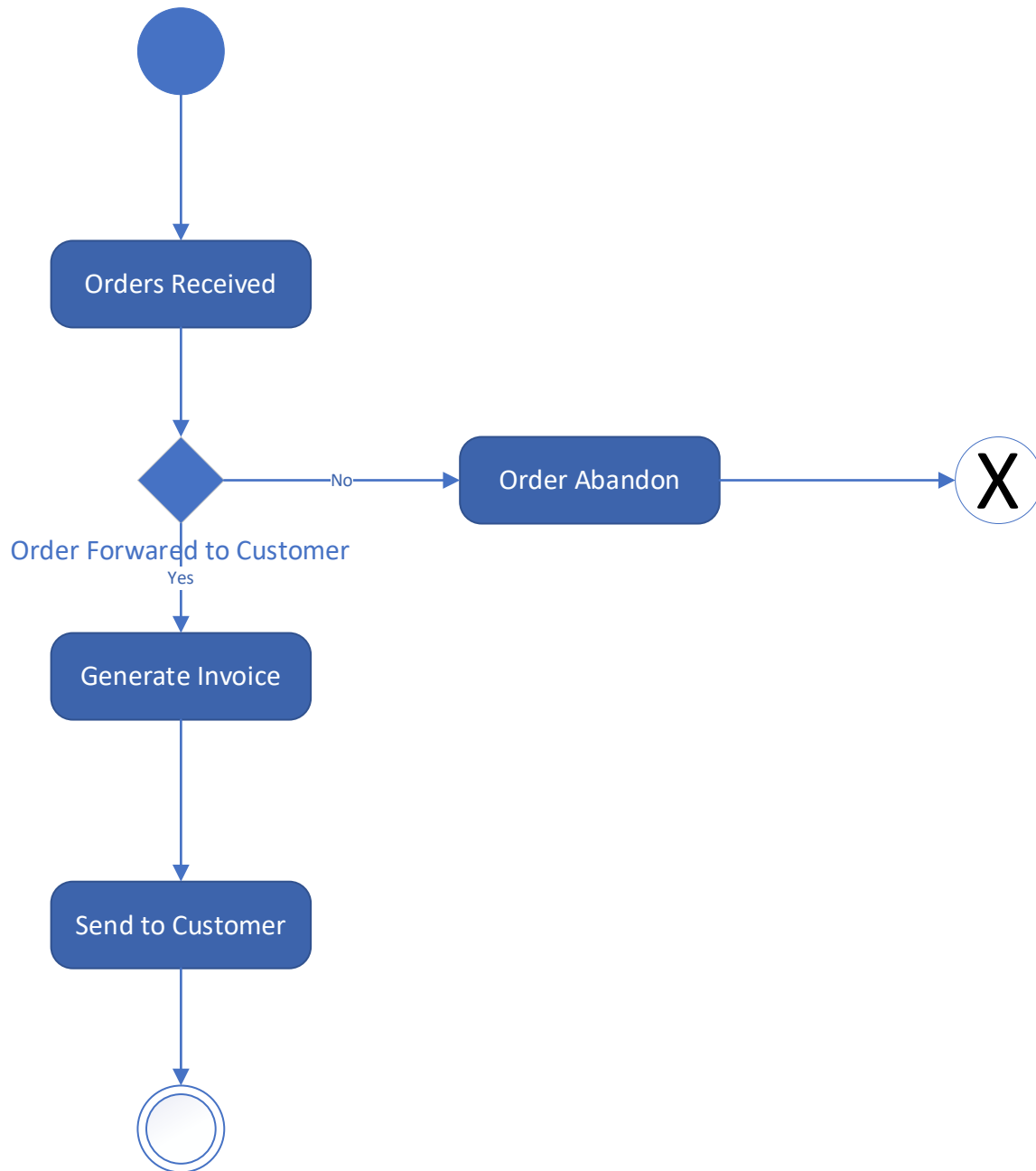
Figure 26 AD-Generation of Invoice

3.2.9 Order Forwarding
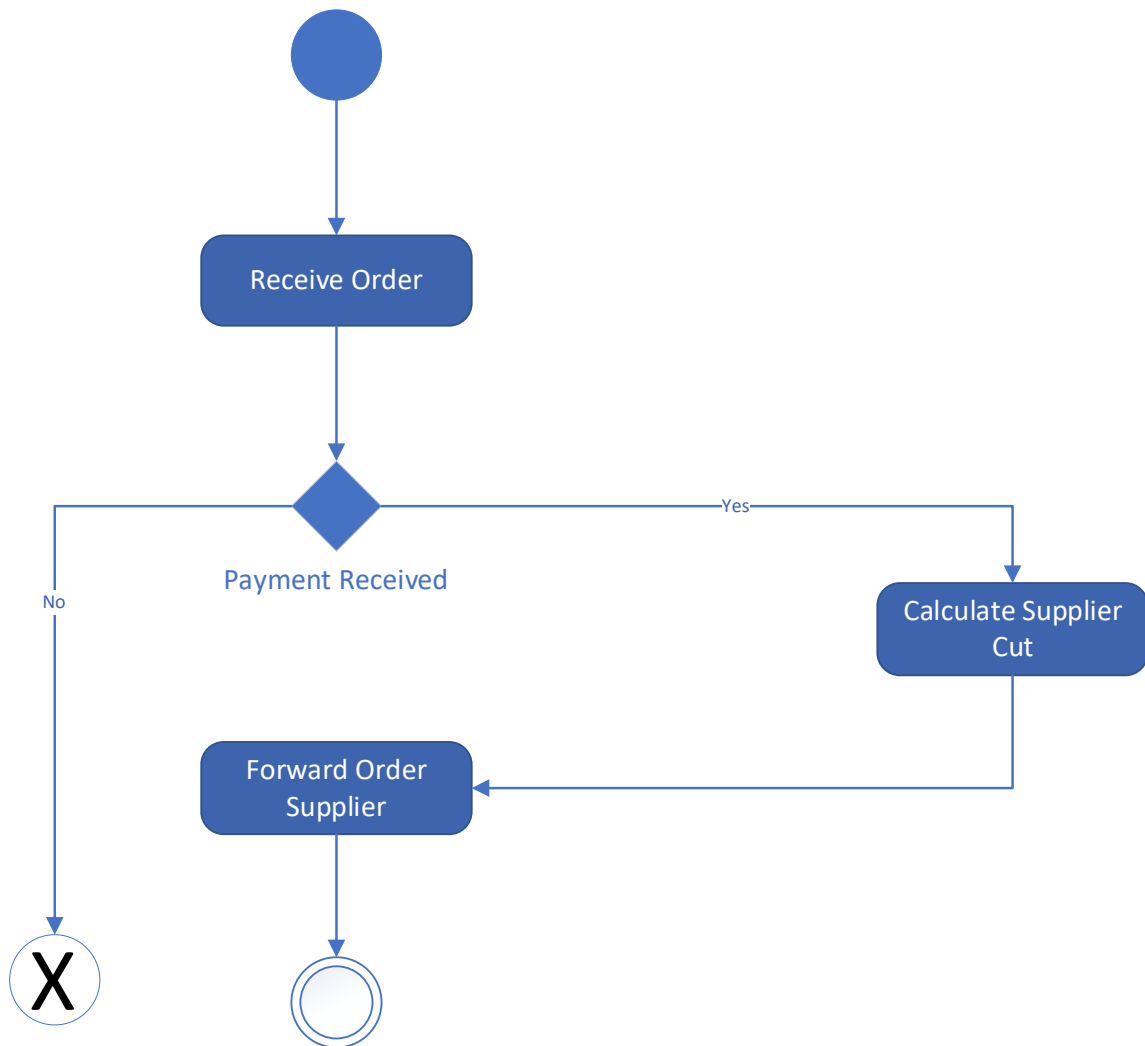
Figure 27 AD-Order Forwarding

3.2.10 Analytics & Reporting
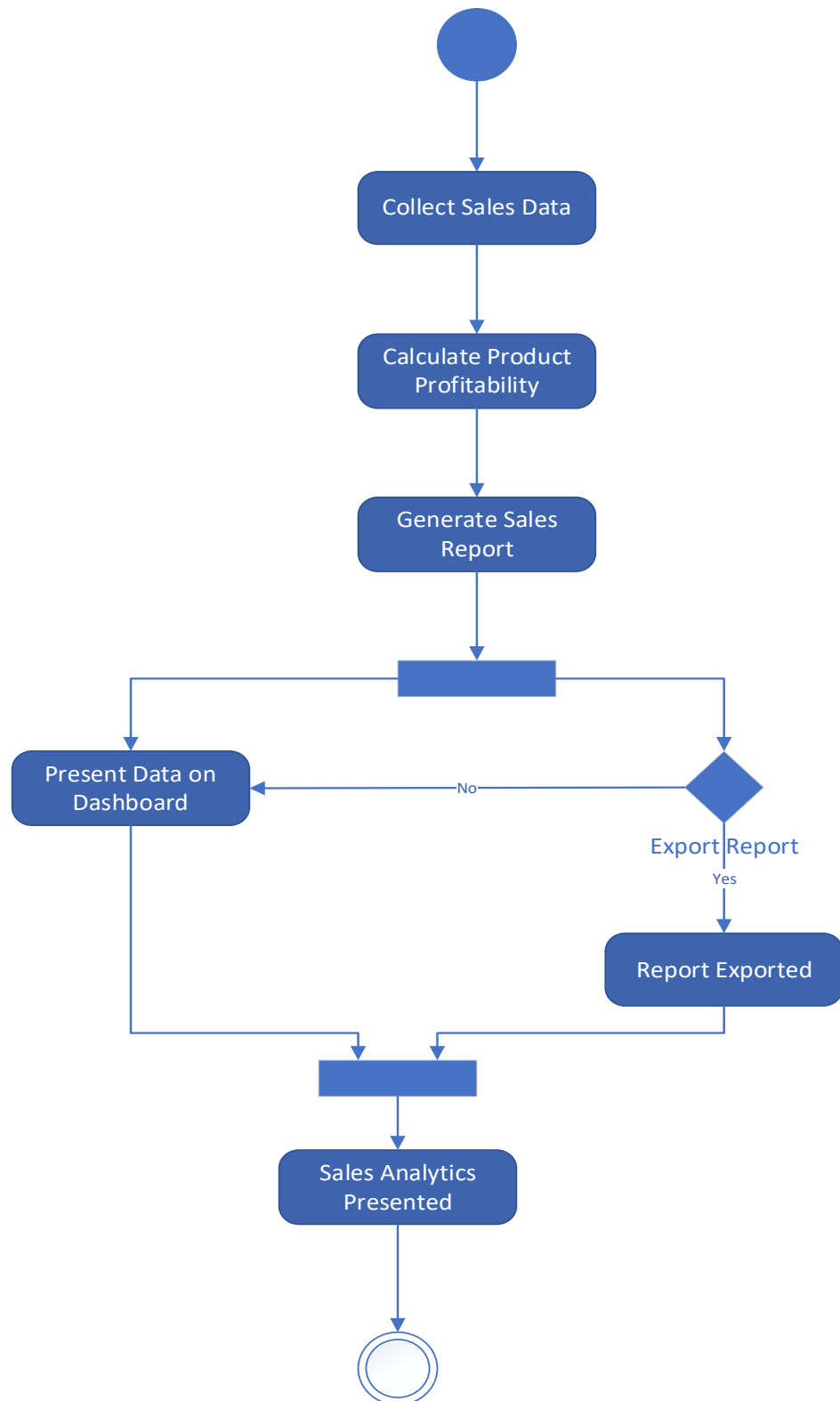
Figure 28 AD-Sales Details

3.2.11 Domain Setup
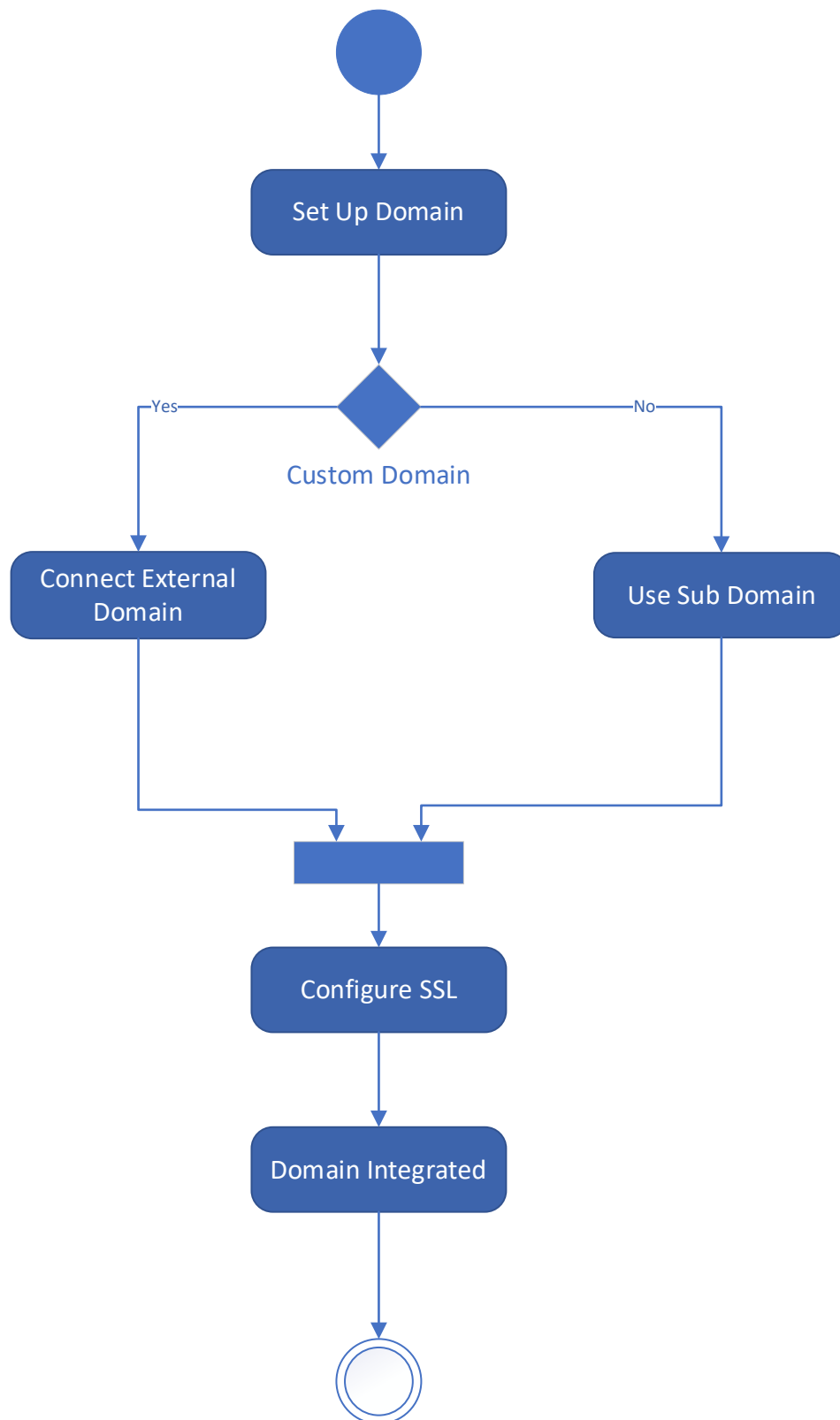
Figure 29 AD-Domain Setup

3.2.12 Online Payment
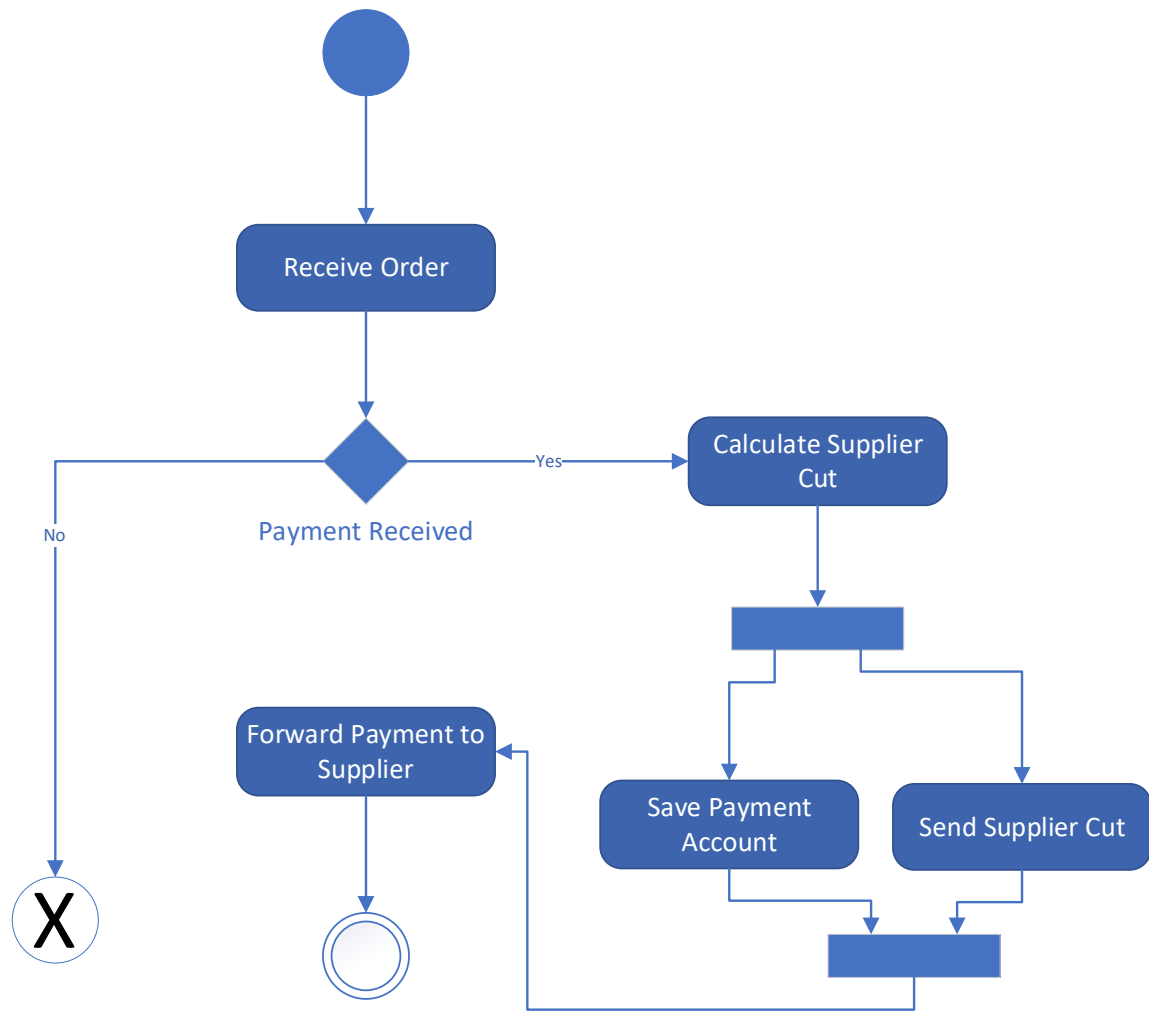
Figure 30D-Online Payment

3.3   Sequence diagram
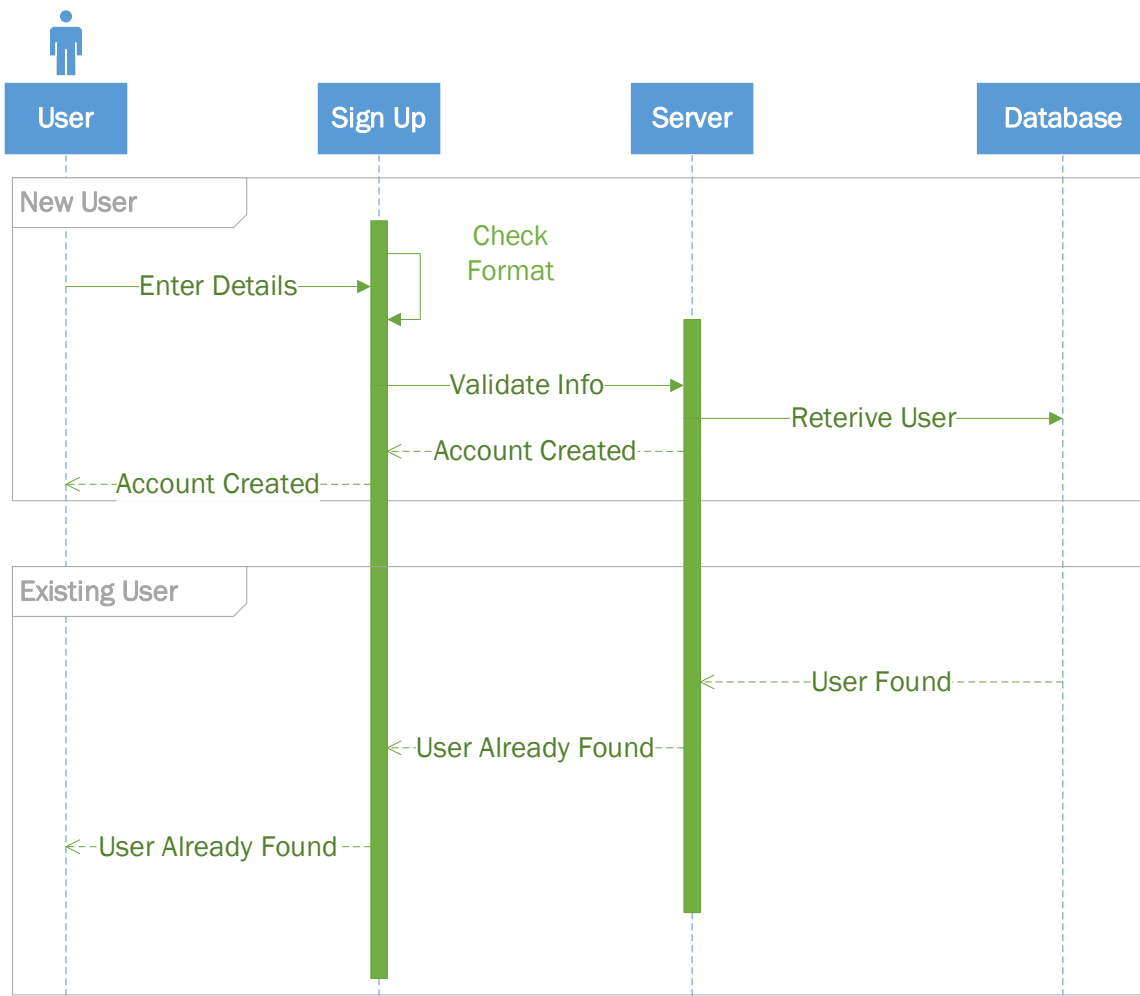
3.3.1 Sign Up

3.3.2 Login
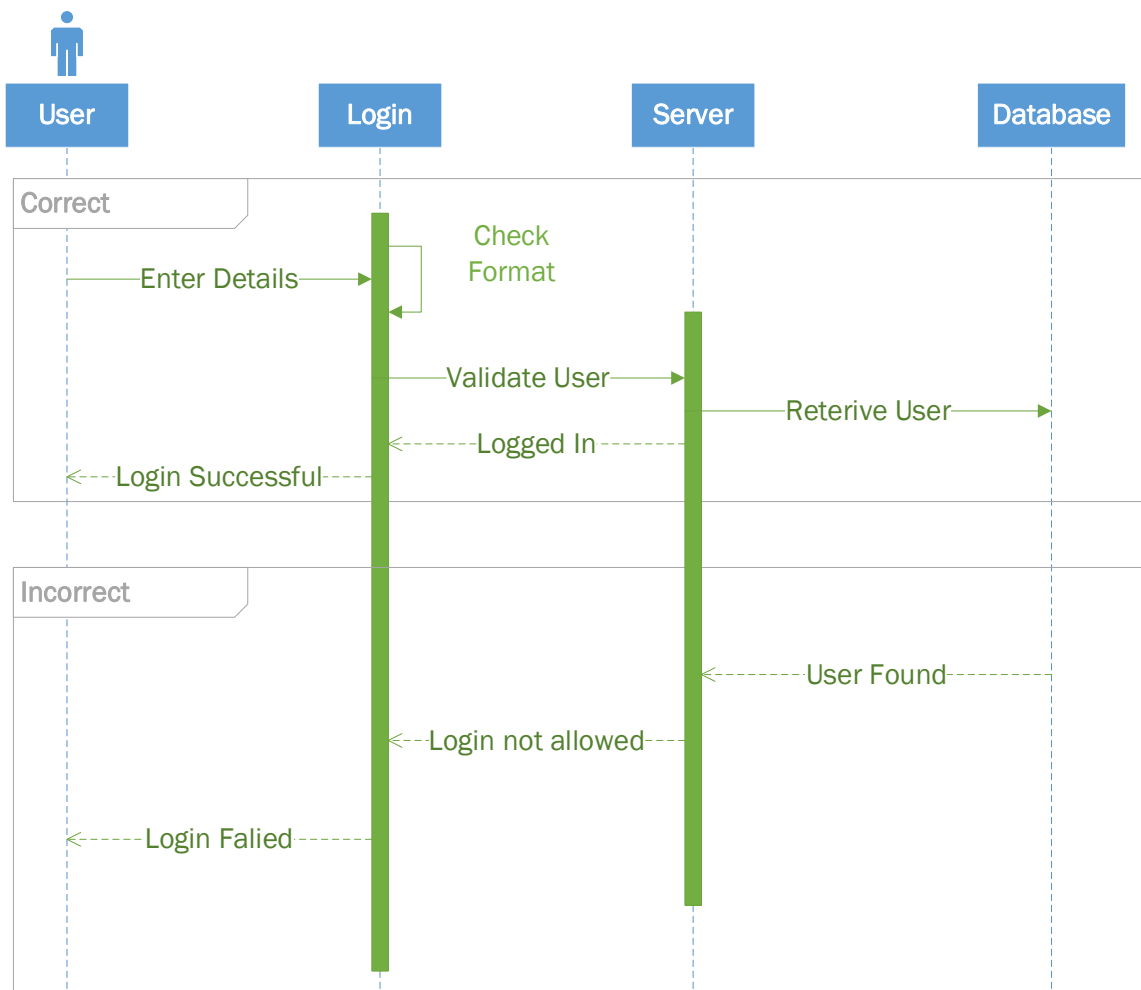
Figure 32 SD-Login

3.3.3 Store Creation
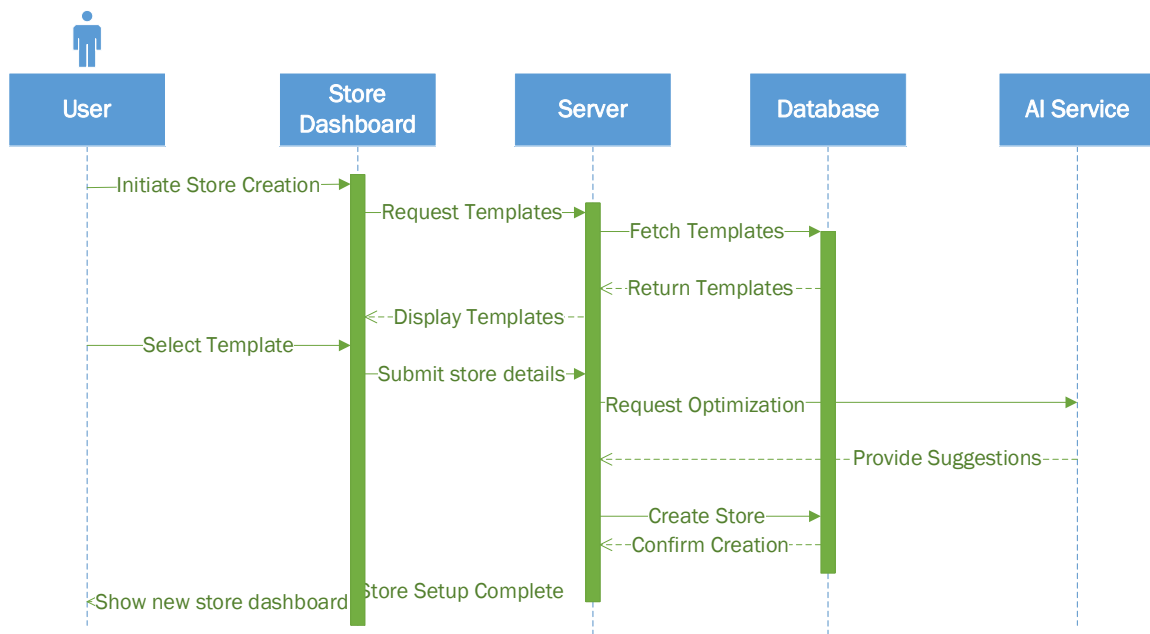
Figure 33 SD-Store Creation

3.3.4 Product Management
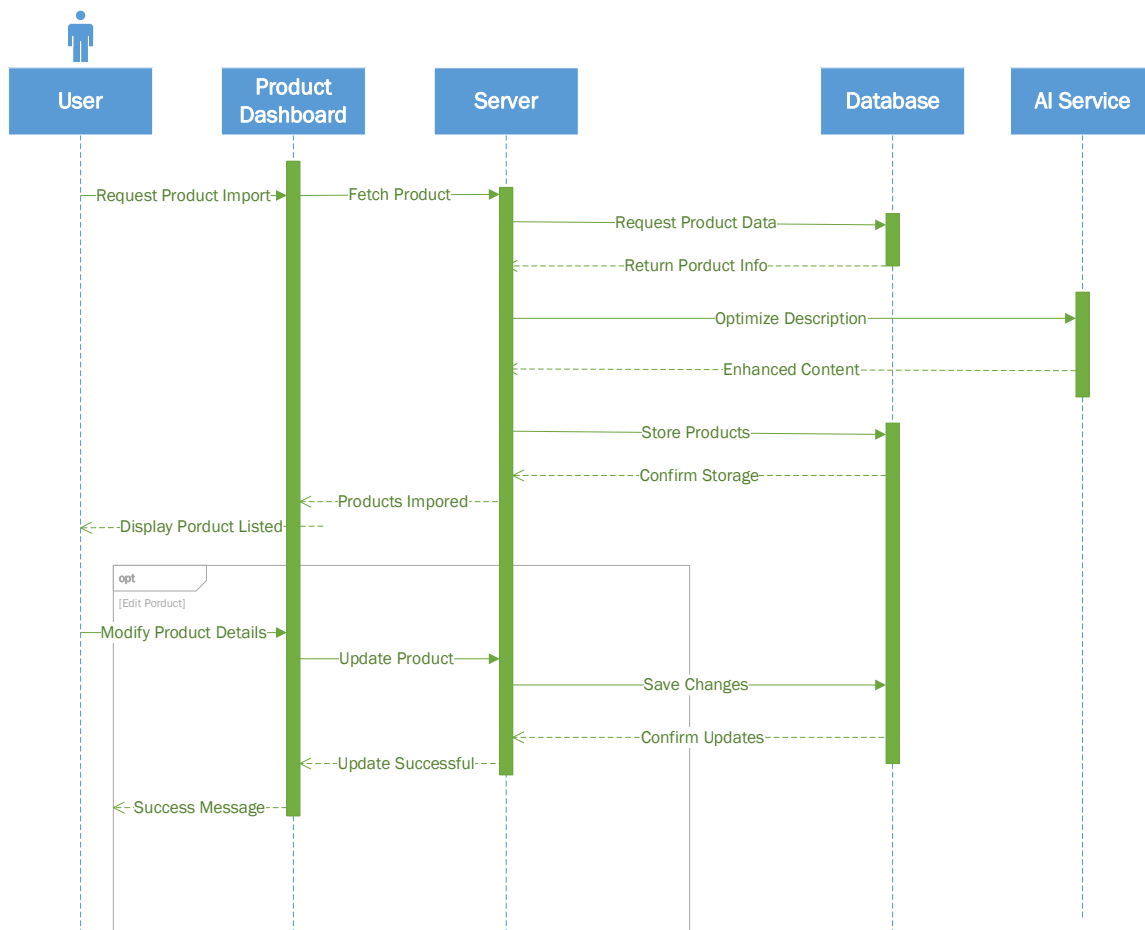
Figure 34 SD-Product Management

3.3.5 Order Processing
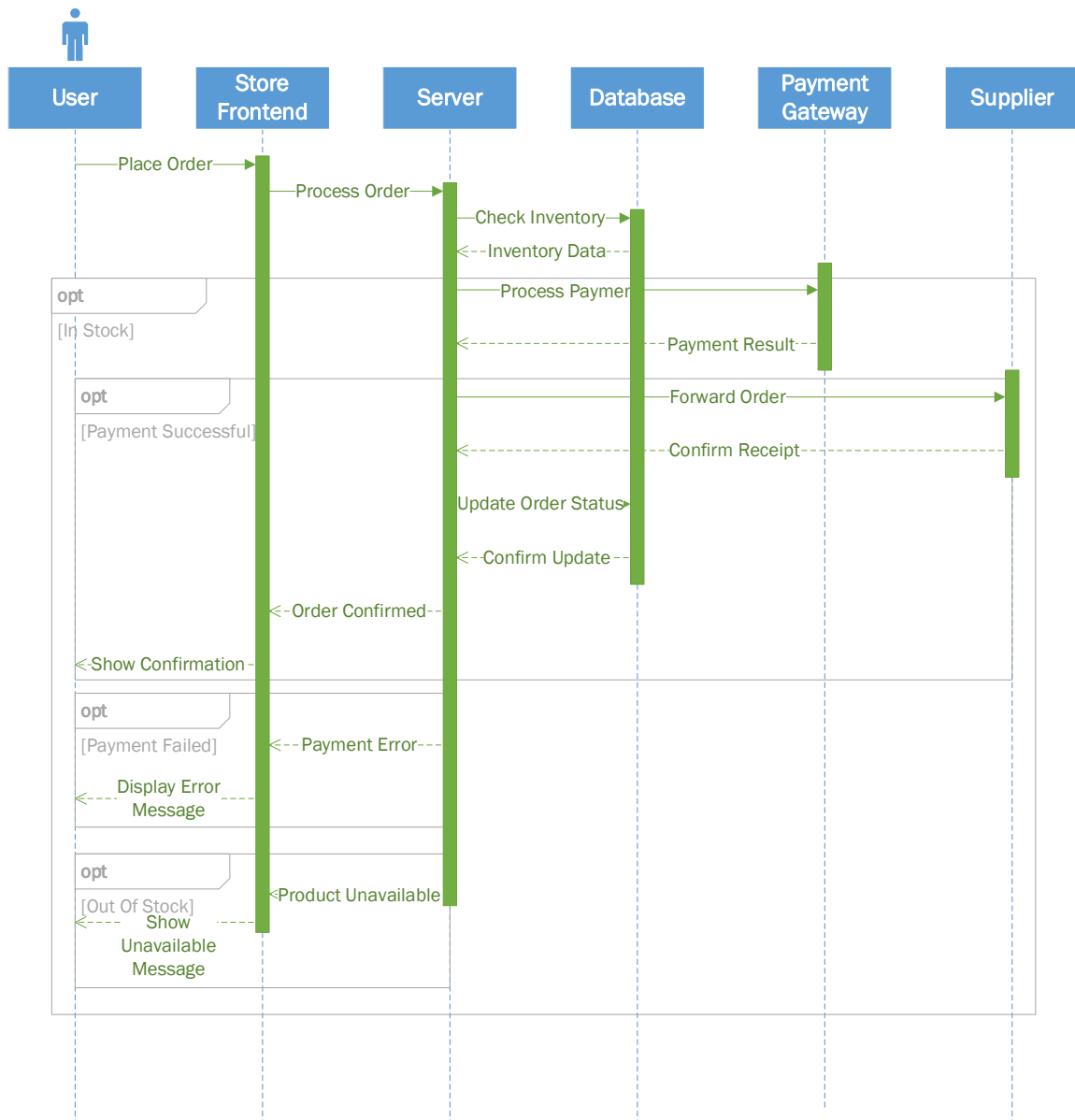
Figure 35 SD-Order Processing

3.3.6 Sales & Analytics View
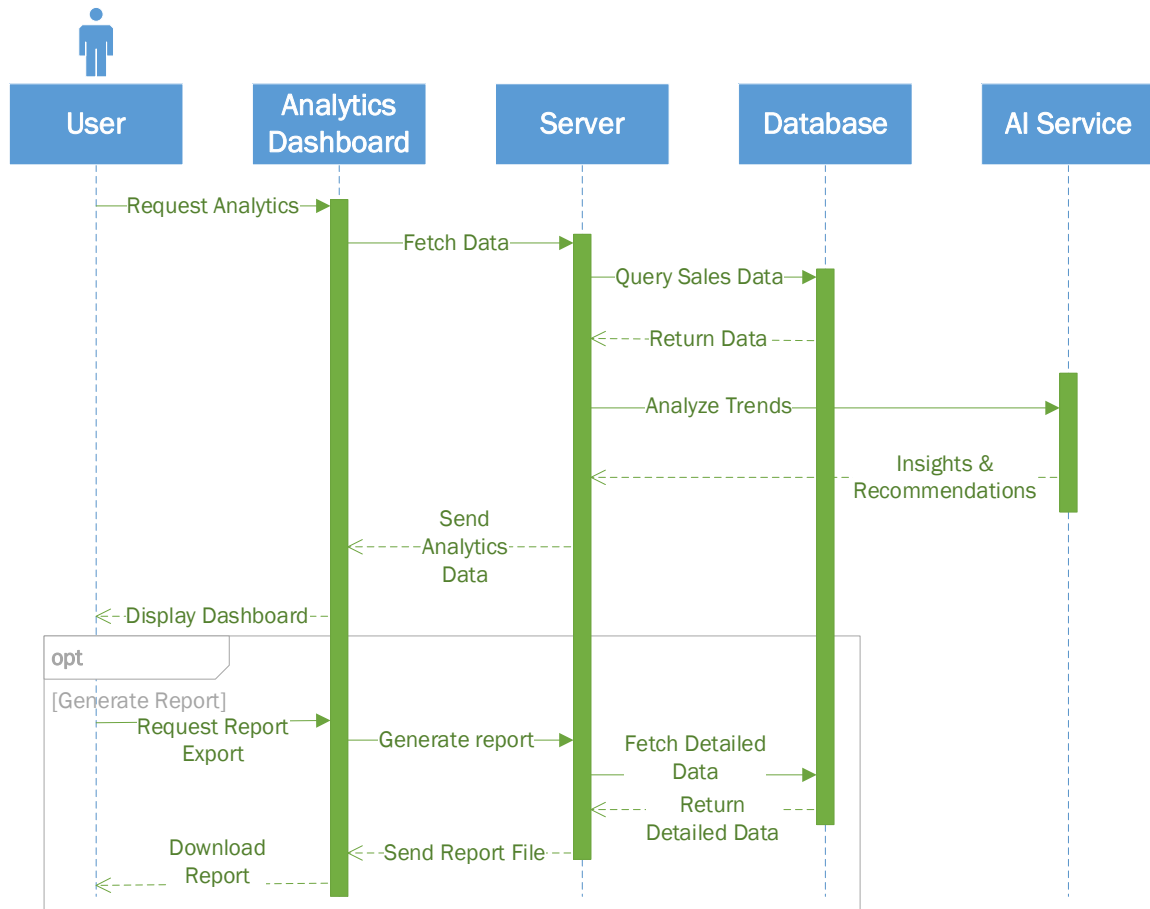
Figure 36 SD-Sales & Analytics View

3.4 Software architecture

- **Scalability:**

  - Services can be scaled independently to handle varying loads, optimizing resources and cost.
  - Critical components like user authentication or payment processing can be scaled without affecting the entire system.

- **Flexibility in Technology**:

- Allows choosing the best technology stack for each service based on its requirements.
- Enables gradual migration to new technologies without overhauling the entire system.

- **Fault Isolation**:

  - Failure in one service (e.g., payment service) does not bring down the entire application.
  - Reduces system downtime and improves reliability.

- **Independent Deployment**:

  - Teams can deploy updates to individual services without affecting others.
  - Minimizes downtime and speeds up the release cycle.

- **Improved Maintainability**:

  - Smaller, focused codebases make it easier to debug, test, and maintain services.
  - Reduces technical debt and improves developer productivity.
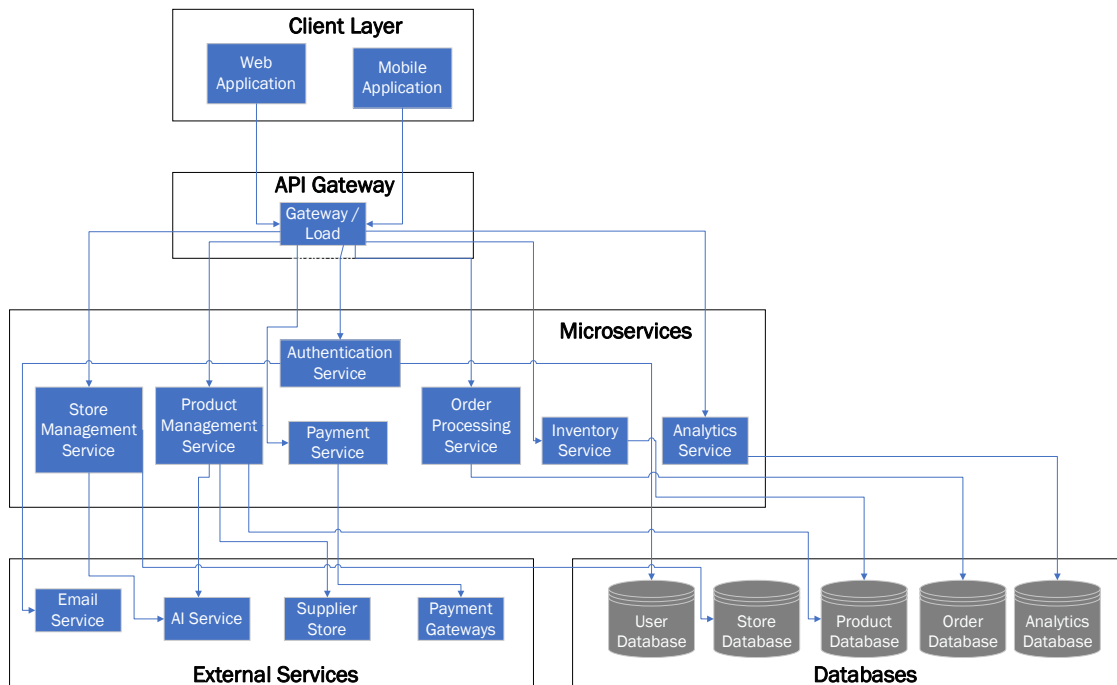
Figure 37 Software architecture Diagram

3.5 Class diagram

Not applicable Due to:

System-Wide Design: Class diagrams are less useful for capturing inter-service communication or overall system architecture in microservices. For this, architecture diagrams, sequence diagrams, or API contract diagrams are more appropriate.

Dynamic Interactions: Since microservices rely heavily on communication patterns (e.g., REST, gRPC, message queues), class diagrams do not effectively capture these dynamic behaviours.

3.6 Database diagram
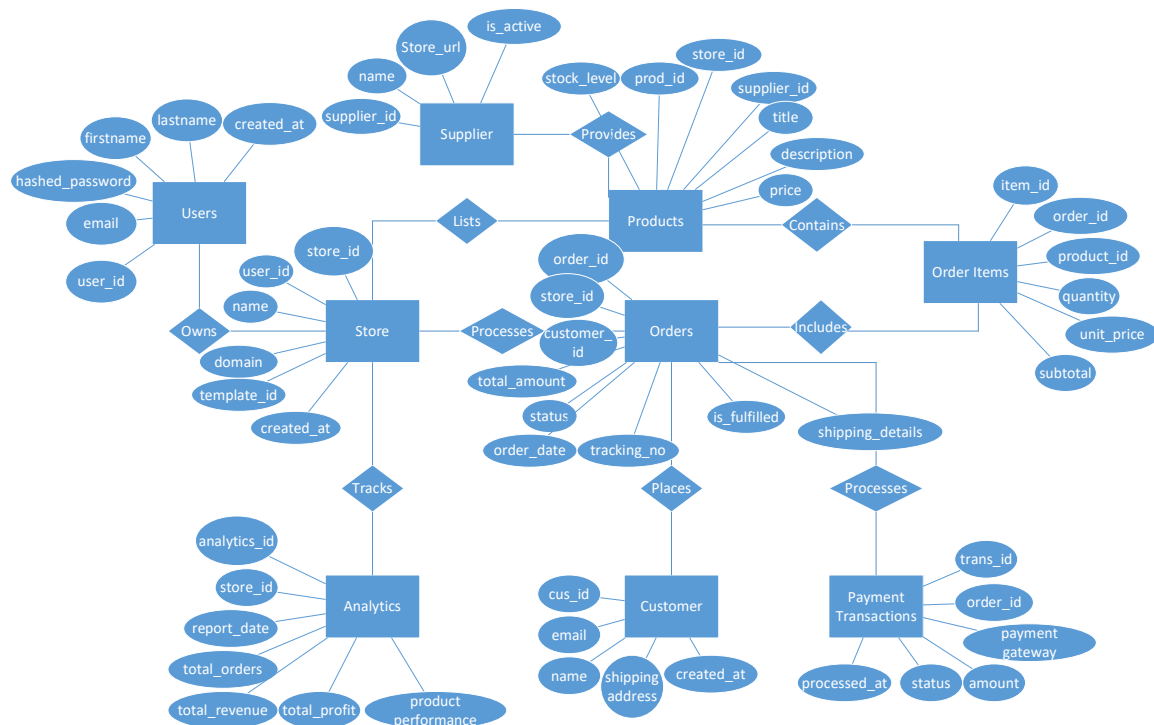
Figure 38 Database Diagram

3.7 Network diagram (Gantt chart)
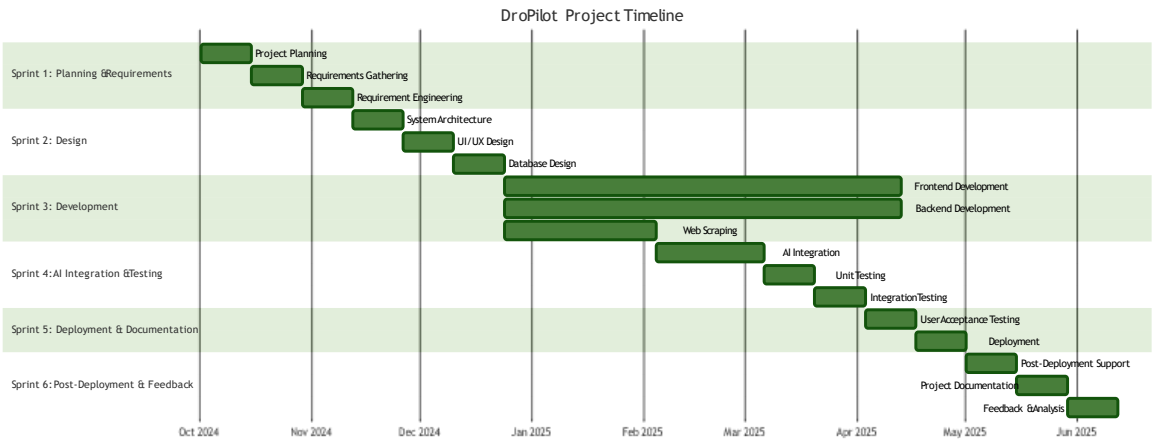
Figure 39 Network diagram (Gantt chart)

3.8 Collaboration diagram

3.8.1 User Authentication
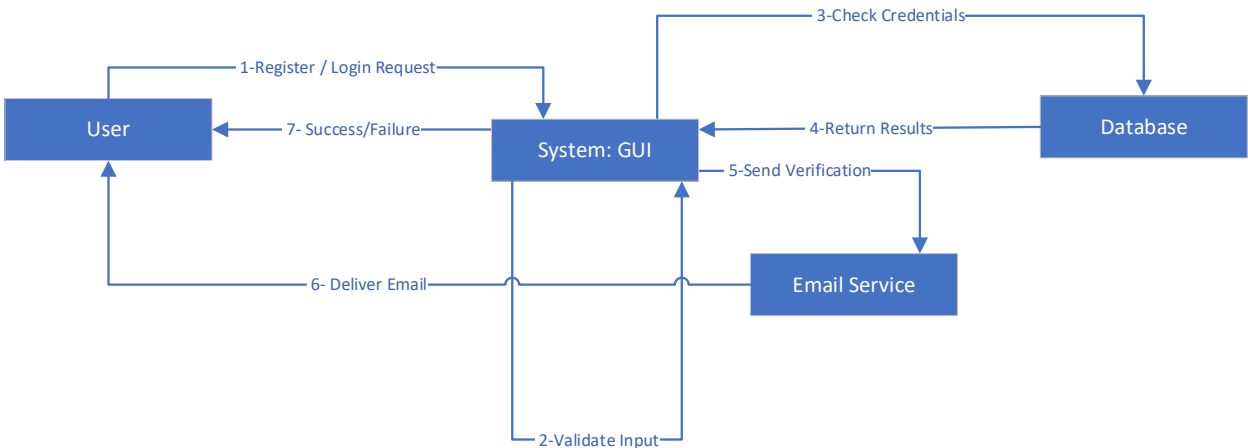
Figure 40 CD-User Authentication

3.8.2 Store Creation
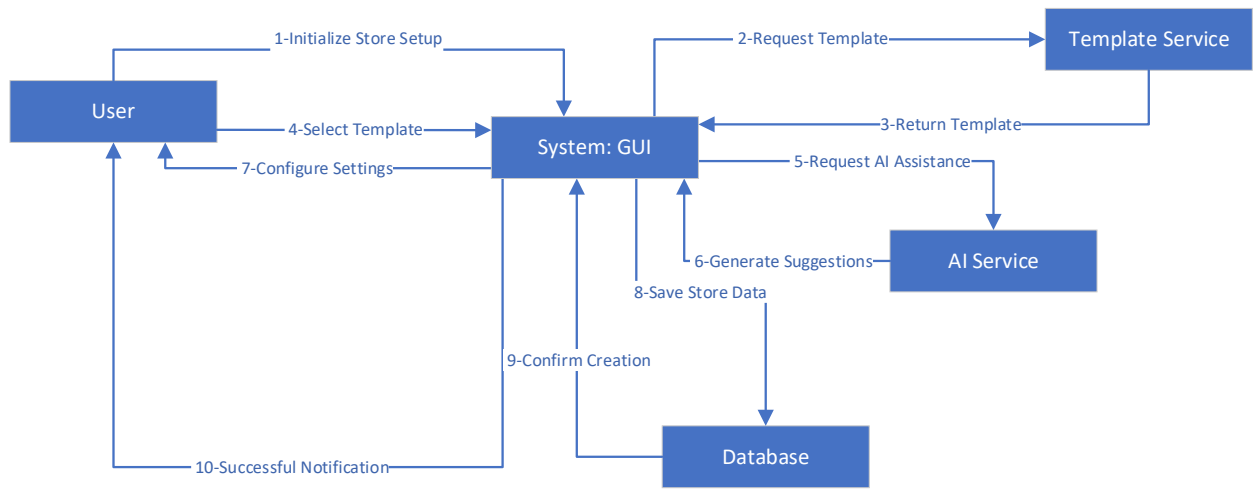
Figure 41 CD-Store Creation

3.8.3 Order Processing
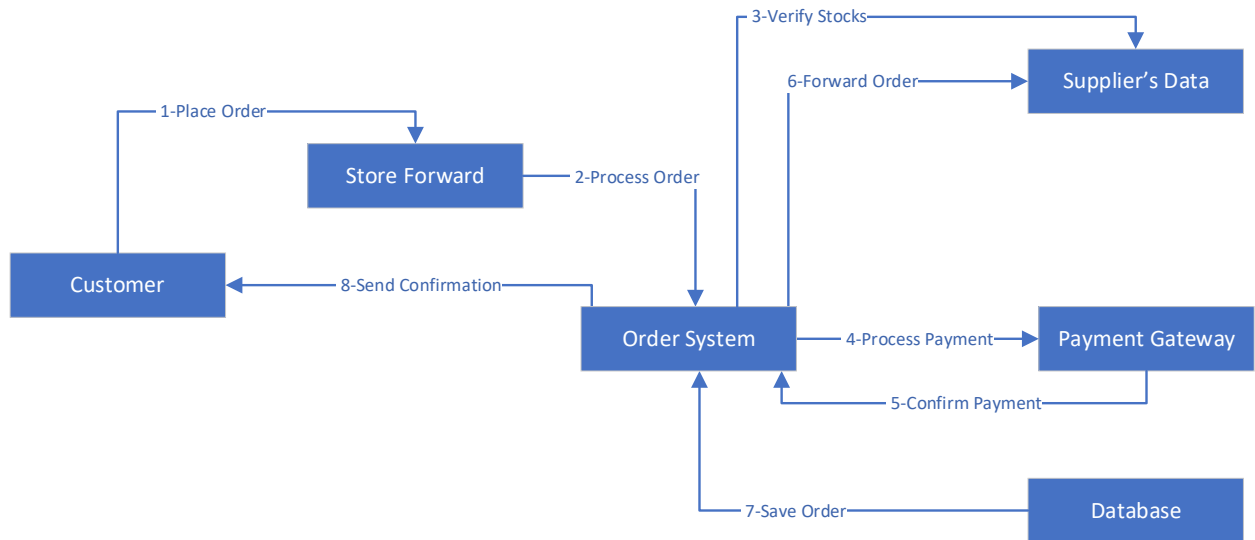
Figure 42 CD-Order Processing

3.8.4 Product Management
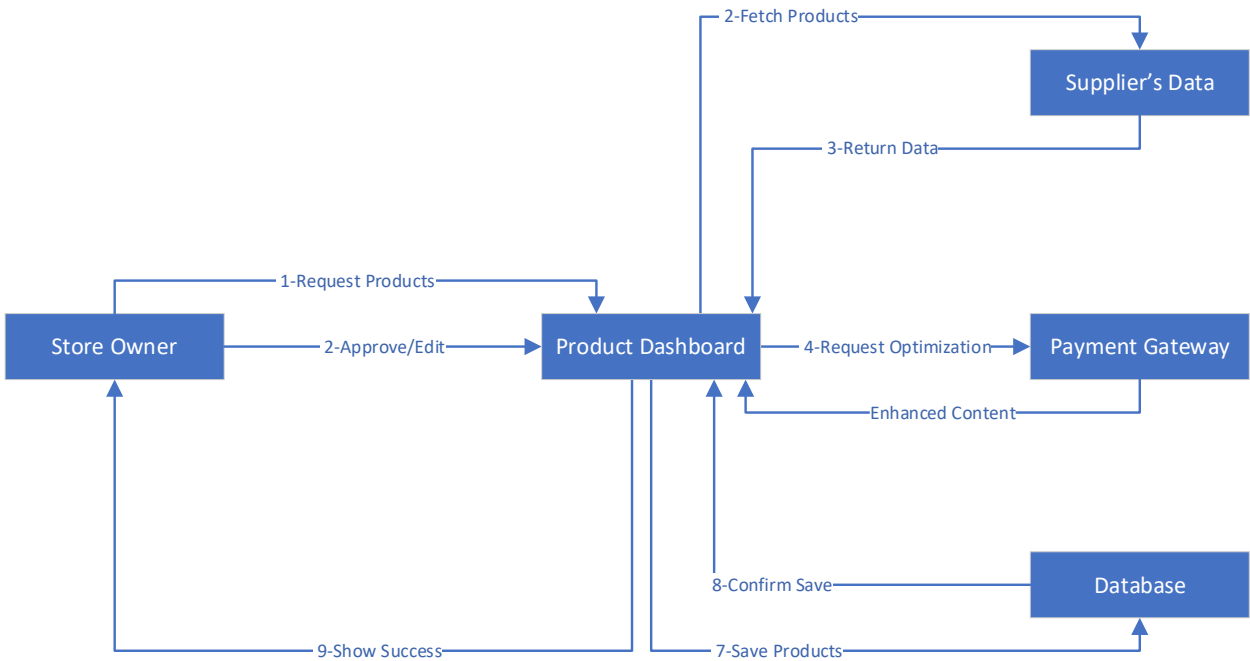
Figure 43 CD-Product Management

3.8.5 Payment Processing
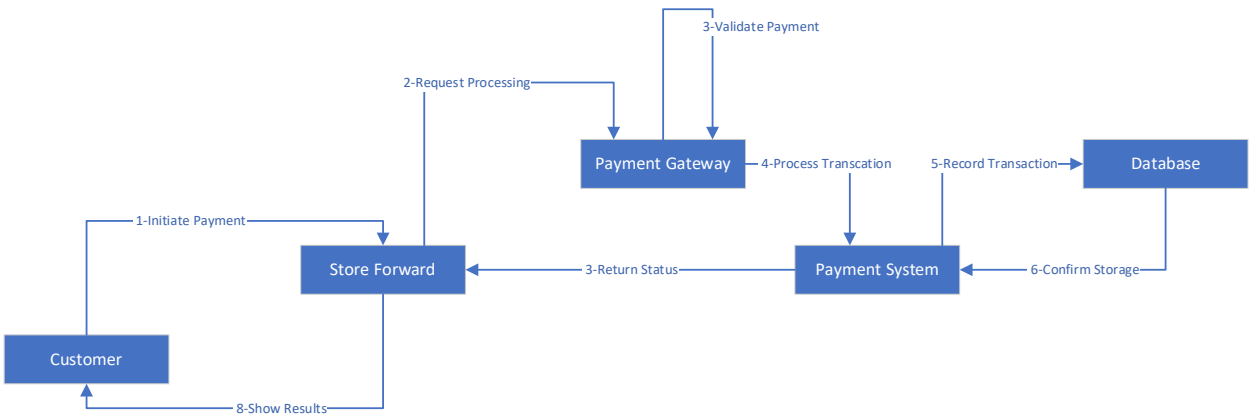
Figure 44 CD-Payment Processing

3.8.6 Analytics & Reporting
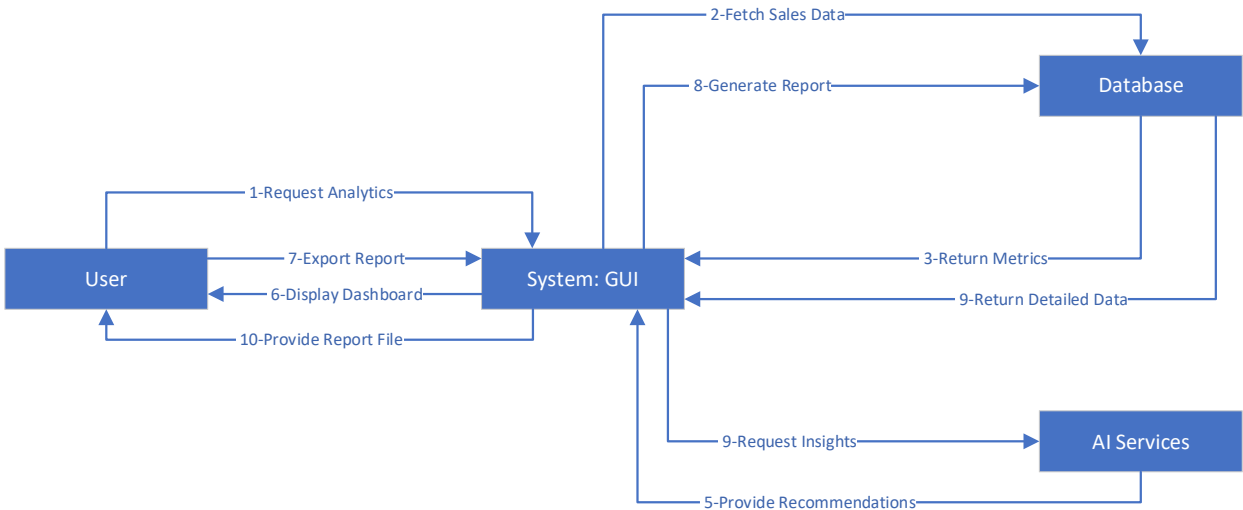
Figure 45 CD-Analytics & Reporting

4 System Testing

System testing is a type of software testing that focuses on testing a complete and integrated software product or system. It aims to validate that the system meets the specified requirements and is fit for purpose. System testing is usually done after the unit testing and integration testing phases, and it involves testing the system as a whole.

4.1 Test cases

Test cases are sets of conditions or variables under which a tester will determine whether an application, system, or component is working correctly. Test cases are an important part of the software testing process as they help to ensure that an application, system, or component is functioning correctly and meeting the requirements of the stakeholders. They are typically created by the tester and reviewed by the development team to ensure that they are comprehensive and accurate.

4.1.1 TC-01: User Registration

Table 41 TC-01: User Registration

Test Case ID	TC-01
Application Name	DroPilot
Use Case(s)	User Registration
Created By	Abdul Hanan
Test Case Description	Verify that a new user can register successfully using valid details.
Action/Test Steps	1. Navigate to the Sign-Up page. 2. Enter valid details (Username, Email, Password). 3. Click on the "Sign Up" button.
Test Data	Username: test_user Email: test@example.com Password: Password123
Pre-Conditions	The user must not already have an account.
Post-Conditions	User should receive an email verification link.
Expected Result	Account is created, and email verification is sent.
Actual Result	
Status	

4.1.2 TC-02: User Login

Table 42 TC-02: User Login

Test Case ID	TC-02
Application Name	DroPilot
Use Case(s)	User Login
Created By	Yahya Irfan
Test Case Description	Verify that a registered user can log in successfully.
Action/Test Steps	1. Navigate to the Login page. 2. Enter valid credentials (Email, Password). 3. Click on the "Sign In" button.
Test Data	Email: test@example.com Password: Password123
Pre-Conditions	User must have an active account.
Post-Conditions	User is redirected to the dashboard.
Expected Result	User is logged in successfully.
Actual Result	
Status	

4.1.3 TC-03: User Onboarding

Table 43 TC-03: User Onboarding

Test Case ID	TC-03
Application Name	DroPilot
Use Case(s)	User Onboarding
Created By	Bushra Hasan
Test Case Description	Verify that the onboarding flow guides the user through the setup process.
Action/Test Steps	1. Log in with valid credentials. 2. Follow the onboarding prompts. 3. Select a template and configure basic store settings.
Test Data	N/A
Pre-Conditions	User must log in for the first time.

Post-Conditions	User completes onboarding and is redirected to the dashboard.
Expected Result	Onboarding steps are successfully completed
Actual Result	
Status	

4.1.4 TC-04: Payment Integration

Table 44 TC-04: Payment Integration

Test Case ID	TC-04
Application Name	DroPilot
Use Case(s)	Payment Integration
Created By	Abdul Hanan
Test Case Description	Verify that the Stripe payment integration processes a payment successfully through the checkout page.
Action/Test Steps	1. Navigate to the application's checkout page. 2. Add an item to the cart (if applicable). 3. Fill in the required billing details. 4. Select "Credit/Debit Card" as the payment method. 5. Enter test card details provided by Stripe (e.g., 4242 4242 4242 4242 for valid transactions). 6. Submit the payment form.
Test Data	• Test Card Number: 4242 4242 4242 4242 • Expiry Date: 12/34 • CVV: 123 • Billing Address: [Test Address] • Other test card details provided in the Stripe documentation.
Pre-Conditions	Stripe API keys are correctly configured in the application.
Post-Conditions	A confirmation email/receipt is sent.
Expected Result	Payment is processed successfully.
Actual Result	
Status	

4.1.5 TC-05: Real-Time Stock Updates

Table 45 TC-05: Real-Time Stock Updates

Test Case ID	TC-05
Application Name	DroPilot
Use Case(s)	Real-time Stock Updates
Created By	Yahya Irfan
Test Case Description	Verify that stock levels are updated automatically through supplier's store.
Action/Test Steps	1. Configure supplier integration. 2. Trigger stock synchronization. 3. Verify updated stock levels in the dashboard.
Test Data	N/A
Pre-Conditions	Supplier's store must be active.
Post-Conditions	Stock levels are synchronized successfully.
Expected Result	Stock updates are reflected in real-time.
Actual Result	
Status	

4.1.6 TC-06: Low Stock Alerts

Table 46 TC-06: Low Stock Alerts

Test Case ID	TC-06
Application Name	DroPilot
Use Case(s)	Low Stock Alerts
Created By	Bushra Hasan
Test Case Description	Verify that the system sends low stock alerts when thresholds are reached.
Action/Test Steps	1. Set a low stock threshold for a product. 2. Reduce product stock below the threshold. 3. Check for alerts (e.g., email or notification).
Test Data	Product: T-Shirt Threshold: 5
Pre-Conditions	Stock levels must be above the threshold initially.

Post-Conditions	Low stock notifications are sent to the user.
Expected Result	System generates and sends low stock alerts.
Actual Result	
Status	

4.1.7 TC-07: Order Processing

Table 47 TC-07: Order Processing

Test Case ID	TC-07
Application Name	DroPilot
Use Case(s)	Order Processing
Created By	Abdul Hanan
Test Case Description	Verify that the system successfully forwards order details to the supplier.
Action/Test Steps	1. Place an order as a customer. 2. Confirm that the order is forwarded to the supplier. 3. Validate the transmitted order details.
Test Data	Order: Laptop Customer: John Doe Shipping: Standard
Pre-Conditions	Supplier's store must be active.
Post-Conditions	Order details are securely forwarded to the supplier, and confirmation is logged
Expected Result	Order is forwarded successfully, and the system confirms transmission
Actual Result	
Status	

4.1.8 TC-08: Automatic Invoice Generation

Table 48 TC-08: Automatic Invoice Generation

Test Case ID	TC-8
Application Name	DroPilot
Use Case(s)	Automatic invoice Generation

Created By	Yahya Irfan
Test Case Description	Verify that the system generates and stores an invoice after an order is confirmed
Action/Test Steps	1. Confirm an order. 2. Check the generated invoice in the user account.
Test Data	Order: Books Price: $50
Pre-Conditions	An order must be confirmed.
Post-Conditions	The invoice is generated and stored in the user's account.
Expected Result	Invoice includes accurate details (product, price, customer, etc.) and follows proper formatting.
Actual Result	
Status	

4.1.9 TC-09: Product Sourcing

Table 49 TC-09: Product Sourcing

Test Case ID	TC-09
Application Name	DroPilot
Use Case(s)	Product Sourcing
Created By	Bushra Hasan
Test Case Description	Verify that product data is fetched from supplier systems automatically.
Action/Test Steps	1. Connect to a supplier's store. 2.Fetch product data. 3.Validate the received product details.
Test Data	Supplier: Gifther.pk Product: Shoes
Pre-Conditions	Supplier's store must be active.
Post-Conditions	Product data is added to the inventory.
Expected Result	Product data (name, description, pricing) is fetched and displayed accurately.
Actual Result	
Status	

4.1.10 TC-10: AI-Enhanced Product Descriptions

Table 50 TC-10: AI-Enhanced Product Descriptions

Test Case ID	TC-10
Application Name	DroPilot
Use Case(s)	AI-Enhanced Product Descriptions
Created By	Abdul Hanan
Test Case Description	Verify that AI generates SEO-optimized product descriptions and allows user customization.
Action/Test Steps	1. Select a product. 2. Generate an AI-enhanced product description. 3. Edit the AI-generated content and save it.
Test Data	Product: Backpack Keywords: Durable, Waterproof
Pre-Conditions	The AI model must be integrated.
Post-Conditions	Customizations are saved and displayed.
Expected Result	AI generates descriptions based on the given product and keywords. Users can edit and save their changes.
Actual Result	
Status	

4.1.11 TC-11: Store Setup

Table 51 TC-11: Store Setup

Test Case ID	TC-11
Application Name	DroPilot
Use Case(s)	Store Setup
Created By	Yahya Irfan
Test Case Description	Verify that the system assists in creating an e-commerce store.
Action/Test Steps	1. Access the store setup feature. 2. Input preferences for products, branding, and themes. 3. Check the generated product listings.
Test Data	Preferences: - Industry: Fashion

	- Theme: Minimalist - Branding: Logo and pastel color palette
Pre-Conditions	User account must be active with the appropriate permissions.
Post-Conditions	The system generates a functional draft store based on user inputs.
Expected Result	The system provides product listings, branding suggestions, and layout recommendations based on user preferences.
Actual Result	
Status	

4.1.12 TC-12: Template Selection

Table 52 TC-12: Template Selection

Test Case ID	TC-12
Application Name	DroPilot
Use Case(s)	Template Selection
Created By	Bushra Hasan
Test Case Description	Verify that the user can select and preview templates based on industry and design style.
Action/Test Steps	1. Navigate to the template selection page. 2. Browse through the template categories. 3. Preview selected templates. 4. Finalize and apply a template to the store.
Test Data	Template Type: Industry – Fashion Design Style: Minimalist
Pre-Conditions	Template options must be available in the system.
Post-Conditions	The selected template is applied to the store.
Expected Result	The system categorizes, previews, and applies the template successfully.
Actual Result	
Status	

4.1.13 TC-13: Customization Options

Table 53 TC-13: Customization Options

Test Case ID	TC-13
Application Name	DroPilot
Use Case(s)	Customization Options
Created By	Abdul Hanan
Test Case Description	Verify that the system allows users to modify store layouts, colors, fonts, and design in real-time, with the ability to save and revert changes.
Action/Test Steps	1. Navigate to the store customization section. 2. Modify layout, colors, and fonts using the provided interface. 3. Check for live preview of changes. 4. Save the changes and verify their persistence. 5. Revert changes.
Test Data	Layout: Two-column design Colors: Blue and white theme Fonts: Roboto
Pre-Conditions	The store must be active.
Post-Conditions	Customizations are successfully applied and saved.
Expected Result	The system provides a user-friendly interface for modifications, saves changes, and supports reverting and advanced customization.
Actual Result	
Status	

4.1.14 TC-14: Domain Integration

Table 54 TC-14: Domain Integration

Test Case ID	TC-14
Application Name	DroPilot
Use Case(s)	Domain Integration
Created By	Bushra Hasan
Test Case Description	Verify that users can integrate custom domains or subdomains and connect external domains with SSL certificates.
Action/Test Steps	1. Navigate to the domain management section. 2. Select an option to use a custom domain or subdomain. 3. Follow the step-by-step instructions to connect an external domain.

	4. Verify SSL certificate activation for secure browsing. 5. Test domain management features such as updating or removing a domain.
Test Data	Custom Domain: www.mystore.com
Pre-Conditions	The store must have domain management capabilities, and the user must own the domain.
Post-Conditions	The custom domain is successfully integrated and secured with SSL.
Expected Result	The system integrates domains seamlessly, provides SSL certificates, and supports management tasks.
Actual Result	
Status	

4.1.15   TC-15: Sales Report

Table 55 TC-15: Sales Report

Test Case ID	TC-15
Application Name	DroPilot
Use Case(s)	Sales Report
Created By	Yahya Irfan
Test Case Description	Verify that the system generates sales reports with detailed metrics and visualizations.
Action/Test Steps	1. Navigate to the analytics and reporting section. 2. Select the sales report for a specific time frame (e.g., weekly). 3. Verify metrics like total revenue, best-selling products, and average order value. 4. Export the report. 5. Check for visual representations such as graphs and charts.
Test Data	Time Frame: Weekly
Pre-Conditions	Sales data must be available for the selected time frame.
Post-Conditions	The user receives a comprehensive report with accurate data.
Expected Result	The system generates a report with correct metrics, visual representations, and export functionality.
Actual Result	
Status	

4.1.16 TC-16: Product Profitability Analysis

Table 56 TC-16: Product Profitability Analysis

Test Case ID	TC-16
Application Name	DroPilot
Use Case(s)	Product Profitability Analysis
Created By	Abdul Hanan
Test Case Description	Verify that the system provides detailed profitability insights for products.
Action/Test Steps	1. Navigate to the analytics and reporting section. 2. Open the product profitability analysis feature. 3. Verify the gross and net profit metrics. 4. Check for detailed cost breakdowns. 5. Identify the most profitable products and suggested optimization areas.
Test Data	Product: Sneakers
Pre-Conditions	Accurate cost and sales data must be available.
Post-Conditions	Insights on profitability and cost breakdown are displayed.
Expected Result	The system provides clear and actionable insights on product profitability.
Actual Result	
Status	

4.2 Testing

Testing is the process of evaluating a system or its components with the intent to find whether it satisfies the specified requirements or not. It can also be used to identify any missing or incomplete requirements. Testing is a critical part of the software development process as it helps to ensure that the system is of high quality and fit for its intended purpose.

Effective testing is essential for ensuring the quality and reliability of a system. It is important to carefully plan and execute the testing process to ensure that all aspects of the system are thoroughly tested and any issues are identified and addressed.

There are different approaches to testing, including:

4.2.1 Unit Testing

In unit testing, we tested all the modules of system separately in following phases:

- Black Box Testing

    Inputs and outputs are made for testing purpose in this phase.

- White Box Testing

  Code and design are tested in this phase.

4.2.2 Integration Testing

In integration testing, we combine all the dependent modules and starts testing them.

• **Bottom-up testing:** In this phase, we are testing the system modules from bottom to top. First, we test the base modules and then at the end we go for testing the first/top module.

• **Top-down testing:** In this phase, we are testing the system modules from top to bottom. First, we test the top modules and then at the end we go for testing the last module of system.

4.2.3 Acceptance Testing

Here we will test that our system is complete and verified that is our system providing us accurate result which are we expecting.

5 Conclusion

5.1 Problems Faced and Lessons Learned

In the development of DroPilot, several potential challenges are anticipated, which will require careful planning and strategic solutions to overcome:

1. **Third-Party Integration Issues**: Integrating third party APIs and payment gateways may present difficulties due to inconsistencies in data structures, rate limits, and occasional downtimes. It will be essential to design robust error-handling mechanisms and fallback strategies to maintain system reliability.

2. **Data Quality Concerns**: Web scraping for product data may yield incomplete, outdated, or inconsistent information. Implementing data validation techniques and employing AI-driven cleaning and verification processes will be crucial to ensuring high data quality.

3. **Scalability and Performance**: As the platform grows and data volume increases, maintaining system performance may become challenging. Optimizing database queries, employing caching solutions, and ensuring the infrastructure can scale dynamically will help address potential bottlenecks.

4. **Security and Compliance**: Handling sensitive user data, including payment information, will require adherence to data protection regulations like **GDPR** and **PCI DSS**. Ensuring data encryption, secure authentication, and access control will be critical to mitigating security risks.

5. **User Experience (UX) Design**: Developing a user-friendly interface that meets the needs of diverse dropshippers may require iterative feedback and multiple design refinements. Prioritizing UX design and usability testing will be key to enhancing platform adoption and satisfaction.

By anticipating these challenges, the team can better prepare strategies and solutions to ensure the successful development and deployment of **DroPilot**.

5.2 Project Summary

DroPilot aims to be an AI-driven automation platform designed to streamline and optimize core processes in dropshipping businesses. The platform's features are intended to reduce manual effort, minimize operational risks, and enhance decision-making through intelligent automation. Key features of **DroPilot** include:

- **Store Creation and Customization**: Allows users to quickly set up and personalize their online stores using intuitive templates and design tools.
- **AI-Powered Product Hunting**: Automates the identification of trending products using web scraping and machine learning techniques.
- **Real-Time Stock and Pricing Synchronization**: Ensures up-to-date inventory and pricing through seamless integrations and webhooks.

- **Order Fulfilment Automation**: Streamlines the fulfilment process by securely transmitting order details to suppliers.
- **AI Customer Support Chatbot**: Provides instant, AI-powered customer support to enhance user experience.
- **SEO Optimization**: Generates SEO-friendly product descriptions and keywords to boost store visibility.
- **Advanced Analytics and Reporting**: Offers actionable insights and detailed reports to support data-driven decisions.

By leveraging AI and automation, DroPilot seeks to address the key challenges faced by modern dropshipping businesses and provide an efficient, scalable solution for store owners.

5.3 Future Work

To further enhance DroPilot, several future developments are planned:

1. **Advanced Predictive Analytics**: Enhancing AI models to predict product trends and customer demands with greater accuracy.
2. **Multi-Language Support**: Expanding the chatbot and user interface to support multiple languages for a global user base.
3. **Augmented Reality (AR) Integration**: Allowing customers to visualize products in real-world settings before purchasing.
4. **Enhanced Security Measures**: Introducing two-factor authentication (2FA) and advanced fraud detection systems to strengthen platform security.

These planned enhancements will ensure DroPilot remains adaptable, innovative, and capable of meeting the evolving needs of dropshipping businesses in an ever-competitive market.

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